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MINISTRY OF ENVIRONMENT, WATER
AND NATURAL RESOURCES

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

# KIBIRONG INTEGRATED WETLAND MANAGEMENT PLAN 2014-2018

*"A well Conserved Kibirong Wetland Ecosystem for Socio-economic Benefits"*

LAKE VICTORIA ENVIRONMENTAL MANAGEMENT PROJECT
LVEMP II
FOR SUSTAINABLY MANAGED RESOURCES

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mazingira yetu | uhai wetu | wajibu wetu

THE WORLD BANK

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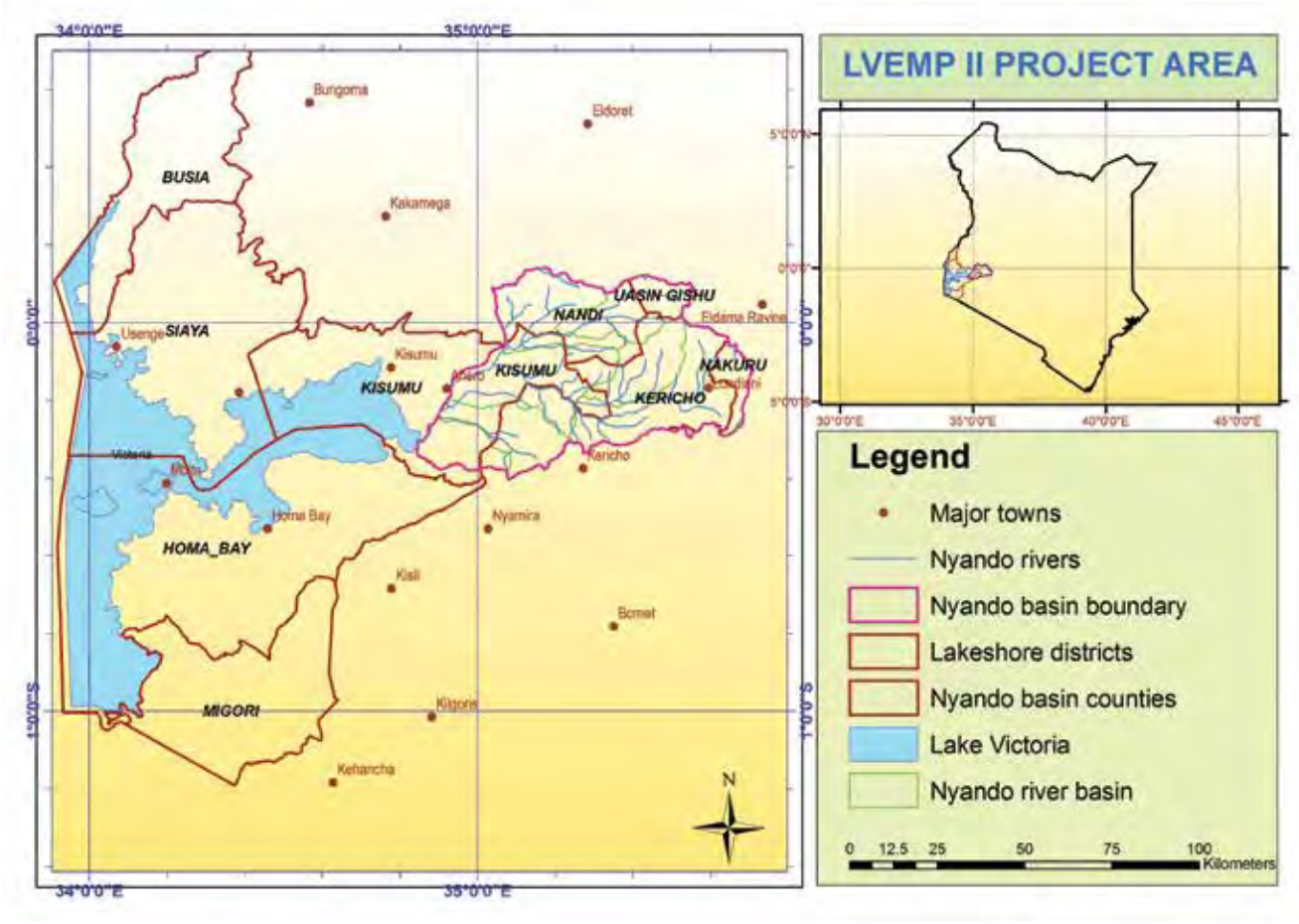
# PROJECT COVERAGE AREA




**NYANDO RIVER BASIN**

# FOREWARD

Wetlands have been defined as the earth's kidneys because of the functions they perform in the hydrological and chemical cycles. They have also been described as "biological super markets" because of the extensive food webs and rich biodiversity they support. They are considered to be important ecosystems, which contribute considerably to national economies and rural livelihoods. However, despite the numerous goods and services they provide, they have received little recognition and continue to face serious threats mainly from the actions of mankind. They are the most degraded and rapidly lost ecosystems in the world. These have resulted in loss of biodiversity and livelihoods in many places. For many years wetlands have been described as wastelands as their benefits have not been understood.

In Kenya, wetlands cover approximately 14,000 $km^2$ (ca 3-4%) of the land 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.

Ensuring sustainable wetland management is not only an international obligation under the Ramsar Convention, but fulfils the achievement of the Millennium Development Goals (MDGs), on poverty eradication and environmental sustainability and post 2015 Sustainable Development Goals (SDGs), regional level commitments such as sustainable environmental and natural resource management as provided for under the East African Community Treaty and the protocol on Environmental and Natural Resources Management.

The Government of Kenya understands and appreciates the role the environment and in particular wetlands, play in underpinning development. It is cognizant that achieving Vision 2030, the national development blue print that aims *to make Kenya a middle income country providing high quality life for all its citizens by the year 2030* depends on maintaining the natural systems that support agriculture, energy supplies, livelihood strategies and tourism

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. My Ministry has embarked on the following strategic interventions in order to reverse wetlands degradation in Kenya: Development of a national Wetlands Policy which seeks to provide guidance on wise-use of wetlands, production of a Wetlands Atlas, which provides reliable and up-to-date visually oriented information regarding wetlands. Additionally, the Atlas provides succinct account of what is happening to various wetlands in Kenya and possible mitigation actions.

The Master Plan for the Conservation and Management of Water Catchment Areas on other hand provides recommended interventions within a framework in order to achieve conservation and sustainable management of the country's water catchment areas.

The Kibirong Integrated Wetland Management Plan (2014-2018) sets the motion for consolidating stakeholder's efforts 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 Nandi is urged to provide leadership and guidance towards achieving the vision of this plan. I call upon partners to support environmental management, and more so the County Governments to increase their resource base and funding towards wetlands rehabilitation and restoration.

**Richard L. Lesiyampe, Phd, MBS,**

Principal Secretary

Ministry of Environment, Water & Natural Resources

# PREFACE

Wetlands are complex and vital ecosystems providing numerous benefits to both nature and mankind. 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

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 provided the need for sustainable wetlands, marine and coastal resource management 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 gazzetment of wetlands as protected and conservation areas.

As the environmental protection agency, 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 coordination 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 Kibirong Integrated Wetland Management Plan for the benefit of both present and future generations.

**Prof. Geoffrey Wahungu,**

Director General

National Environment Management Authority

# ACKNOWLEDGEMENTS

Kibirong Integrated Wetland Management Plan has set the motion towards ensuring wise-use and sustainable management of the wetland resources. The plan which envisions a *"well conserved Kibirong Wetland Ecosystem for socio-economic benefits"* is a product of commitments and good will of many stakeholders. Therefore, my warm gratitude goes to all staheholders 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 componets of LAVEMP II.

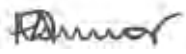
I recognize the financial support provided by the Government of Kenya and the World Bank without which this exercise could not have been achieved.

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 Opaa, 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 Kihiu. 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)

# LIST OF ACRONYMS

| | |
|---|---|
| **AEWA:** | African-Eurasian Water bird Agreement |
| **AEZ:** | Agro ecological zone, Nandi |
| **C.C.S:** | Christian Community Services |
| **CBD:** | Convention on Biological Diversity |
| **CBO:** | Community Based Organization |
| **COP:** | Contracting Parties |
| **EAC:** | East African Community |
| **EMCA:** | Environment Management and Coordination Act |
| **F:** | Females |
| **GOK:** | Government of Kenya |
| **KEFRI:** | Kenya Forestry Research Institute |
| **KFS:** | Kenya Forestry Services |
| **KWS:** | Kenya Wildlife Services |
| **LH1:** | Lower Highland-Humid |
| **LH2:** | Lower Highland-Sub-Humid |
| **LVEMP:** | Lake Victoria Environment Management Program |
| **M:** | Males |
| **MDG:** | Millennium Development Goals |
| **MOA:** | Ministry of Agriculture |
| **NEMA:** | National Environment Management Authority |
| **NGOs:** | Non-Governmental Organizations |
| **UH1:** | Upper Highland- Humid |
| **UM1:** | Upper Midland- Humid |
| **UM2:** | Upper Midland- Sub-Humid |
| **UM3:** | Upper Midland- Semi-Humid |
| **UN:** | United Nations agencies |
| **UNCCD:** | United Nations Convention to Combat Desertification. |
| **UNEP:** | United Nations Environment Program |
| **UN-HABITAT:** | United Nations Human Settlements Program |
| **UNO:** | United Nations Organization |
| **WARMA:** | Water Resource Management Authority |
| **WRUA:** | Water Resource Users Association |
| **Y:** | Youths |

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# EXECUTIVE SUMMARY

Nandi County is endowed with many wetlands comprising of rivers, swamps, dams and springs among others contributing immensely to the socio-economic and ecological development. They provide essential goods and services including fish, water for various purposes, reeds, food, and recreational uses and modify climate.

Despite the myriad of functions performed by wetlands, they continue to face many threats including encroachment for agriculture and settlement, pollution, siltation and loss of biodiversity due to human and natural – induced factors. Most of these challenges and threat facing wetlands are due to inadequate information and lack of recognition of the values that wetlands play in socio-economic sectors of human life.

The integrated management plan (IMP) for Kibirong is timely and a welcome move towards reversing the degradative actions that have impeded the sustainable management and utilization of this once bountiful ecosystem. The management plan aims at promoting conservation and sustainable utilization of the wetland resources within the Ramsar Convention's Wise- use Principle.

The plan has identified the strategic objectives, actions, indicators of success and actors intended towards broader stakeholder engagement, capacity building and resource mobilization. Key actions include catchment management, water pollution control and solid waste management, livelihood improvements and advancing monitoring and participatory research that can inform county-level policy making and decision-making processes. As County Government, we are committed to provide financial and technical support towards plan implementation.

**His Excellency,**

**CLEOPHAS KIPROP LAGAT**
Governor,
Nandi County

# 1.0 INTRODUCTION

Wetlands play an important role in regulating water flow, groundwater recharge, water storage, filtering of nutrients and pollutants, shoreline and microclimate stabilization and are of exceptional importance as habitats for large number of species especially birds. Wetland habitats are also of high economic importance for provision of water and fisheries. Wetlands in arid and semi-arid lands are an important refuge for grazing. However, wetlands are being drained for agricultural use at an alarming rate resulting in degradation of catchment areas, pollution and unsustainable harvesting practices. Given the fragility of wetlands there is an urgent need to strike a balance between the environmental functioning of wetlands and their use for livelihood. This requires management regimes which help maintain some of the natural characteristics of wetlands while also allowing for their wise use.

Swamps, dominated by *Cyperus papyrus,* form a distinctive wetland type in tropical Africa, supporting many endemic species (Hughes and Hughes 1992). One estimate puts the total area covered by papyrus swamps in Africa at 4000 km2 (Thompson and Hamilton 1983), but their extent is decreasing due to human encroachment and intensified land use changes around them (Thompson and Hamilton 1983; Hughes and Hughes 1992; Mafabi 2000; Kairu 2001). Papyrus swamps around Lake Victoria play crucial socio-economic roles to the local people and are of great significance for wetland as well as wildlife conservation (Bennun and Njoroge 1999; Mafabi 2000; Byaruhanga et al. 2001). They host wildlife species such as the sitatunga antelope *Tragelaphus spekei*, African python *Python sebae* and a suite of papyrus specialist birds including the globally threatened papyrus yellow warbler *Chloropeta gracilirostris* and papyrus gonolek Laniarius mufumbiri (Nasirwa and Njoroge 1997; Bennun and Njoroge 1999; Byaruhanga et al. 2001; Birdlife International 2004). Further, the swamps supply large amounts of organic nutrients to fringing waters, thus allowing an increase in animal and plant production at the swamp edge (Gaudet 1980; Moore 1994).

In Kenya, papyrus swamps are patchy and localized, and are found mainly along river inflows on the shores of Lakes Victoria, Naivasha and Jipe (Britton 1978; Bennun and Njoroge 1999; Boar et al. 1999). Land use activities around papyrus swamps of Lake Victoria are dominated by cultivation, livestock grazing and settlements (Mafabi 2000).These activities have intensified in recent years and are of particular concern as they have led to other forms of disturbance to papyrus swamps such as pollution, burning and papyrus harvesting (van der Weghe 1981; Mafabi 2000). In the Kenyan side, these activities have increased at an alarming rate (Keya and Michieka 1993; Government of Kenya 1994, 1995; Bennun and Njoroge 1999; Kairu 2001).

Wetland management plans therefore must be developed for site-specific wetlands in the Lake Victoria basin, including Kibirong, in order to address the challenges and threat facing them towards realizing sustainable use of these important natural resources. The development of a participatory wetland management plan is also in line with the MDG goal 7- target 9, which seeks to promote integrating the principle of sustainable development into country policies and program in an effort to reverse the loss of environmental resources. At the regional level, the East African Community advocates for the sustainable management and development of natural resources within the Basin.

# 2.0 NANDI COUNTY BACKGROUND

## 2.1 COUNTY PHYSICAL DESCRIPTION

### 2.1.1 LOCATION AND SIZE

Nandi County is one of the smallest Counties in the Rift Valley region, occupying an area of 2,839 sq. km (Table 1). The county is bordered by Kakamega County to the west; Uasin Gishu County to the north and east, Kericho County to the south-east corner, and Kisumu County to the south. Geographically, the unique jug-shaped structure of Nandi County is bound by the Equator to the South and extends northwards to latitude 00 34' to the North. The western boundary extends to longitude 340 45' East, while the eastern boundary reaches longitude 350 25' to the East.

**TABLE 1: AREA OF THE NANDI COUNTY AND THE SUBCOUNTIES**

| NAME OF DIVISION | AREA IN SQ. KM. |
|---|---|
| Mosop | 769 |
| Aldai | 500 |
| Tinderet | 378 |
| Kapsabet | 529 |
| Kilibwoni | 279 |
| Nandi Hills | 387 |
| Total | 2,839 |

*Source: District Survey Office, Nandi, 1993.*

### 2.1.2 TOPOGRAPHY AND GEOLOGY

Nandi County is characterized by hilly topography that includes an outcrop of basement system rocks. These rocks are distinctly visible as govanite tors in the hills of Sang'alo and Sarura in the north. Southward, they are replaced by thick layers of red soil usually covered by anthills. The dissected scarp at the southern border of the district is another manifestation of rock exposure.

The physiography of Nandi County is composed of five units with typical topography as follows: rolling hills in the west; the Kapsabet Plateau (part of Uasin Gishu Plateau); the wooded highlands and foothills of Tinderet Volcanic mass in the south-east; Kingwal Swamp in the Centre (Baraton-Chepterit); and the dissected Nyando Escarpment at the southern border.

The first unit constitutes an undulating landscape typified by rolling hills. They are chiefly flat-topped ridges with identical summits that may be remnants of an eroded plain. The Kimondi and Mokong Rivers flow westward through the area eventually joining the Yala River.

The Kapsabet Plateau extends from Kapsabet eastwards. The eroded remains of the original high plain form a conspicuous incised peneplain near Kapsabet at a height of 2,020 metres above sea level. The unit constitutes an undulating land surface traversed by rivers that form a sub-parallel consequent drainage system incised on the lava surface. The course of some rivers is slightly North West indicating the general dip of original lava flows. River Kipkarren is one of them.

Geologist believe that volcanic lava flowed along the gently sloping plateau northward, having been diverted by a hill at Kabiyet to flow west towards Sarora hills and also southward across the present King'wal Swamp.

The Tinderet Highlands are part of highly dissected piles of lava which form an extension of Kenya Highlands from the south-east corner of the district. In the wooded south-east corner, at the top of Meteitei Valley, rocks just out to a height of 2,500 metres. Fifteen kilometers to the east of the roads from Nandi Hills towards Songhor and Kisumu is a highly rugged landscape over which volcanic lava flowed.

Rivers in Tinderet form a northwest quadrant of radial drainage pattern. The Kipkurere, Kubos, Kindus and Ainabngetuny Rivers have deeply incised valleys, flowing south-west. The King'wal and Kipterges Rivers and their tributaries drain the northwestern flank of Tinderet Highlands. In the centre of the area, these rivers produce substantial waterfalls, dropping from the top of harder bands in volcanic rocks to the level of a swamp which foots the scarp. The King'wal Swamp lies at a height of over 1,960 metres and is considered to be a site of a hollow in the original landmass. The nearest basement system rocks outcrop the swamp near Chepterit. Drainage is prevented to the north and east by volcanic rock and prevented from the sourth by agglomerates of Tinderet. The rivers escape to the west over a series of rapids composed of hard bends in the basement system gneisses.

Nandi Escarpment is a manifestation of extremely rugged ground containing granite and volcanic rocks. The Equator runs alongside the scarp line in the area. There has been extensive faulting and intrusion both above and below the scarp. The rivers flowing the scarp descend in impressive rapids, dropping from 2,000m to 1,300m through Kibos. North of Nyando Scarp, hills occur at about 2,150 metres and a range of identifically high hills form a ridge westward along Nandi Fault. These, together with Kabiyet and Sang'alo Hills, are regarded as residuals of the original land surface. The wastershed of rivers descending the scarp (from Kimorick-Mocking system) runs only 10km.

These rivers, swamps and valleys have varied effects on the district's development. The rivers are the main sources of water supplies in the district. Due to the perennial water-flow in these rivers, enough water sources are available for both domestic use and commercial activities. Some rivers, especially in Tinderet Subcounty, have rapid falls which can be used to harness hydro-electric power. The swamps have not been put into any economic use. Most of them are poorly drained hence having no economic significance to the development of the district. Most of the valleys are for horticultural production. They are the main topography of the district results in very steep slopes which have a negative effect on transport system, especially during the wet seasons. This mainly interferes with the marketing operations and movement of people.

Four types of land slopes exist in the County:

#### 2.1.2.1 Mountainous

The land generally has rather steep slopes especially in part of Meteitei and Tinderet areas to the south-east; Kemeloi, Banjoes, Kaptumek, Kapkures, Kapkerer areas to the south; and Kamwega and Soimining to the north west.

This type of topography has made transportation network very difficult to establish. This factor alone has created a drawback in provision of development facilities in the affected regions.

#### 2.1.2.2 Steep Slopes

This includes parts of Chepterwai, Kipkarrensalient, Kabiemit, Ndalat, Sarora and Kabiyet areas to the north and Kapkangani areas to the west. Afforestation is required on the hills. Development of the main economic activities has been affected by the factors noted for the mountainous regions.

#### 2.1.2.3 Rolling or Hilly Land

This includes parts Nandi Hills, Kaptel, Kaptumo, and Kobujoi areas. Farming and other economic activities are well developed and mostly mechanized. This is attributed to the ease of communication both on the roads and on the farms.

#### 2.12.4 Gentle to Moderate Slopes

These cover parts of Kilibwoni, Kaplamai, Kosirai, Mutwot, Lelmokwo and Itigo areas. The topography of this region is just as in other areas. Also productivity of the farming activities is high due to high soil productivity and less capital injection towards soil conservation activities.

# 2.2 CLIMATE AND WEATHER PERSPECTIVES

The hilly and undulating topographical features of Nandi County coincide with a spatial distribution of ecological zones that define the agricultural and overall economic development potential of the area. The northern parts receive rainfall ranging from 1,300 mm to 1,600 mm per annum. The southern half is affected by Lake Basin atmospheric conditions receiving rainfall as high as 2,000 mm. p.a (table 2). Generally the County receives an average rainfall of about 1200mm to 2000 mm per annum. The long rains start in early March and continue up to end of June. The short rains start in mid September and end in November. However, there is no single month without some rainfall. The dry spell is usually experienced from end of December to mid March. The lowest rainfall is experienced in the eastern and north eastern parts of the district. The highest is recorded in the Kobujoi-Tindinyo area in Aldai subcounty. The rainfall distribution and intensity has direct relationship to economic activities in the County. Most parts of Nandi experience mean temperature between $18^0$ C -$22^0$ C during the rainy season, but the portion of the County below Nyando Escarpment at 1,300 m above sea level receives temperatures as high as $26^0$ C. However, during the dry months of December and January the temperatures are as high as $23^0$ C and during the cold spell of July and August the night temperature are as low as $14^0$ C (table 3).

The areas with 1500mm (and above) rainfall per annum, form the extended Agro-Ecological Zone for current and potential tea cultivation (LH1and UM1) (table 4 & 5). The relatively drier areas to the east and north-east which receive activity are carried out throughout the entire district. Due to the reliability of the rainfall in the entire County, Nandi has the potential to produce various agricultural crops ranging from tree crops, horticultural crops, and pyrethrum, cereals, and fruit trees.

**TABLE 2: MEAN MONTHLY RAINFALL FOR VARIOUS STATIONS (10 YEARS MEAN MONTHLY RAINFALL IN MM UP TO 1992)**

| STATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEPT | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nandi Hills | - | 63.32 | 139.5 | 179.5 | 174.3 | 122.0 | 133.7 | 164.9 | 113.2 | 127.0 | 108.4 | 59.2 |
| Kabiyet | 70.0 | 111.6 | 111.6 | 153.7 | 165,86 | 115.5 | 147.0 | 181.8 | 127.8 | 79.7 | 56.6 | 31.1 |
| Kobujoi | 62.63 | 13.73 | 137.3 | 33.8 | 344.2 | 144.5 | 113.5 | 175.5 | 178.4 | 156.4 | 123.1 | 70.6 |
| Kapsabet | 62.9 | 73.8 | 73.8 | 14.4 | 137.3 | 135.1 | 154.2 | 127.2 | 125.7 | 107.73 | 152.7 | 92.4 |

*Source: DAO's Annual Report, Nandi 1993.*

**TABLE 3: ANNUAL MEAN TEMPERATURE ($^0$C)**

| TOWN | KAIMOSI | KAPSABET | SONGHOR |
|---|---|---|---|
| Altitude AEZ Station | 1615M UM1 | 1998m LH1-2 | 2133m LH1-2 |
| January | 21.1 | 18.1 | 19.4 |
| February | 21.6 | 18.3 | 19.7 |
| March | 21.4 | 18.6 | 19.3 |
| April | 21.1 | 18.8 | 18.3 |
| May | 20.5 | 17.1 | 17.8 |
| June | 20.1 | 16.7 | 16.8 |
| July | 19.3 | 16.2 | 16.6 |
| August | 19.8 | 16.1 | 16.9 |
| September | 20.4 | 16.1 | 17.7 |
| October | 20.4 | 17.5 | 18.8 |
| November | 20.6 | 18.1 | 18.8 |
| December | 20.8 | 17.5 | 19.2 |

*Source: DAO's Annual Reports, Nandi, 1993.*

**Note:** AEZ= Agro= ecological zone, Nandi

**TABLE 4: CLIMATE IN VARIOUS AGRO-ECOLOGICAL ZONES OF NANDI DISTRICT**

| AGRO-ECOLOGICAL SECOND ZONE RAINS (MM.) | ALTITUDE | ANNUAL MEAN TEMPERATURE IN C | ANNUAL AVERAGE RAINFALL (MM.) | FIRST RAINFALL (MM.) | SECOND RAINFALL (MM.) |
|---|---|---|---|---|---|
| UH, | Forest | Reserve | | | |
| LH, Tea/Dairy Zone 550-800 | 1900-2400 | 18.0-15.0 | 1300-2100 | 630-850 | 550-800 |
| LH-2 Maize/Wheat/Pyrethrum Zone 500-700 750 | 1900-1400 | 18.0-15.0 | 1300-1800 | 600-750 | 500-700 |
| $LH_3$ Wheat/Maize/Barley Zone 500-600 680 | 1900-2300 | 20.5-15.5 | 1280-1650 | 500-680 | 500-600 |
| $UM_4$, Coffee Zone $UM_4$ | 1600-2000 | 19.17.5 | 1200-1600 | 400-600 | 500-600 |

*Source: Farm Management Handbook of Kenya.*

**TABLE 5: AGRO-ECOLOGICAL ZONES (SQ. KM)**

| AGRO-ECOL. ZONE | UH1 | LH1 | LH2 | LH3 | UM1 | UM2 | UM3 | LM1 | LM2 |
|---|---|---|---|---|---|---|---|---|---|
| Area | 111 | 344 | 306 | 612 | 473 | 83 | 111 | 56 | 195 |
| Major marginal | Dairy | Dairy | Wheat | Wheat | Coffee | Coffee | Marginal | Sugarcane | - |
| Land use | Sheep | Tea | Barley | Barley/ Pyrethrum | Tea | - | Coffee | - | - |

*Source: Agricultural Management Handbook MOA, 1983.*

**Note:**

- UH1- Upper Highland- Humid
- LH1-Lower Highland-Humid
- LH2- Lower Highland-Sub-Humid
- UM1- Upper Midland- Humid
- UM2- Upper Midland- Sub-Humid
- UM3 - Upper Midland- Semi-Humid

## ADMINISTRATIVE AND POLITICAL UNITS

The Nandi County Council covers the entire County except for the areas covered by Kapsabet Municipal Council and Nandi Hills Urban Council.

## ECONOMIC POTENTIAL

The distribution of soil depends on the soil forming factors which include the parent rock, climatic conditions, time and human as well as biological activities. Fertility depends on soil characteristics and varies with soil type and location.

## WATER RESOURCES

Nandi County is blessed with 7 major rivers and myriad of permanent streams flowing throughout the year. They include Olare Onyonkie river, Kimondi-King'wal, Kabutie, Mokong, Yala, Kipchoria and Kundos Ainopngetuny rivers. All the major rivers except two have their sources outside the district.

## FORESTRY

Nandi County is endowed with a rich supply of natural forestry resources. The County has about six gazetted forest reserves comprising only 75% of the initial natural forest reserves (table 6). The total length of the forest boundaries in 1978 was estimated at 231.7 Km of which 205.81 Km was artificial boundaries and 25.76 Km natural ones (rivers).

The forest area has gradually reduced from about 16% of the total County land area to around 12%. The North and South Nandi Forest Reserves are mainly confined to altitude below 1,900 metres above sea level, being a major contrast to North Tinderet Forest Reserve which lies between 2,300 metres to 2,500 metres above sea level.

The Nandi Forest is an extension of the tropical Kakamega Forest characterized by high rainfall and diverse species of trees. The Forest is composed of mixed indigenous hardwoods, besides 2,635.8 ha of exotic plantations at Kimondi and Cerengoni Forest Stations. The total boundary length of forest in the district is about 363.8 km. up from 205.81 km. (1978).

The medium potential areas are covered by shrubs and bushes. These grasslands cover mainly the eastern plateau parts, and portions lying below the scarp on Nyando Plains at 1,300 m. Woods, bushes and savanna grassland can be found in Songhor and extreme northern areas. Some land contains swamps, rocks and hills.

**TABLE 6: GAZETTED FOREST RESERVED IN THE DISTRICT**

| STATION (1978) | FOREST RESERVE | AREA (HA.) |
|---|---|---|
| Nandi | Uhuru | 433.4 |
| Nandi North | Teressia | 384.5 |
| Tinderet | Nandi North | 6,815.5 |
| North Nandi (Mosop/Aldai) | North Nandi | 11,460.3 |
| Cerengoni/Kapchorwa | North Tinderet | 17,432.5 |
| Nandi and Kobujoi | South Nandi | 17,961.4 |
| Total | | 54,487.4 |

*Source: MENR, Forestry Department, Nandi, 1993*

# 2.3 WILDLIFE

The Wildlife population in the district is erratic due to concentrated and widespread human settlement coupled with intensive agricultural activities. The most common game animals are the primates mainly found in Tinderet subcounty. A few leopards are found in Aldai subcounty. From 1995 onwards, Sitatunga antelopes have inhabited Kingwal wetland increasing the potential of Eco-tourism in the County.

**PLATE 1: SITATUNGA AND CROWNED-CRANES AT A WETLAND**

# 3.0 LEGAL FRAMEWORK

It is unfortunate that to date Kenya does not have a wetland policy. However, there are authoritative documents that support the conservation of wetlands in the country. Such documents include the Environmental Conservation Management Act (EMCA) of 1999 (GOK, 2000), the draft Wetlands Conservation and Management Policy 2013 and most recently provisions in the Kenya Vision 2030. The draft Wetlands Conservation and Management Policy for example states in part that the government, in collaboration with stakeholders will endeavour to map wetland areas countrywide and encourage and support development and implementation of catchment-based wetland management plans through a participatory process, develop and implement catchment-based management plans for all Ramsar sites through a participatory process and ensure restoration of degraded wetlands, riverbanks and lakeshores where appropriate, promote and support establishment of constructed wetlands.

Further it is clear from the draft policy that the government is committed to harmonising and coordinating the roles of various regulatory agencies charged with the management of wetlands (GOK, 2008). Apart from the draft Wetland Conservation and Management Policy, an authoritative blue print approved to guide the country in different sectors, the vision 2030 in section 5.4 address environmental issues outlines clearly what the government aims to achieve in environmental conservation in line with the MDGs (GOK, 2007) and the post MDGs, the Sustainable Development Goals (SDGs).

## 3.1 WETLAND MANAGEMENT POLICIES AND LEGISLATIVE FRAMEWORKS

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### 3.1.1 REVIEW OF THE POLICY CONTEXT

The context that defines and informs the development of the Wetlands Policy can be divided broadly into three, namely: global, regional and national. The global 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 context 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 identified above.

### 3.1.2 THE GLOBAL CONTEXT

As a member of the international community, Kenya participates in global discourses touching on environmental conservation and sustainable development within the framework of the United Nations Organization (UNO). Moreover, as the only developing country to play host to key United Nations (UN) agencies, namely the United Nations Environment Programme (UNEP) and the United Nations Human Settlements Programme (UN-HABITAT), it is closely associated with these discourses and has played host to major global gatherings on different aspects of environmental governance and management. With the promulgation of the Constitution, such international processes are expected to have much more significance in national policy processes in view of the stipulation by Article 2 of the Constitution that general rules of international law shall form part of the law of Kenya, and that any treaty or convention ratified by the country shall form part of its national law.

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 UN Framework Convention on Climate Change.

## 3.2 RIO DECLARATION ON ENVIRONMENT AND DEVELOPMENT

The Rio Declaration and Agenda 21 are non-binding declarations, but their importance in articulating general principles of the international law of sustainable development is not in doubt. The Rio Declaration reaffirmed the Stockholm Declaration made 20 years earlier at the conclusion of the United Nations Conference on the Human Environment, and built on it to articulate "a new and equitable global partnership through the creation of new levels of co-operation among States, key sectors of societies and people". It laid the framework for collaborative action among governments and between them and other stakeholders in the realization of the goals of sustainable development, setting out principles that have come to define environmental governance at all levels.

The Rio Declaration has relevance to national environmental policy making in its statement of principles that reconcile imperatives of environment and development. It asserts that "environmental protection shall constitute an integral part of the development process" and commits all states and peoples of the World to "co-operate in the essential task of eradicating poverty as an indispensable requirement for sustainable development". It underscores the need for informed participation by all concerned citizens, including women youth and indigenous communities in decision-making regarding management of the environment, and the importance of legislative and institutional frameworks for managing the environment. Other principles articulated by the Declaration include the Precautionary Principle, internalization of environmental costs, the use of economic instruments to promote compliance, and environmental impact assessment as a key input for decision-making. These principles have been adopted in the management plan.

## 3.3 AGENDA 21

Agenda 21 is a comprehensive programme of work for the realization of sustainable development in the 21st century, complete with budgetary estimates. It sets out specific actions to be taken for conservation and management of resources, including landscape ecological planning that integrates entire ecosystems and watersheds. It specifies strategies and interventions for sustainable management of land, combating desertification and drought, sustainable agriculture and rural development, conservation of biological diversity, protecting and managing fresh water, among others. Entrenched in Agenda 21 is the idea of partnerships for sustainable management that involve the participation of all social groups – women, youth and indigenous communities – as well organized groups such as Non-Governmental Organizations (NGOs), the private sector, researchers, local governments and farmers. It also underscores the importance of funding arrangements, technology transfer, research, education, training and public awareness, capacity development, information, and international cooperation in its implementation.

## 3.4 CONVENTION ON BIOLOGICAL DIVERSITY

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.

## 3.5 UNITED NATIONS CONVENTION TO COMBAT DESERTIFICATION

The United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa came into force on 26th December 1996 and was ratified by Kenya on 24th June 1997. It seeks to combat desertification and drought through "long-term integrated strategies that focus simultaneously, in affected areas, on improved productivity of land, and the rehabilitation, conservation and sustainable management of land and water resources, leading to improved living conditions, in particular at the community level" The strategies are to be implemented through cooperation with communities, NGOs and other stakeholders at national level and among countries at sub regional, regional and international levels. In addition to general obligations of Parties to the Convention, there are specific obligations for affected country parties and for developed country parties. The Parties also commit to give priority to affected African country parties.

## 3.6 RAMSAR CONVENTION ON WETLANDS

The Convention on Wetlands of International Importance Especially as Waterfowl Habitat (the Ramsar Convention on Wetlands) is the international Convention that has the greatest bearing on the development of the Wetlands Policy. The Convention, which is the only global environmental treaty that deals with a particular ecosystem, 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, Lakes Nakuru, Naivasha, Baringo, Bogoria, Elementaita and the newest 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.

One is struck by the fact that 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 trans boundary dimensions of environmental conservation and management, but at ultimately the gains of for the environment can only be realized when the imperatives set in global agreements and commitments are translated into actions at the local level. It is in this respect that the global environment movement speaks of thinking globally while acting locally. This is true for wetlands as it is for other environmental resources. It informs the requirement for national frameworks articulated by the Ramsar Convention.

The need for national 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.

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 or 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. In a context defined by limited human and financial resources and institutional capacity, it is doubtful how the stand-alone approach can benefit wetlands conservation and management.

The Handbook outlines a process for the development of a National Wetland Policy that merits consideration here, even though the remit of this review is limited to the content of the draft policy. This is because the process followed in developing a policy document is often as important as the content of the policy with regards to the buy-in from key stakeholders that is needed to ensure legitimacy, which in turn is critical for ensuring that the policy is implemented. The fact that the wetland policy has been in the works for more than a decade raises issues about process that should exercise the minds of stakeholders, as these have implications for the implementation of the policy once adopted.

## 3.7 THE AFRICAN - EURASIAN WATER BIRD AGREEMENT

This was an agreement developed in 1993 from deliberations of the Bonn Convection. The first consultative meeting of range states of African-Eurasian Water bird Agreement (AEWA) was held in Nairobi in June 1994. AEWA is another agreement that offers a good opportunity for the management and conservation of wetlands

# 4.0 PARTICIPATORY RESOURCE ANALYSIS

## 4.1 METHODOLOGY

The Kibirong Integrated Wetland Management Plan was developed using a participatory approach, where the planning team gave strong consideration to using the vast knowledge and experience from local communities. Participants were drawn from Koyo, Chepkongony and Ndurio locations that are adjacent to the wetland.

Participatory resource analysis involved the following key activities:

- Identifying resources in the wetland;
- Ranking resource use;
- Identifying key wetland use benefits from different resources;
- Identify the key wetland resource user groups according to gender;

## 4.2 KEY WETLAND RESOURCES (GOODS/ PRODUCTS) FROM KIBIRONG WETLAND ECOSYSTEM

Through a brain storming session, the planning team identified key wetland resources in the wetland system. Consensus was reached that the priority list of wetland resources should include those that existed in the past and are now non-existent. The team also agreed to consider some potential resource uses that are not necessarily being currently utilized but can be useful in future. Special emphasis was also given to key wetland services/ functions provided by the wetland system.

By using a voting system, the planning team ranked different resources from the wetland, as perceived according to use and importance in their livelihoods. Through group discussions composed of mixed Resource User Groups (RUGs) and other stakeholders, lists were made of the key wetland resource uses in the wetland. The planning team was also guided to provide more details on the specific benefits that were got from different wetland resources. Examples include grass as a resource, which can be utilised for different benefits, for example grazing, construction/ thatching, and mulching. This was anticipated to have a bearing on management planning, because one resource may be having different threats, depending on the use at hand, while some benefits from the same resource may not be having problems. A ranking exercise was conducted, to show the perceived relative importance of different wetland resources. Table 7.0 gives a summary of the ranked key resources from the wetland system.

**TABLE 7: KEY RESOURCES FROM KIBIRONG WETLAND ECOSYSTEM RANKED ACCORDING TO PERCEIVED LEVEL OF IMPORTANCE**

| RESOURCE | BENEFITS | GENDER | RANKING |
|---|---|---|---|
| Water | Human domestic use<br>Livestock and wildlife use<br>Irrigation<br>Industrial use | F,M,Y | 1 |
| Crops | Food security<br>Income generation<br>Nutrition | F,M,Y | 14 |

| | | | |
|---|---|---|---|
| Grass | Livestock feed, prevent erosion and flooding<br>Thatching houses<br>Cultural use (during initiation) | F,M,Y | 7 |
| wildlife | Medicinal use as in the case of shy otters<br>Ecotourism<br>Research and Education | F,M,Y | 2 |
| Fish | Provision of food<br>Income generation | F,M,Y | 6 |
| Birds | Ecotourism<br>Aesthetic value | F,M,Y | 4 |
| Trees | Herbal medicine, Firewood<br>Fruits, Aesthetic value<br>Soil erosion control,construction and income generation | F,M,Y | 3 |
| Cultural Site | For initiation activities rituals and ceremonies<br>Ecotourism | F,M,Y | 9 |
| Herbal plants | Herbal medicine and income generation | F,M,Y | 5 |
| Papyrus reeds | Carpet making, Mat making<br>For decoration and cultural use<br>Basket /Arm chair making and income generation | F,M,Y | 8 |
| Sand | Construction of structures or facilities and income generation | F,M,Y | 13 |
| Clay | Pottery,Making walls for building<br>Brick making and income generation | F,M,Y | 12 |
| Salt-lick | Provision of minerals<br>Livestock and wildlife deworming | F,M,Y | 11 |
| Mushroom | Used as food for humans and income generation | F,M,Y | 10 |

**KEY:** F- Females M- Males Y- Youths

## 4.3 IDENTIFICATION OF KEY WETLAND RESOURCE USER GROUPS

The planning team agreed to the fact that most of the resources are used by all sectors of society. They also noted that the relevant resource benefits are either harvested or utilized by different gender groups. Based on that fact, resource use in Kibirong wetland was disaggregated into use according to gender.

Resource use in the wetland is divided according to gender roles in different sectors of society. For example some activities are a domain of male adults (men), while some others are mainly dominated by women and youth. For example hunting and brick making are dominated by men. Women were reported to be active in the marketing of firewood. Women and youth were reported to be the ones mainly responsible for fetching of water and firewood.

Different gender roles in the use of the wetlands have a bearing on how to target interventions for Kibirong wetland management and conservation programmes. Concerns on decline of a particular resource will be felt by the relevant key resource users, who can have a stronger commitment to work together to find appropriate solutions. Future management and conservation programmes in the area should therefore focus on different genders in the society.

## 4.4 KEY WETLAND SERVICES/ FUNCTIONS OF THE WETLAND SYSTEM

The planning team came to a consensus that wetland benefits from the wetland can be categorized in 2 classes as direct benefits (goods/ products) and indirect benefits (services/ functions). Whereas the goods/ products identified in section 3.2 can be harvested and utilized at home or sold in the markets, the services/ functions are not tangible though they contribute a lot to livelihood improvement. It was agreed that the services or functions are in most cases complementary in providing quality goods/ products. The team agreed that the services/ functions provided by the wetland system are therefore very vital for the livelihoods of the communities in the area and beyond. Through a voting system, the services/ functions were ranked. Table 8 gives a summary of the key functions/ services from the wetland system. After the exercise, the planning team appreciated the importance of the functions/ services, especially based on the likely impacts from loss of the relevant services.

**TABLE 8: KEY SERVICES AND FUNCTIONS OF KIBIRONG WETLAND**

| SERVICE/FUNCTION | END PRODUCT/RESULT | RANK |
|---|---|---|
| 1. Water recharge and storage | Increased water level | 1 |
| 2. Water filtration and cleansing | Provision of clean water | 2 |
| 3. Carbon sinks/ climate change | Purification of air | 4 |
| 4. Habitat Provision for fauna and flora | Provision of habitat to wetland species of plants animals | 3 |
| 5. Fish spawning and breeding grounds. | Increased fish production hence food security. And income generation | 5 |
| 6. Fertilty and nutrient retention | Increased vegetation growth | 6 |
| 7. Flood Control/ silt retention | Wetlands control floods by retaining silt which would have caused flat plains downstream hence flooding is avoided | 7 |

**PLATE 2: A CONSERVED WETLAND**

# 5.0 STAKEHOLDER ANALYSIS

A 'stakeholder' was defined as an interested individual, group or institution that may or may not be affected by decisions or actions pertaining to a specific resource, and may or may not be part of decision-making about the resource.

Stakeholder analysis involved identification of primary, secondary and key stakeholders, assessment of their interests and determination of how these interests affect the wetland.

## 5.1 METHODOLOGY

The task was introduced in a plenary session before they were divided into groups to discuss assigned tasks. Deliberations from the group work were presented and discussed in plenary sessions before coming up with a consensus.

Multiple approaches were used to make the process fully participatory. The first session involved presentations which were used to raise awareness among stakeholders on specific issues. The participants were taken through presentations on wetland management planning process, stakeholder participation in wetland management and Stakeholder analysis.

The presentation on stakeholder participation in wetland management planning focused on: Who is a wetland Stakeholder and Stakeholder participation in management of wetlands. Some of the key issues discussed covered the following:

- Planning within the wise use concept;
- Overall goal to achieve optimal utilization;
- Long term objectives of planning within the framework of draft National Wetland Policy;
- Optimization of the benefits from wetland services;
- Contribution to the wellbeing of all communities;
- Enhancement of fair distribution of wetland benefits; and
- Provision basis for monitoring and evaluation of wetland resource use, among others.

The stakeholders were enlightened on the contemporary approach used in the wetland management planning process. Adaptive Management Approach i.e." learning by doing" while taking into account factors that affect the features of the site, continual development of the processes and demonstration that the management is appropriate and effective was emphasized.

From the discussion, it was emphasized that it is the stakeholders who plan, design, implement monitor and evaluate the project. At this point different types of wetland stakeholders (direct, indirect and non-users) and how they impact on the wetlands (positively or negatively) was outlined. The rationale used to group stakeholders as primary stakeholders (those who benefit directly), secondary stakeholders (intermediaries) and key stakeholder (those who influence decision-making) depending on their interests was also clearly outlined.

Stakeholder participation in management of natural resources was outlined by clarifying the assumptions of Participatory Approaches and different types of participation. The purpose of this was to elicit the right kind of

participation from the stakeholders. After the presentations, questions raised by the stakeholders were clarified setting the stage for educating the participants on the main objective of the Stakeholders Analysis Process.

After the presentations the stakeholders were engaged in group discussions. The tasks involved:

- Identifying and listing all potential stakeholders;
- Identifying stakeholder interests (both overt and hidden) in relation to the problem and objectives;
- Assess the likely impact of wetland degradation (positive, negative, unknown) on each of the interests;
- Indicating the relative priority that should be given to each stakeholder to satisfy their interests.

The final output of the analysis was a matrix diagram with four groups (boxes) of stakeholders A, B, C and D. The categories of boxes A, B, C are key stakeholders that can significantly influence wetland management activities.

## 5.2 STAKEHOLDER IDENTIFICATION

During this process, stakeholders were identified by the participants and categorized into primary and secondary stakeholders. To ensure that the process was adequately done, the following checklist of questions was used as a guide:

- Have all primary and secondary stakeholders been listed?
- Have all potential supporters and opponents of the project been identified?
- Has gender analysis been used to identify different types of female stakeholders at both primary and secondary level?
- Have primary stakeholders been sub-divided into water user or occupational groups?
- Have the interests of vulnerable groups (especially the poor) been identified?
- Are there any new primary or secondary stakeholders that are likely to emerge as a result of the project?

### 5.2.1 PRIMARY STAKEHOLDERS

These included the following groups: Land owners adjacent to the wetland, Domestic water users, Farmers (irrigation water for food crops and horticulture). They use the wetland for various purposes as follows:

- Fishing
- Grazing
- Swimming
- During initiation
- Baptism
- Agro forestry
- Herbalists
- Brick makers
- Papyrus harvesters
- Clay harvesters

### 5.2.2 SECONDARY STAKEHOLDERS

- Ministry of Agriculture, Livestock and Fisheries
- Ministry of Tourism
- KWS and KFS
- Ministry of Environment, Water and Natural Resources
- Ministry of Gender and Social development
- Lake Victoria Environment Management Project,
- Ministry of Health
- Ministry of Interior Coordination
- County Government
- Ministry of Education/ institutions of higher Learning
- Ministry of Industrialization (Kaptumo Tea Factory)
- Ministry of National Planning
- Community Based Organization (CBOs):
- N.G.Os (C.C.S-Christian Community-Services)
- Nature Kenya

### 5.2.3 OTHER STAKEHOLDERS

- Political Leaders
- Churches
- Development partners
- Business community

## 5.3 STAKEHOLDER INTERESTS

After identifying all the stakeholders, it was important to identify their interests within the Wetland. The interests of all stakeholders are often difficult to define, especially if they are 'hidden' (covert) or in contradiction with the openly stated aims of the individuals, groups or institutions involved. However, this is an important process as knowing the interest of a stakeholder is a key to their involvement and participation in the management planning and overall role in the management of the resource. A rule of thumb is to relate each stakeholder to either the problem that a project seeks to address or the established objectives of the project. It is after identifying the interests of stakeholders that an initial list of those to be involved in the process was drawn out (table 9). To ensure the interests of stakeholders was appropriately drawn; the following questions were used to guide the participants.

- What are the stakeholder's expectations of the project?
- What benefits are there likely to be for the stakeholder?
- What resources will the stakeholder wish to commit (or avoid committing) to the project?
- What other interests does the stakeholder have which may conflict with the project?
- How does the stakeholder regard others in the list?

**TABLE 9: LIST OF KEY KOYO WETLAND STAKEHOLDERS AND THEIR INTERESTS IN THE WETLAND**

| STAKE HOLDER | INTEREST | POTENTIAL IMPACT |
|---|---|---|
| KWS | ✓ Biodiversity Conservation.<br>✓ Habitat conservation<br>✓ Strengthening ecotourism. | ✓ Increase in population of wetland flora and fauna.<br>✓ Conservation of heritage.<br>✓ Improved standards of living. |
| Farmers/ Land owners | ✓ Grazing land.<br>✓ Cultivation for food and economic gain. | ✓ Overgrazing.<br>✓ Siltation and reduced water level.<br>✓ Water pollution due to introduction of farm chemicals.<br>✓ Soil erosion. |
| Brick-Makers | ✓ Bricks for income generation. | ✓ Reduced soil fertility.<br>✓ Creation of pits.<br>✓ Air pollution.<br>✓ Reduced water level. |
| Fisheries department | ✓ production of fish for food and income generation | ✓ Water storage.<br>✓ Alternative livelihood hence conservation of biodiversity and habitats. |
| Institutions of higher learning | ✓ Research.<br>✓ Biodiversity conservation. | ✓ Provision of data for baseline survey and decision making. |
| County Government | ✓ Custodians of trust land<br>✓ Socio-economic development | ✓ Conservation of culture and heritage.<br>✓ Environmental conservation and promotion of tourism |
| Community Based Organizations | ✓ Conservation of biodiversity.<br>✓ Capacity building. | ✓ Increase in population of flora and fauna.<br>✓ Dissemination of conservation skills and knowledge. |
| Ministry of Agriculture. | ✓ Food production. | ✓ Improved food security |
| Livestock department | ✓ Livestock production. | ✓ Improved food security |
| KFS | ✓ Tourism and marketing of tourist attraction sites<br>✓ Conservation of forests/ wildlife | ✓ Ecotourism, improved forest cover<br>✓ Habitat and species conservation |
| Ministry of Environment and Natural resource. | ✓ Environment conservation.<br>✓ Water conservation | ✓ Improved livelihood<br>✓ Environmental quality<br>✓ Increased water quantity and quality |
| Fisheries Department | ✓ Fish | ✓ Eco-tourism.<br>✓ Habitat and species conservation.<br>✓ Enhanced fish production |
| Ministry of Health | ✓ Disease control –water related | ✓ Water conservation and treatment |
| Institutions of higher learning | ✓ Research, provision of data foe baseline survey and decision making | ✓ Provision of data for baseline information necessary for planning. |
| Industries | ✓ More profit | ✓ Job provision; increased living standards. |
| Ministry of National Planning | ✓ Future planning e.g. vision 2030. | ✓ Future development planning |

| | | |
|---|---|---|
| LVEMP II | ✓ Lake Victoria Basin conservation<br>✓ Sustainable use of natural resources<br>✓ Improved water quality | ✓ Increased water volumes; quality and conservation of habitat and biodiversity. |
| NEMA | ✓ Environmental conservation. | ✓ Enforced legislation on land and other natural resources. |
| Schools/Churches | ✓ Education, both academic and spiritual. | ✓ Provision of knowledge, skills and faith. |
| Business community | ✓ Profit<br>✓ Availing goods and services. | ✓ Providing a source of livelihood |
| Administration | ✓ Security enhancement | ✓ Mobilization and coordination of government plans.<br>✓ Enforcing legislation<br>✓ Implementation of development activities |
| Nature Kenya | ✓ Biodiversity conservation | ✓ Improved species diversity |

## 5.4 ANALYSIS OF STAKEHOLDER IMPORTANCE AND INFLUENCE

### 5.4.1 ASSESSING IMPORTANCE

Importance refers to those stakeholders whose problems, needs and interests are a priority of the Kibirong Wetland Management Planning Project. Some of these stakeholders may be unrecognized primary stakeholders, upon whom the management of the resource places high priority (e.g. fishermen, women and poor subsistence farmers). These stakeholders may have weak capacity to participate in the project and limited power to influence decisions but their needs must be addressed effectively for the management of the wetland to be successful. Answers to the following questions were used to cross check whether the "importance" of the stakeholders was appropriately assessed.

- Which problems, affecting which stakeholders, does the project seek to address or alleviate?
- For which stakeholders does the project place a priority on meeting their needs, interests and expectations categories?

Explanations of the categories are as follows:

- **Box A:** Stakeholders of high importance but with low influence = Require special mechanisms if their interests have to be protected;
- **Box B:** Stakeholders appearing to have a high degree of influence, who are also of high importance to the success of wetland management = Development of good working relationship among these stakeholders can ensure an effective coalition of support;
- **Box C:** Stakeholders with high influence, who can affect outcome of the management process BUT whose interests are not the target = these stakeholders may be a source of significant RISK and will need careful monitoring and management;
- **Box D:** Stakeholders in this box have low influence on and low importance to the project objectives = they require limited monitoring and management but they are of low priority.

Table 10 gives a summary of the different stakeholders in different categories. Almost all the primary stakeholders fell in category A. Some government departments and some civil society organizations fell in category B. Other

government departments fell in group C with very few organizations falling in category D. This exercise gave the overall stakeholder situation in the wetland area and was used to form management plan design.

## 5.4.2 ASSESSING INFLUENCE

Influence refers to the power a stakeholder has over the project to control what decisions are made, to facilitate project implementation or to exert influence which positively or negatively affects a project. Influence is best understood as the extent to which individuals, groups or institutions (i.e. stakeholders) are able to persuade or coerce others into making decisions and following certain courses of action. The power may be derived from the nature of a stakeholder's organization or their position relative to other stakeholders and may be formal or informal. It is also important to determine stakeholders whose power and influence may increase because of resources introduced by the trans-boundary wetland management project. The power and influence of the stakeholders was conducted as per Table 11.

**TABLE 10: VARIABLES AFFECTING STAKEHOLDERS' RELATIVE POWER AND INFLUENCE**

| WITHIN AND BETWEEN FORMAL ORGANIZATIONS | FOR INFORMAL INTEREST GROUPS AND PRIMARY STAKEHOLDERS |
|---|---|
| ✓ Legal hierarchy (command & control, budget holders) | ✓ Social, economic & political status |
| ✓ Authority of leadership (formal & informal, charisma, political, familial or cadre connections) | ✓ Degree of organization, consensus & leadership in the group |
| ✓ Control of strategic resources for the project (e.g. donors & suppliers of services) | ✓ Degree of strategic control of strategic resources significant to the project |
| ✓ Possession of specialist knowledge (e.g. hydraulics) | ✓ Informal influence through links with other stakeholders |
| ✓ Negotiating position (i.e. strength in relation to other stakeholders in the project | ✓ Degree of dependence on other stakeholders |

**TABLE11: WETLAND STAKEHOLDERS' IMPORTANCE AND INFLUENCE MATRIX DIAGRAM**

| BOX A: HIGH IMPORTANCE, LOW INFLUENCE | BOX B: HIGH IMPORTANCE, HIGH INFLUENCE |
|---|---|
| ✓ Dairy farmers<br>✓ Fish farmers<br>✓ Bee keepers<br>✓ Baraton university<br>✓ Moi university<br>✓ Maseno University<br>✓ C.B.Os [Sonabic, Resio, Kibirong group, ]<br>✓ Schools<br>✓ Horticultural farmers<br>✓ Cereal farmers<br>✓ Business community<br>✓ Local NGOs [Nature Kenya]<br>✓ Churches.<br>✓ Kaptumo Tea Factory | ✓ KWS<br>✓ NEMA<br>✓ Nature Kenya<br>✓ County/municipal councils<br>✓ County Government<br>✓ Ministry of planning and vision 2030<br>✓ LVEMP II (Ministry of Envt, Water and NR)<br>✓ Ministry of Roads<br>✓ Ministry Trade and industries<br>✓ Ministry of Agriculture, Fisheries and livestock development<br>✓ Ministry of Heritage and Culture<br>✓ Ministry of Gender and Social development<br>✓ NGOs<br>✓ WRUA (Kundos)<br>✓ Ministry of Interior Coordination (administration) |
| **BOX C: LOW IMPORTANCE, HIGH INFLUENCE** | **BOX D:LOW IMPORTANCE, LOW INFLUENCE** |
| ✓ Politicians<br>✓ Media<br>✓ Village elders | ✓ Poultry farmers.<br>✓ Brick Makers<br>✓ Papyrus harvesters<br>✓ Hunters |

# 6.0 PROBLEM IDENTIFICATION

The community acknowledged that there were a number of threats that face the wetland and they recognize that most of them are human-based activities as listed below:

- Planting of blue gum trees near wetland and/or in the wetland,
- Agricultural activities in the wetland by draining and clearing of natural wetland vegetation (poor farming intervention),
- Encroachment and settlements in the wetland,
- Diversion of the rivers and streams for irrigation,
- Overgrazing,
- Over harvesting of wetland products
- Deforestation for firewood and timber,
- Unsustainable soil harvesting for brick making,
- Unsustainable clay soil harvesting,
- Burning of wetland and burning of farms as a method of land preparations,
- Over-abstraction of water from the wetland for irrigation and river damming at the source,
- Poor farming practices on the farms and catchments – lack of water and soil conservation practices,
- Climate change – flooding and drought,
- Lack of awareness,
- Laundry washing and bathing in the river,
- Fertilizer and chemical use in the farms in the farms in catchment,
- Washing of motor vehicles in water bodies
- Uncontrolled grazing
- Wetland boundary realignment

## PROPOSED CONSERVATION MEASURES BY COMMUNITIES

- Leaving some distance away from the stream bank when cultivating/ buffer zones
- Planting grass and indigenous trees in areas close to the wetland
- Promotion of nature based enterprises
- Civic education/ awareness creation on the importance and conservation measures of wetlands
- Reducing over-grazing/ controlled grazing by establishing a grazing strategy
- Enforcement of conservation laws
- Adoption of good farming practices
- Formation of conservation CBOs
- Planting of early maturing tree species for fuel
- Enhanced use of energy saving stoves
- Enhanced use of solar energy
- Rehabilitation of brick making and sand harvesting sites

## WAY FORWARD

- Community accepted to take leading role in developing the community based wetland management plan;
- Communities requested to form area/wetland committee to help in the management and conservation of the wetland. A committee of four people was formed in each location i.e. Ndurio, Chepkongony and Koyo.
- Need for Registration of umbrella CBO
- Initiate alternative socio-economic activities to reduce pressure on the wetland

# 6.1 ANALYSIS OF PROBLEMS RELATED TO WETLAND RESOURCES AND SUGGESTED SOLUTIONS

**TABLE 12: PROBLEM ANALYSIS FOR KIBIRONG WETLAND: FIRST LEVEL PROBLEMS**

| PROBLEM | PRIMARY CAUSE | SECONDARY CAUSE | COPING STRATEGIES | SUGGESTED SOLUTION(S) |
|---|---|---|---|---|
| Wetland degradation | -Encroachment<br>-Urbanization<br>-Land use change<br>-Land reclamation<br>-Inadequate awareness on the value of the wetland | -High demand for construction material<br>-Overstocking<br>-Poor farming skills<br>-High demand for building materials<br>-High demand for timber products<br>-Pollution | -Agroforesty | -A forestation/reforestation<br>-Destocking<br>-Improved farming system<br>-Wetland conservation<br>-Sensitization and awareness creation on the value of wetland |
| Encroachment | -Overpopulation<br>-Urbanization<br>-Food insecurity<br>-Poverty<br>-Overstocking<br>-Lack of clear wetland bounderies<br>-Lack of Wood fuel | -Overgrazing<br>-Irrigation<br>-Farming in wetlands<br>-Human settlement<br>-Deforestation | -wetland cultivation/ farming | -Awareness creation on benefits of wetlands<br>-Wetland demarcation |
| Soil erosion | -High demand for construction material<br>-Overstocking<br>-Poor farming skills<br>-High demand for building materials<br>-High demand for timber products<br>-Pollution | -Deforestation<br>-Overgrazing<br>-Poor farming methods<br>-Poor soil structure | -tree planting | -Awareness creation<br>-Aforestation/reaforestation<br>-Destocking<br>-Improved farming methods<br>-Use of improved farming methods such as terracing |
| Flooding | -Siltation and Soil erosion<br>-Deforestation<br>-Poor farming methods | -contour ploughing<br>-Planting across contours | -Contour planting<br>-Terracing<br>-Tree planting | -Terrace construction<br>-Check dams<br>-Afforestation/reforestation<br>-Riverbank protection<br>- Creation of Wetland buffer zones |

**TABLE 13: PROBLEM ANALYSIS FOR KIBIRONG WETLAND: SECOND LEVEL PROBLEMS**

| PROBLEM | PRIMARY CAUSE | SECONDARY CAUSE | COPING STRATEGIES | SUGGESTED SOLUTION(S) |
|---|---|---|---|---|
| Low water volume | -Poor land cultivation methods<br>-Deforestation<br>-Hostile climate ie extreme dry weather<br>-Interfering with water sources/ diversion | -Diverting water through drainage<br>-Planting of Eucalyptus trees<br>-Poor methods of farming<br>-Human activities e.g. encroachment for agriculture<br>-Overuse/over abstraction of water<br>-Overpopulation | -Bore hole/well drilling | -Capacity building of community on shallow well-uses.<br>-Law enforcement and capacity building<br>-Sinking of boreholes<br>-Monitoring and evaluation<br>-By- laws -Formation of water user groups for families along the wetlands<br>-Plant water friendly trees<br>-Sensitization of communities along the wetlands<br>-Involvement of local leaders like LCs/ Elders<br>-Encourage afforestation<br>-Spring protection |
| Water pollution | -Poor Sewerage disposal<br>-Encroachment into water sources<br>-Washing bikes and vehicles near water sources<br>-Use of agricultural chemicals | -Poor disposal of sewerage and other waste<br>-Poor disposal of human wastes from pit latrines<br>-Shallow and poor maintenance of latrines<br>-Topography – you cannot dig deep toilets in some water logged areas | -Open/Bush defecation<br>- Direct livestock watering into the wetland | -Waste disposal by-laws<br>-Sensitization of communities to avoid constructing latrines near wetlands<br>-Buffer zone creation<br>-Awareness creation<br>-Creation of artificial wetlands<br>-Promotion of eco-friendly herbicides<br>-Promotion of eco-san toilets,<br>-Encourage zero grazing<br>-By- laws to govern water sources |
| Reduced grazing areas | -Dry season grazing<br>-Burning and clearing of wetlands<br>-Conflict of interests<br>-Pressure on land due to Overgrazing/ overstocking<br>- Clearing of wetlands and burning<br>-Deforestation | -Overpopulation<br>-Personalizing of common grazing grounds/tenure issues<br>-Reclamation of wetlands for development<br>-Over flooding of grazing areas | -Wetland grazing<br>-fencing off of the wetland riparian areas | - Establish and enforce By- laws<br>-Planting of fodder along the wetlands<br>-Promotion of zero grazing<br>-Zonation of the wetland<br>-Biodiversity inventory<br>-Sensitization<br>-Promoting good farming methods<br>-Avoid overstocking<br>-Encourage Zero grazing<br>-Feed conservation during the dry season<br>- Sensitization<br>-Gazette wetlands<br>-Increase indigenous fruit and tree plants |
| Reduced population of wild animals | -Clearing of wetlands and burning<br>-Deforestation<br>-Illegal hunting | | -intense hunting | -Gazette wetlands<br>-Develop and implement Bye laws on hunting<br>-Sensitization |

| PROBLEM | PRIMARY CAUSE | SECONDARY CAUSE | COPING STRATEGIES | SUGGESTED SOLUTION(S) |
|---|---|---|---|---|
| Reduced crop production | -Poor farming methods<br>-High costs of farm inputs<br>-Poor timing<br>-Low quality seeds | -Low soil fertility<br>-Soil erosion<br>-Pests and diseases<br>-Poor farming methods<br>-Climatic changes | -Switch to no-traditional foods | -Promote good farming practices<br>-By- laws<br>-Planting certified seeds |
| Soil exhaustion | -Over cropping<br>-Overgrazing<br>-Soil erosion<br>-Low crop rotation | -Bush burning<br>-Overpopulation<br>-Lack of employment | | -Community sensitization<br>-Bye laws<br>-Promote agroforestry<br>-Minimum tillage -Reafforestation<br>-Population control<br>-practice crop rotation |
| Spread of waterborne Diseases | -Stagnation of the water/wetland modification | -Human activities e.g. agriculture Brick making | -use of insect treated mosquito nets (ITNs) | -Sensitization on insect control<br>-Gazetting grazing areas |

**PLATE 3: SOME OF THE WETLAND PRODUCTS**

# 7.0 MANAGEMENT OBJECTIVES, VISION AND ACTIONS

## 7.1 METHODOLOGY

There is a very close link between the stakeholder Analysis, Resource Analysis and the Setting of Management Objectives. It is very important that the stakeholders understand the cause and effect of all the environmental issues affecting the wetland and the connection between their own (small scale) practices and individual or cumulative (large scale) effects on wetland values. The objectives set consequently should target the stakeholders who are most critical in the achievement of the same objectives. Focus was directed to what the relevant stakeholders need to know and provide information that increases that understanding and thereby build support either through communication or use of appropriate incentives. Management objective therefore focused on the value and interest of the stakeholders rather than exclusively on the ecological values, say biodiversity conservation.

The guidelines used to prepare objectives in this Wetland Management planning process was a stepwise process which includes Step 1: Description of site features, Step 2: Evaluation of features and selection of key features, Step 3: Formulation of long-term objectives for each key feature, Step 4: Formulation short-term operational objectives for each key feature. This process was clearly outlined to the stakeholders and the significance of each step explained to help them make informed decisions. However, the approach used to set vision and management objectives recognized the above provision but varied to some extent. The focus was on what affects the people in the exploitation of the wetland. As such stakeholders were given an opportunity to raise all the issues affecting them or causing conflicts/problems within the Kibirong Wetland. Several issues were raised and then grouped into four thematic areas which included:

- Environmental Conservation issues
- Encroachment
- Socio-economic viability
- Sustainable use of wetland

The stakeholders were then randomly divided into the four groups and mandated to discuss the problems in detail, their causes and possible remedial measures that would help resolve the conflicts. They were also mandated to deliberate on long and short term management objectives for each identified issues. Each group of the groups also deliberated on what vision they wish to set for Kibirong Wetland Management Plan.

### VISION FOR KIBIRONG WETLAND

The following key words were identified by the stakeholders as the building blocks for the vision that they wanted of their wetland. They stakeholders wanted a Kibirong Wetland which:

- Is well conserved;
- Is sustainably utilized;
- Provides economic benefits;

Four different sets of visions were drafted by different groups during group discussions. After lengthy deliberations, all the stakeholders came up with a common vision, which focuses at attaining:

*"A well conserved Kibirong Wetland ecosystem for socio-economic benefits"*

## FORMULATION OF MANAGEMENT OBJECTIVES

The overall objective of Kibirong Integrated wetland management plan was formulated by unpacking the vision by reflecting on aims for achievement and sustenance of benefits from Kibirong, which had been reflected in the vision for the Kibirong wetland: *"A well conserved Kibirong Wetland ecosystem for socio-economic benefits"*

The management objectives were set to address the major thematic areas and were as follows:

- To control water pollution and increase the water level in the wetland
- To reduce soil erosion levels in the wetland.
- To control encroachment and increase biodiversity conservation efforts
- To control floods and reduce incidences of water borne diseases in the wetland community
- To control invasive species of plants in the wetland
- To control mining activities in the wetland

## FORMULATION OF MANAGEMENT ACTIONS AND ACTIVITIES

To achieve the intended objectives of management and ultimately the vision for Kibirong wetland, the planning team unpacked the formulated objectives into actions/ activities/ interventions. Table 14 summarizes the key activities and programmes formulated under each of the objectives in order to secure and restore Kibirong wetland in Nandi County.

**TABLE 14: THE IMPLEMENTATION PLAN FOR KIBIRONG WETLAND**

| OBJECTIVE | ACTIVITY | TIMEFRAME | RESPONSIBLE/ACTORS | INDICATORS | BUDGET(IN MILLION KSHS) |
|---|---|---|---|---|---|
| To control water pollution and increase water level in the wetland | ▪ Institute proper waste management and disposal<br>▪ Develop and enforce community bye-laws on water pollution eg on water diversion,<br>▪ Creation of Artificial wetlands<br>▪ Encourage integrated pest management (IPM) through biological means<br>▪ Regular/periodic water quality assessment and monitoring<br>▪ Establish cattle watering troughs on designated areas<br>▪ Demarcate wetland boundary including buffer / riparian zone<br>▪ Adopt renewable energy sources<br>▪ Practice zero grazing<br>▪ Encourage rainwater harvesting<br>▪ Planting of wetland friendly tree species such as bambooo around the wetland<br>▪ Undertake Agroforestry/farm forestry practices<br>▪ Establish woodlots<br>▪ Train communities on use and production of biogass<br>▪ Raise awareness and build capacities both at county and community levels | 2014-2018 | KFS, Kibirong wetland Management committee;<br>NEMA;<br>Ministry of agriculture;<br>Ministry of energy;<br>NGOs such as VI-Agroforestry;<br>Local Communities;<br>County Government;<br>WRMA;<br>Ministry of Environment, Water and NR;<br>Ministry of Interior Coordination ;<br>Ministry of public Health and sanitation | ▪ Size/acres planted;<br>▪ Number of cleaner production and waste management and disposal technologies initiated/ adopted ;<br>▪ No of Trainings held on biogass production and use at the household level; number of farmers with dairy cows; tree seedlings established;<br>▪ Number of households using improved Cooking's Stoves (ICS);<br>▪ Water quality and quantity data and improvement trends;<br>▪ Number of Households accessing river/wetland water; Other climate related data and trends eg rainfall etc | 45 |
| To halt soil erosion | ▪ Plant cover crops<br>▪ Construct gabions<br>▪ Afforestation/; reforestation and tree planting and rehabilitation of degraded sites<br>▪ Sustainable (agriculture) farming methods eg across and mixed cropping contours<br>▪ Destocking<br>▪ Regulate clay, sand harvesting<br>▪ Encourage other livelihood sources | 2014- 2018 | NEMA;<br>Ministry Envt, Water and NR;<br>Ministry of Agriculture, Fisheries and Livestock;<br>Kibirong wetlands Management committee;<br>WRMA;<br>KFS;<br>County Government | Size of rehabilitated sites;<br>Area planted with cover crops; number/population of livestock; existing regulations and community bye-laws;<br>No. of Farm forestry and livelihood initiatives initiated; | 39.0 |

| OBJECTIVE | ACTIVITY | TIMEFRAME | RESPONSIBLE/ACTORS | INDICATORS | BUDGET(IN MILLION KSHS) |
|---|---|---|---|---|---|
| To stop encroachment and enhance biodiversity | ▪ Undertake trainings, awareness and sensitization on environmental management and the existing laws and regulations governing wetland management<br>▪ Delineate wetland boundaries<br>▪ Develop and enforce community-based bye-laws<br>▪ Establish woodlots<br>▪ Establish indigenous wetland friendly trees/ vegetation within and around the wetland including river banks/riparian areas<br>▪ Initiate payment for ecosystem services (PES) initiatives<br>▪ Diversify livelihoods<br>▪ Promote exchanges for information and best practices | 2014- 2018 | KWS;<br>Kibirong wetland Management committee;<br>Ministry of education;<br>Ministry of Interior Coordination; NEMA;<br>MEWNR;<br>KFS; WRMA;<br>Nandi County Government;<br>Ministry of Energy;<br>NGOs eg Nature Kenya | Number of training, awareness and sensitization sessions conducted;<br>No. of Field visits and number of participants attended/ participated;<br>Number of woodlots established; size/acreage planted with wetland friendly trees/vegetation;<br>levels of adoption and use of green/renewable energy sources; rainfall intensity and frequency;<br>Biodiversity inventories and data trends;<br>Wetland boundary map and assessment reports;<br>Reports/proceedings/minutes | 34.0 |
| To control floods and minimize waterborne diseases | ▪ Construct check dams<br>▪ Terracing<br>▪ Train communities and committees on Integrated Flood Management (IFM)<br>▪ Hilltops rehabilitation /afferestation and re-afforestation<br>▪ Undertake de-stocking and promote zero grazing<br>▪ Riverbank protection and riparian zone management trainings and initiatives<br>▪ Plant cover crops<br>▪ Establish Community-level gendered structures eg sub committees) to deal with enforcement and flood disaster management<br>▪ Seek /provide alternative livelihood sources such as apiary and fishfarming, rice highland farming | 2014-2018 | NEMA; Wetlands Committee; MEWNR, KFS/KWS; WRUAs; Chiefs/and sub-chiefs;; WRMA; County Government;<br>Ministry of agric, livestock and fisheries;<br>Fisheries Department ;<br>Development partners | Existence of community-level structures for IFM; frequency and distribution/occurrence of floods;<br>Existence of community-based wetland management by-laws and rules;<br>Trainings held and number participated; existence of enforcement committee;<br>number of livelihoods;<br>presence of flood mitigation structures eg check-dams | 60.0 |

| OBJECTIVE | ACTIVITY | TIMEFRAME | RESPONSIBLE/ACTORS | INDICATORS | BUDGET(IN MILLION KSHS) |
|---|---|---|---|---|---|
| To control alien and invasive plant species | ▪ Training and awareness creation on invasive species and their management; manual /mechanical removal of the plants; promote and support off-wetland farming;<br>▪ Practice organic farming at the catchment scale;<br>▪ Establish wetland-friendly vegetation along river banks and wetland riparian areas<br>▪ Develop and implement invasive species strategy for Kibirong wetland | 2014-2018 | NEMA;<br>KFS;<br>Ministry of Agric, Fisheries and Livestock;<br>KARI<br>;Community; WRMA;<br>County Government;<br>KWS;<br>NGOs;<br>Development Partners; | Training reports and number trained; number of livelihood enterprises initiated; existence of a strategy; size/acres cleared of invasive species; nutrient levels in the wetland/water; Biomass;<br>Woodlots and size rehabilitated; | 35.0 |
| To promote research and education | ▪ Conduct participatory wetland related researches including gendered impacts of climate change and variability on the ecosystem and biodiversity<br>▪ Undertake biodiversity inventory and water quality assessments;<br>▪ Undertake Market researches for wetland products and valuation<br>▪ Population, health and Environment (PHE) assessments/studies<br>▪ Wetland Policy related researches<br>▪ Collaborate with relevant authorities so as to source wetland information on relevant issues<br>▪ Value addition to wetland products<br>▪ Collect data on plants, forestry, human resource capacity and socio-economics<br>▪ Develop a wetland benefit sharing strategy for Kibirong | 2014-January 2018 | Ministry of Education, Science and Technology;<br>NEMA;<br>Kibirong wetland development committee;<br>Ministry of Planning;<br>Research institutions;<br>Universities; NGOs,<br>KWS, WRMA, KEFRI, KEMFRI, KARI;<br>development partners | Research reports; water quality data; biodiversity inventory | 14.0 |

# 8.0 IMPLEMENTATION STRATEGY

## 8.1 MONITORING AND EVALUATION

Monitoring and evaluation of the management plan should be a continuous activity following adaptive (experimental) management approach. This is because the management of wetland ecosystems is a new and dynamic discipline which is done alongside generation of new information / data which must be fed into the system as time goes on. The action plan set for the wetland will therefore be evaluated regularly on the basis of information, data and knowledge generated by the implementation of the management plan, particularly in the thematic areas. The guiding principle for the whole process should target maintenance of essential values and functions of wetlands, preservation of the multi-functionality of all the wetlands, taking into account the interrelationships between wetland and other ecosystems, integration of all development agenda / investments with conservation and lastly by ensuring the full involvement of all the wetland dependent stakeholders.

The monitoring indicators are clearly stated in the action plan (Table 14 ), it is expected that all the community members elected to oversee the implementation of the management plan will be directly involved in M and E in close collaboration with the County Government, NEMA officials and the Kibirong Wetland Management Plan Implementation Committees.

**TABLE 15: KEY MONITORING INDICATORS FOR KIBIRONG WETLAND MANAGEMENT PLAN**

| Objective | Monitoring Indicators |
|---|---|
| To control water pollution and water-borne diseases in the wetland | ✓ Number of awareness meetings done<br>✓ Increased number of water birds in the wetland<br>✓ Increased number of established sewage systems in the wetland<br>✓ Reduced cases of anthropogenic activities such as washing and bathing in wetland water system<br>✓ Reduced cases of water borne diseases at nearby hospitals.<br>✓ Number of people trained on health matters in the community<br>✓ Number of people trained in wetland conservation and its benefits<br>✓ Number of buffer zones created<br>✓ Number of radio programs aired on water pollution control and benefits of wetland conservation<br>✓ Number of laboratory water quality analyses done on water sample from Kibirong wetland |
| To control encroachment and increase biodiversity conservation efforts | ✓ Area of wetland demarcated<br>✓ Number of people practicing alternative livelihood such as Dairy goats keeping<br>✓ Poultry<br>✓ Dairy cows<br>✓ Fish farming<br>✓ Bee keeping<br>✓ Rabbit keeping<br>✓ Horticulture<br>✓ Eco tourism<br>✓ Number of exchange tours accomplished<br>✓ Number of trainings and barazas carried out for education and awareness creation<br>✓ Number of indigenous trees planted<br>✓ Area of wetland recovered through conservation |

| | |
|---|---|
| To control floods by reducing soil erosion levels in the wetland. | ✓ Number of indigenous trees planted in the water sheds<br>✓ Number of surviving trees established<br>✓ Number of farmers practicing zero grazing<br>✓ Number of terraces done<br>✓ Number of check dams constructed<br>✓ Length of river bank protected<br>✓ Number of tree nurseries established<br>✓ Number of dykes constructed |
| To control invasive species of plants in the wetland | ✓ Number of tones of invasive grasses destroyed<br>✓ Number of eucalyptus trees uprooted from the wetland<br>✓ Acreage of indigenous trees planted to replace the eucalyptus trees uprooted |

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REINSURANCE PLAZA, 2ND FLOOR
P.O. BOX 9220- 40100, KISUMU
**TEL:** +254-57-2020563
**FAX:** +254-57-2020284
**Email:** lvemp2kenya@gmail.com
**Website:** wwwlvemp2kenya.org