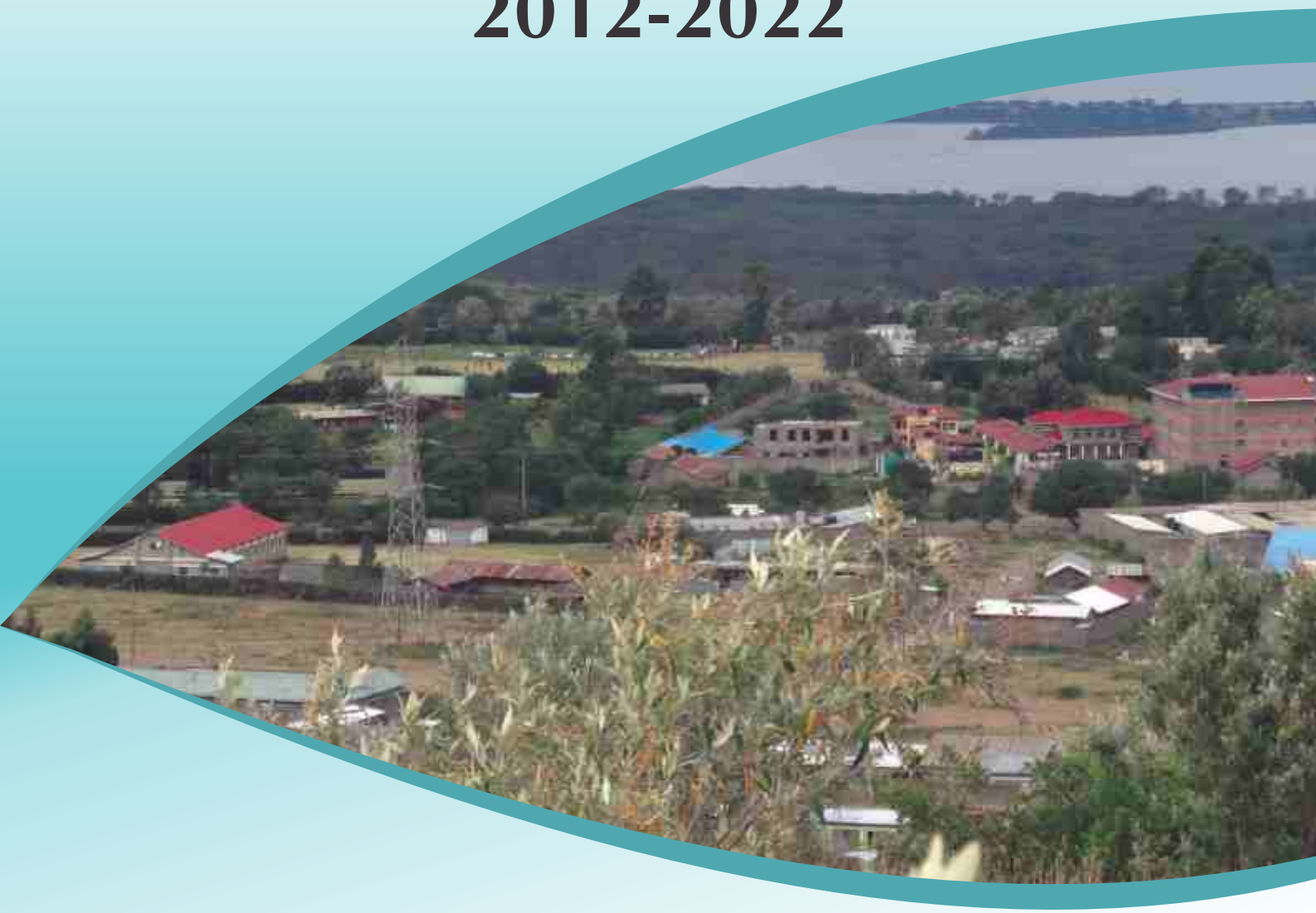
REPUBLIC OF KENYA

# Lake Naivasha Basin Integrated Management Plan

# 2012-2022



WETLANDS INTERNATIONAL

KENYA WILDLIFE SERVICE

IMARISHA NAIVASHA

WWF

RECONCILE

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REPUBLIC OF KENYA

# Lake Naivasha Basin Integrated Management Plan

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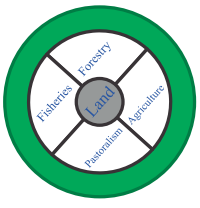


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**Ministry of Environment, Water and Natural Resources**
**P O Box 30126-00100 Nairobi, Kenya**



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Evolve Media Limited

# Contents

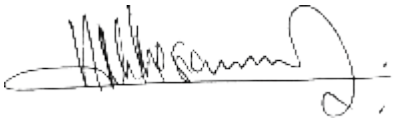
# Foreword

The Lake Naivasha Basin Integrated Management Plan (LNBIMP) represents the culmination of tireless work and effort by various Government institutions, National and International NGOs, Local Civil Society Organizations, Private Sector Organizations, Research Organizations, other interested Parties and the wider Naivasha Community who have joined efforts for the common goal of the preservation and sustainable development of the Lake Naivasha Basin. The stakeholders have actively participated in a series of forums to input and provide valuable comments that have resulted in this Plan. The contributions from the stakeholders are highly acknowledged.

The Lake Naivasha Basin is a complex and interconnected system with diverse stakeholder interests. An integrated management plan for the Lake Basin brings together all resource user groups in the development and management of the resources to maximize the economic, social and environmental benefits. The Plan offers an integrated, equitable and coordinated approach to resource use within the Lake Basin and proposes the development of joint efforts in the promotion of environmental conservation, sustainable development and improved livelihoods for stakeholders in the Basin. The Plan further identifies management zones and proposes management interventions and actions specific to each zone.

The objective of the Plan is to serve primarily as a guideline for integrated and proactive ecosystem,-based approaches towards planning, managing and monitoring of developments within the Basin; and seeking equitable, efficient and environmentally sound solutions for the benefit of the entire community within the Basin.

The Plan contributes to many past and current initiatives and it is my hope that the Plan will act as a framework for sustainable resource management of the Lake Naivasha Basin for the benefit of all. The strategic approaches envisioned in the Plan require cooperative action by all stakeholders, and it is in this regard that we invite all to actively take forward the Plan through coordinated action. Once again, we emphasize that this Plan is for all the actors in Naivasha – governmental, non-governmental, civil society groups, and the general public. Let us all join hands to realize the vision of a healthy and productive Lake Naivasha Basin.



**Dr. Richard L. Lesiyampe, PhD, MBS**
*Principal Secretary*
*State Department of Environment and Natural Resources*
*Ministry of Environment, Water and Natural Resources*

# Approval

The National Environment and Management Authority (NEMA) has taken a keen interest in the Lake Naivasha Basin due to its ecological and socio-economical significance at the Local, National and International levels. The last two State of Environment reports developed for the Lake Naivasha Basin through NEMA have indicated increasing pressure on the environment emanating from an expanding human population and land use transformations compounded by the lack of an integrated approach to natural resource management within the Basin. In the recent past the Basin has attracted increasing interest from stakeholders, including the Government of Kenya, with diverse management initiatives destined to reverse the negative outcomes. There is need for coordination and application of an ecosystems approach towards sustainable management of natural resources within the basin.

Under the Environment Management and Coordination Act 1999, NEMA has an obligation to coordinate all environmental management activities and promote the integration of environmental considerations into development policies, plans, programmes and projects with a view to ensuring the proper management and rational utilization of environmental resources on a sustainable yield basis for the improvement of the quality of human life in Kenya.

The successful development of an Integrated Management Plan for the Lake Naivasha Basin marks a major milestone providing an integrated framework for environmental management and development within the Lake Naivasha Basin that will spur sustainable environmental improvement and socio-economic development within the region.

The National Environment and Management Authority applauds the efforts and achievements by the stakeholders in the Lake Naivasha in developing the basin's Integrated Management Plan and hereby pledge its support and commitment in the implementation of the Plan.

NEMA approves this framework and its subsequent implementation within the Lake Naivasha Basin.

**Professor Geoffrey Wahungu, PhD**
*Director General*
*National Environment and Management Authority*

# Acknowledgment

The development of the Lake Naivasha Integrated Management Plan is a culmination of the collective and remarkable efforts of local communities, private sector, Civil Society Organizations, and government lead agencies within the Lake Naivasha Basin and the support of various development partners. The preparation of the plan has been through the guidance of the Kenya Wildlife Service (KWS), the government agency that is the custodian of Ramsar Convention under which wetlands in Kenya fall. Kenya Wildlife Service through its Training Institute in Naivasha, undertook the enormous task of stakeholder engagement and information collation that has evolved to this document. Without the strong commitment from KWS in leading the process, this process would not have been completed. We wish to acknowledge input of Prof Geoffrey Wahungu and Dr Francis Mwaura who provided the first materials for the Management Plan. The commitment of the technical team, made up of Prof. George Otiang'a-Owiti - team leader, Roselyn A. Onyuro, Kamau Mbogo and Eva C. Malel; worked tirelessly to provide crucial guidance by ensuring that the momentum of the process and the enthusiasm and commitment of the stakeholders did not diminish throughout the process. The support of the then Director of KWS, Julius Kipng'netich, in the process is highly appreciated.

The initial financial support for the development of this Management Plan was provided by the Wetlands International Africa Office in Dakar, Senegal through Wetlands and Livelihoods Program Seed Fund Facility. This grant enabled the team to conduct a stakeholder analysis for the basin, establish a forum for stakeholder engagement and build support among the stakeholders towards a common vision in the development of the Integrated Management plan. We wish to note the key role of Regional Director, Wetlands International, Africa Office, Mr. Ibrahima Thiam, the Capacity Development Officer, Col. Abdoulaye Ndiaye and the Advisory Board of Wetlands International for their technical oversight in the process. We cannot fail to mention several other partners that have given financial contributions to support different components of the Plan. They include World Wildlife Fund-Kenya Country Office (WWF-KCO) through the Naivasha Landscape Project, Resource Conflict Institute (RECONCILE) and Imarisha Naivasha Board.

Final acknowledgement is due to all the dedicated people who contributed to the development of this Plan in various ways. This includes the staff of the collaborating institutions (Imarisha Naivasha, WWF-KCO, RECONCILE), the staff at the KWS Wetlands Office and Training Institute, Technical staff of all Government agencies in Naivasha, Community leaders who facilitated field verification visits within the Basin, and the members of the Community within the Basin who gave invaluable information that formed the basis of this Integrated Management Plan. Together we have made the Plan a living document.

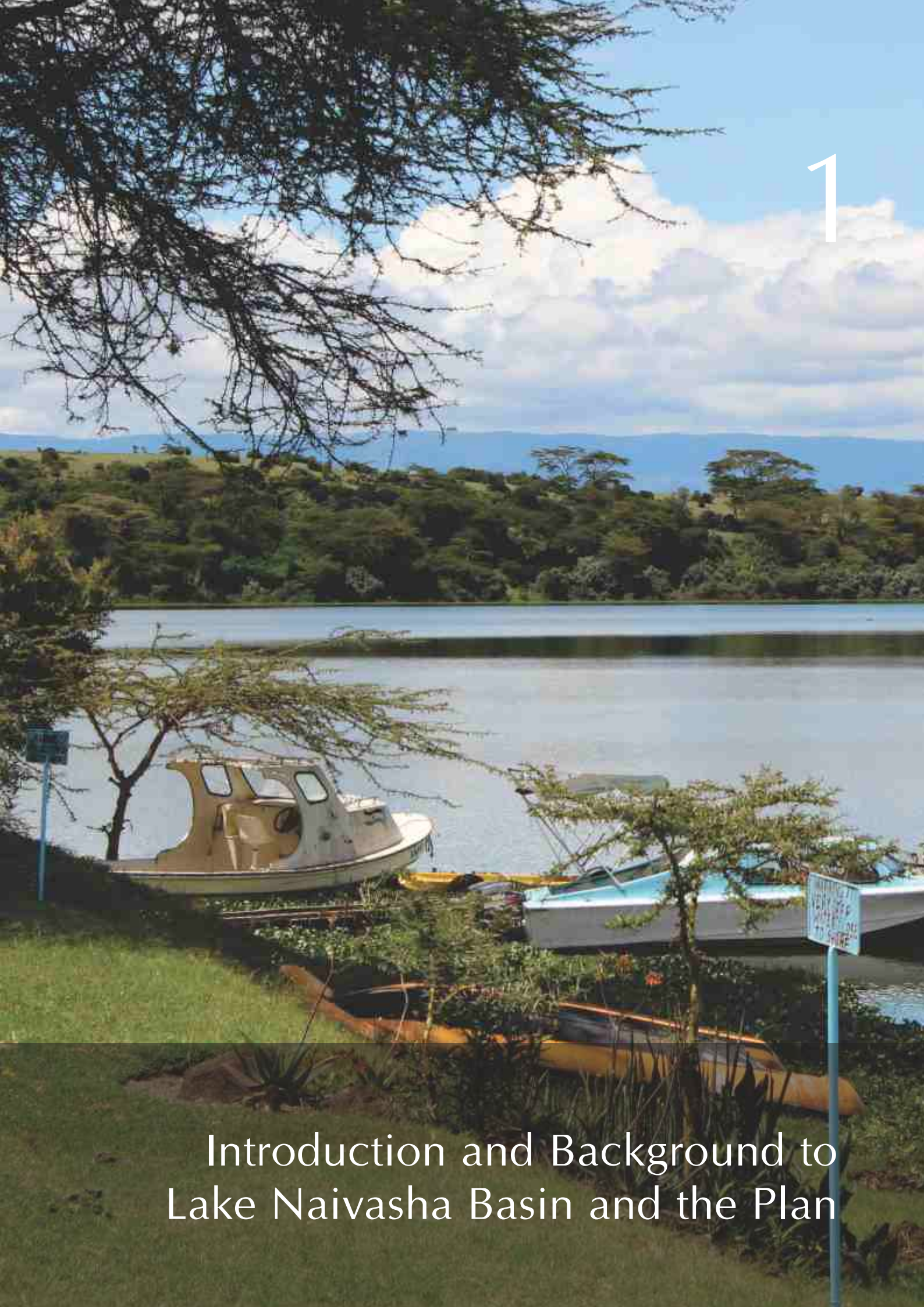
**William K. Kiprono, MBS**
*Director*
*Kenya Wildlife Service*

# Abbreviations & Acronyms

| | |
|---|---|
| 4K | KUUNGANA - to unite; KUFANYA - to do; KUSAIDIA - to help; KENYA |
| AEWA | Africa Eurasian Water Bird Agreement |
| AFC | Agricultural Finance Cooperation |
| BMU | Beach Management Unit |
| CAAC | Catchment Area Advisory Committees |
| CBD | Convention on Biological Diversity |
| CBOs | Community Based Organizations |
| CDN | Catholic Diocese of Nakuru |
| CEPAD | Centre for Pastoralist Development |
| CFAs | Community Forest Associations |
| CMS | Convention of Migratory Species of Wild Animals |
| CSOs | County Development Committee |
| CECs | County Environment Committees |
| DRSRS | Department of Resource Surveys and Remote Sensing |
| EAC | East African Community |
| EIA | Environmental Impact Assessment |
| EMCA | Environmental Management and Coordination Act |
| FD | Fisheries Department |
| FoKP | Friends of Kinangop Plateau |
| GBM | Greenbelt Movement |
| GiZ | Deutsche Gesellschaft für Internationale Zusammenarbeit |
| GoK | Government of Kenya |
| ha | Hectares |
| HCDA | Horticultural Crops Development Authority |
| HWC | Human Wildlife Conflict |
| IBA | Important Bird Area |
| IBECA | Indigenous Biodiversity Environmental Conservation Association |
| ICRAF | World Agro forestry Centre |
| IDRC | International development for Research Cooperation (Canada) |
| IGAD | Intergovernmental Authority on Development |
| IGAs | Income Generating Activities |
| IMP | Integrated Management Plan |
| IPPs | Independent Geothermal Power Producers |
| IUCN | International Union for Conservation of Nature |
| KAC&EC | Kenya Anti-corruption and Ethics Comission |
| KARI | Kenya Agricultural Research Institute |
| KATO | Kenya Association of Tour Operators |
| KCC | Kenya Creameries Cooperative |
| KEBS | Kenya Bureau of Standards |
| KEDRI | Kenya Dairy Research Institute |

| | |
|---|---|
| KEFRI | Kenya Forestry Research Institute |
| KMFRI | Kenya Marine Fisheries Research Institute |
| KENGEN | Kenya's Electricity Generation Company of Kenya |
| KEPHIS | Kenya Plant Health Inspectorate Service |
| KFS | Kenya Forest Service |
| KGDC | Kenya Geothermal Development Company |
| KMC | Kenya Meat Commission |
| Kshs | Kenya Shillings |
| KTB | Kenya Tourism Board |
| KWS | Kenya Wildlife Service |
| KWSTI | Kenya Wildlife Service Training Institute (Naivasha) |
| LN | Lake Naivasha |
| LNCDF | Lake Naivasha Conservation and Development Forum |
| LNGG | Lake Naivasha Growers Group |
| LNBIMP | Lake Naivasha Basin Integrated Management Plan |
| LNMIC | Lake Naivasha Management Implementation Committee |
| LNRA | Lake Naivasha Riparian Association |
| LNTG | Lake Naivasha Tourism Group |
| M&E | Monitoring and Evaluation |
| M.C.N | Municipal Council of Naivasha |
| masl | Metres above sea level |
| MEAs | Multilateral Environmental Agreements |
| mg/l | Milligram/Litre |
| MoAL&F | Ministry of Agriculture, Livestock and Fisheries |
| MoES&T | Ministry of Education, Science and Technology |
| MoEW&NR | Ministry of Environment, Water and Natural Resources |
| MoD&P | Ministry of Devolution and Planning |
| MoH | Ministry of Health |
| MoLSS&S | Ministry of Labour,Social Security and Services |
| MoLH&UD | Ministry of Lands, Housing and Urban Development |
| MoEAC&T | Ministry of East African Affairs, Commerce and Tourism |
| MoI&ED | Ministry of Industrilaization and Entreprise Development |
| MW | Mega watts |
| NAIVAWASS | Naivasha Water and Sanitation Company |
| NAPNET | Nature and People Network |
| NAWACOMP | Naivasha Watershed Conservation and Management Programme |
| NCPB | National Cereals and Produce Board |
| NEMA | National Environment Management Authority |
| NGOs | Non-Governmental Organizations |
| NMK | National Museums of Kenya |
| NO3-N | Nitrates - Nitrates |
| NRM | Natural Resource Management |
| NWC | Nakuru Wildlife Conservancy |
| CA | County Administration |
| PAC | Problem Animal Control |
| PACD | Plan of Action to Combat Desertification |
| PCPB | Pest Control Products Board |

| | |
|---|---|
| PES | Payment for Ecosystem Services |
| Ramsar | Convention on Wetlands of International Importance |
| RECONCILE | Resource Conflict Institute |
| REDD & REDD+ | Reduction of Emissions, Deforestation & Desertification |
| SACCOs | Savings and Credit Co-Operatives |
| SCMP | Sub-Catchment Management Plans |
| SHDI | Self Help Developmental International |
| SHGs | Self Help Groups |
| SME | Small Medium Enterprises |
| SNV | Stichting Nederlandse Vrijwilligers (Netherlands Development Organization |
| Spp | Species |
| UNCOD | United Nations Conference on Desertification |
| UNEP | United Nations Environmental Programme |
| UNFCCC | United Nations Framework Convention on Climate Change |
| USA | United States of America |
| WAP | Water Allocation Plan |
| WRB | Water Regulatory Board |
| WRMA | Water Resources Management Authority |
| WRUAs | Water Resource Users Associations |
| WSBs | Water Services Boards |
| WSUP | Water and Sanitation for the Urban Poor |
| WWF | World Wide Fund for Nature |



1

# Introduction and Background to Lake Naivasha Basin and the Plan

**Introduction**

The Lake Naivasha basin area is approximately 3,400 km$^2$ lying in the Eastern Rift or Gregory Rift, and extending into the Mau Escarpment (3048masl) to the west and the Nyandarua or the Aberdare Ranges (4000masl) to the east, the Eburru hills (2800masl) to the northeast of the Mau Escarpment and forms a surface water divide between the Lake Naivasha and Lake Elmentaita basins. Lake Naivasha itself is an endorheic shallow freshwater lake with a water surface elevation of approximately 1890masl. It is situated in the Eastern Rift Valley of Kenya, approximately 90km northwest of Nairobi. Lake Naivasha is one of a series of seven major lakes in the Eastern Rift Valley of Kenya. Listed from north to south, these lakes are Turkana, Baringo, Bogoria, Nakuru, Elmentaita, Naivasha and Magadi (Figure 1.1). The Naivasha basin is administratively located in eight districts (Naivasha, Narok North, Gilgil, Mirangini, Kipipiri and Kinangop, Nyandarua Central, Nyandarua South) in the three counties, Nakuru, Narok and Nyandarua (Fig. 1.2).

The Lake Basin has immense socio-economic and conservational benefits which support over seven hundred thousand people. Within this basin is the internationally renowned Lake Naivasha, a Ramsar site. The basin is however under serious threat from a wide range of rapidly intensifying pressures which include; increasing reduction of lake levels, deterioration of lake and river water quality, deforestation in the basin, increased soil erosion and siltation of rivers, increased lake sedimentation, fish mortality and decreasing fish yields, increased land conversion, encroachment and transformation of the lakeshore riparian zone, encroachment and transformation of the riverine buffer zones in the catchment areas, increasing population and unplanned human settlements, poor waste management in the urban areas, inaccessibility to the lake by pastoralists, fishermen and general public and lake infestation by invasive species.

Many conflicting demands placed on the basin's natural resources, and increasing human population, economic demands and urbanization has also resulted in increased water abstraction in the Lake Basin and environmental degradation.

Much of the development and operations in Lake Naivasha basin are uncoordinated, resulting in an inequitable resources distribution in the catchment and environmental degradation. There is therefore a need for an integrated, equitable and coordinated approach to resource management within the basin. The objective of the Integrated Management Plan is to serve primarily as a guideline for integrated and proactive ecosystem-based approach to the planning, management and monitoring of developments within the basin; seeking equitable, efficient and environmentally sound solutions for the benefit of the entire community within the basin.


**Figure 1.1**
Position of Lake Naivasha in relation to other wetland lakes in Kenya
*(Modified from Otianga-Owiti & Osewe, 2006)*

**Scope of the Plan**

The geographical scope of the Integrated Management Plan considers the entire Lake Naivasha basin which includes the Lake, lower, middle and upper catchment. The lower catchment is mainly the Rift Valley which is less

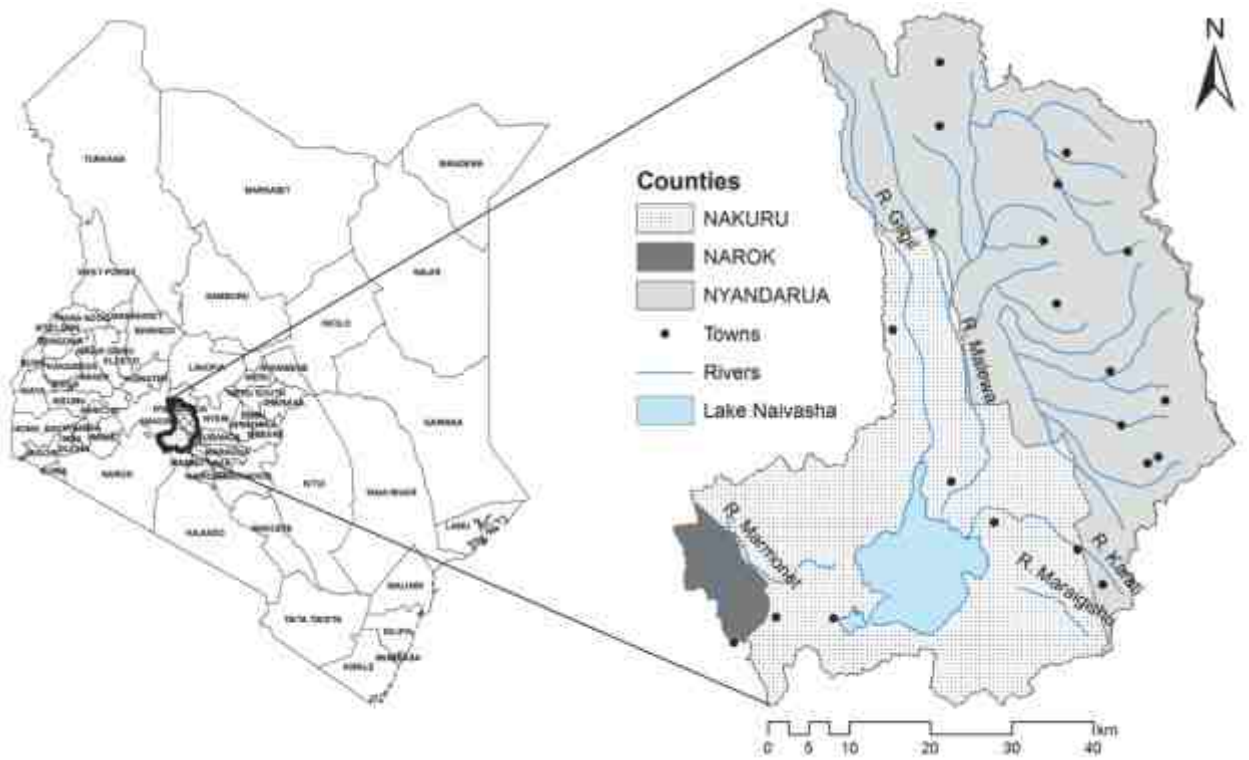



**Figure 1.2**
Administrative location of the Lake Naivasha Basin in Kenya

than 2000masl around lake Naivasha, the middle area is between 2000masl to 2400masl and covers the Kinanagop and Moi-Ndabi areas and the upper catchment is above 2400masl, extending to the slopes of Aberdare and beyond.

**Plan Rationale**

Management planning is a process of arriving at goals and objectives for managing a given resource in a defined area. Since Lake Naivasha basin is a complex entity with diverse stakeholder interests, an integrated management plan would bring together all resource user groups in the development and management of resources, to maximize the resultant economic, social and environmental welfare.

This plan proposes the development of joint efforts in promotion of environmental conservation, sustainable development and improved livelihoods for stakeholders in Lake Naivasha Basin. The plan further identifies management zones and proposes management interventions and actions specific to each zone.

The LNBIMP seeks to:

i). Enhance quality and quantity of water resources within the basin
ii). Enhance ecosystem services and promote financial incentives mechanisms to communities
iii). Ensure equitable access and sustainable utilization of basin resources
iv). Improve and secure livelihoods for local communities including disadvantaged groups
v). Promote participatory resource use and management
vi). Improve on knowledge to enhance management of resources by the stakeholders
vii). Provide a tool for resources mobilization to implement the various components of the plan

**Structure of the Plan**

This Management Plan is structured into eight parts:

i). Chapter One: Introduction and Background to Lake Naivasha Basin, and the plan.
ii). Chapter Two: Description of the Lake Naivasha Basin and an inventory of the resources and resources values.
iii). Chapter Three: Guiding principles, goals, objectives and strategies
iv). Chapter Four: Policy and legal framework
v). Chapter Five: Stakeholders analysis and involvement
vi). Chapter Six: Zonation
vii). Chapter Seven: Management options and implementation strategy
viii). Chapter Eight: Plan implementation, monitoring and evaluation

**Plan Development Process**

The preparation of the Lake Naivasha Integrated Management Plan was undertaken through an open and transparent process according to the following roadmap:

1) Situational analysis through an intensive review of relevant documents,
2) Fact finding and views gathering from stakeholders,
3) Stakeholder analysis, covering the entire basin,
4) Multi stakeholder consultative workshops,
5) Synthesis of information gathered,
6) Drafting of the Integrated Management plan,
7) Participatory validation and adoption of management plan.

**International and National Obligations**

Kenya is signatory to various International natural resource-based Conventions and Treaties some of which have been domesticated to form national legislation and policies. These provide for the legal and institutional framework for conservation and management of natural resources in the country, upon which this LNBIMP is anchored.

# 2

# Description of the Lake Naivasha Basin and an Inventory of the Resources and Resources Values

**Physiography**

The physiography of the Naivasha basin is characterized by steep slopes in the Aberdare Ranges and Mau Escarpment and gently undulating land in the Kinangop plateau. The land drops through a series of smaller escarpment to the flat topography of the lacustrine profile around the lake.

The regional physiography comprises four topographic zones, namely:

(a) the lacustrine beds,
(b) the Rift Valley floor,
(c) Rift Plateaus, and
(d) Rift Escarpments (Figure 2.1).

The lacustrine beds are dominated by ancient lake sediments deposited from older and much bigger Pleistocene lakes. The zone is prominent in the Mirera-Karagita area to the east of the lake and extends to the north as far as the Ilkek Plain towards Gilgil where the bed is 20 km across, thinning to less than 5 km just south of Gilgil. The western lacustrine margin is bordered by the volcanic hill masses of Kongoni and Maiella-Ndabibi Plain.

The railway line borders the eastern lacustrine margin especially, near Naivasha Town opposite the Kihoto area and elsewhere by the Kinangop fault scarp (Figure 2.1). The rift floor extends southwards towards Mount Longonot (2750 masl) south westwards towards the Olkaria hills complex (2400 masl), which are traversed by the Ol Njorowa Gorge (1920 masl). The northern margin of the rift floor is interrupted by the Eburru Hills (2400m), which are part of the Mau Escarpment. The Eburru hills form the drainage divide between the lake and the Lake Elmentaita basin.

The plateaus and plains consist of gently undulating terrain of less than 8% slope and are exemplified by such as the Akira Plains to the south of the lake, Ndabibi Plains to the west and Kinangop Plateau to the east (Figure 2.1). The rift escarpments comprise the highest landforms in the basin with steep foot slopes of up to 30-40% especially in the Aberdare (Nyandarua) Ranges (3600m) to the east and the Mau Escarpment (3000m) to the west. The two landforms are the principal key water towers for Lake Naivasha.

**Climate**

Lake Naivasha basin is mostly dominated by a semi–arid environment in the lower catchment and has only a narrow semi-humid zone in the upper catchment. The rainfall is bimodal and is distributed between two rainy seasons in April – June (long rains) and October – November (short rains) (Figure 2.2). The rainfall is of considerable variation, with between 1000 and 1500 mm/year in the upper catchment especially the Aberdare Ranges and less than 800mm/year in the Rift Valley floor. The average rainfall immediately around Lake Naivasha is about 600mm.

The Mean annual temperature in the basin varies with altitude ranging from25°C on the shores of the lake to 16°C in the Aberdare Mountains, with daily temperatures ranging from 5°C to 25°C.

**Geology**

The geology of the Naivasha basin is configured according to the topographic zones as shown in Figure 2.3. The Kinangop – Ol Kalou plateau is underlain by soft pyroclastic rocks, which according to Thompson & Dodson 1963, is probably of Kamasian age (lower Middle Pleistocene). The most common pyroclastic rocks are soft, light coloured tuffs, which occasionally form very thick deposits. Powdery light grey pumiceous ash is common over much of the southern plateau where it was deposited in the Post-Kanjeran times during the Holocene.

The chemical analyses of rocks in the Kinangop area have shown high level of oxides in the following metals; Silicon, Aluminium, Iron, Calcium and Magnesium (Thompson & Dodson 1963). The geology around the Ol Bollossat area to the North of Kinangop is characterized by pyroclastic rocks and sediments, which are underlain by Miocene basalt (Thompson & Dodson 1963). The Moi Ndabi-Maiella and Eburru region which is part of the Mau escarpment

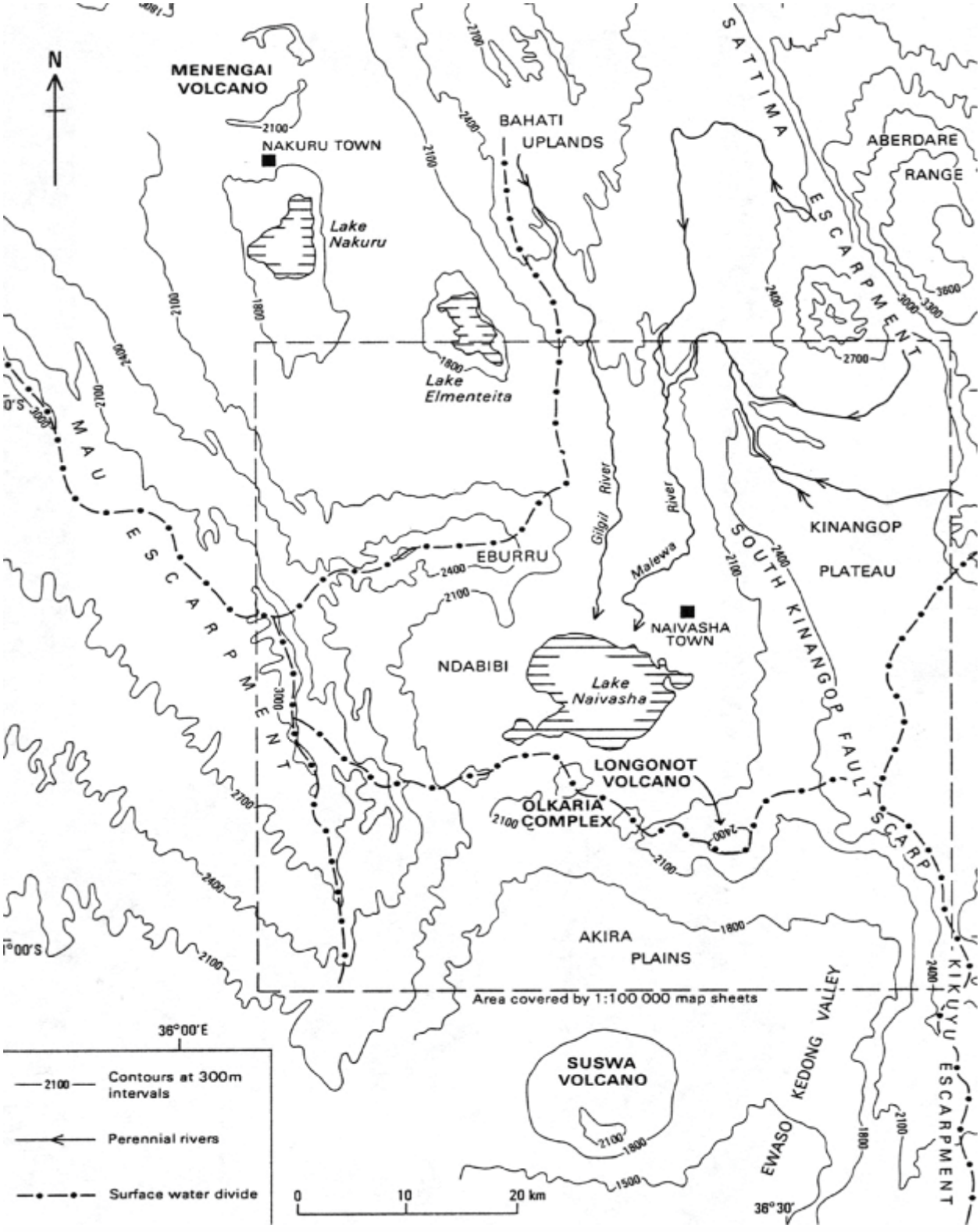



**Figure 2.1**
Physiographic profile of the Lake Naivasha Basin *(Clark et al. 1990)*

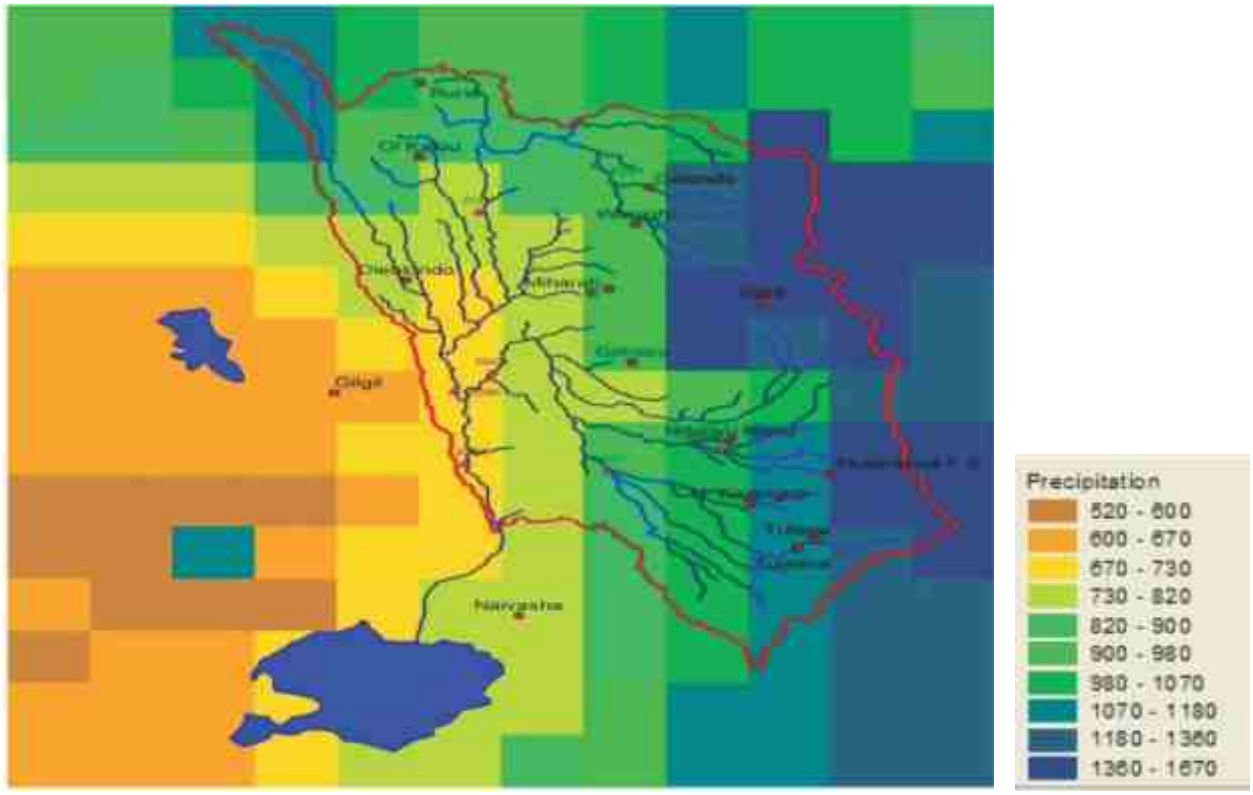



**Figure 2.2**
Rainfall distribution map for the Naivasha Basin *(WWF/CARE, 2007)*

is composed of rocks with largely soft volcanic ashes and tuffs which are highly vulnerable to erosion due to their extremely soft nature. This area is associated with the most recent volcanicity in the region. The Eburru area has the highest concentration of surface geothermal activity.

Within the rift floor, the rocks vary from under saturated tephrites to highly acidic and sodic rhyorites. According to Thompson and Dodson (1963), strongly alkaline lavas including olivine basalt, quartz and kataphorite characterize about 10% of the rift floor. Several places in the rift floor are characterized by lacustrine diatomaceous earth, which is believed to have formed from ancient deposits of much larger lakes, which occupied the rift valley during the Pleistocene. Pumice deposits are also common within the rift floor especially in areas within the vicinity of Mount Longonot.

**Soils**

The soils in the basin are configured by the geo-pedologic and landscape profile. The rift floor is characterized by lacustrine sediments that accumulated during the ancient Gamblian lakes in the Pleistocene period. These soils are mainly composed of reworked volcanic ash and pyroclastic deposits. They are deep loams of greyish to brown colour which are either slightly saline or sodic and non-calcareous. At the edge of the lake the soil is less alkaline and more liable to cracking during the dry season and characterized by high levels of exchangeable Sodium and Potassium ions. The Kinangop Plateau is characterized by an assortment of Humic Planosols, Vertisols, Andosols and Phaeozems while steeper areas towards Ol Kalou are dominated by Lithic Leptosols with Nitosols and Luvisols in a few pockets. The hills and minor scarps are dominated by Cambisols while soils in

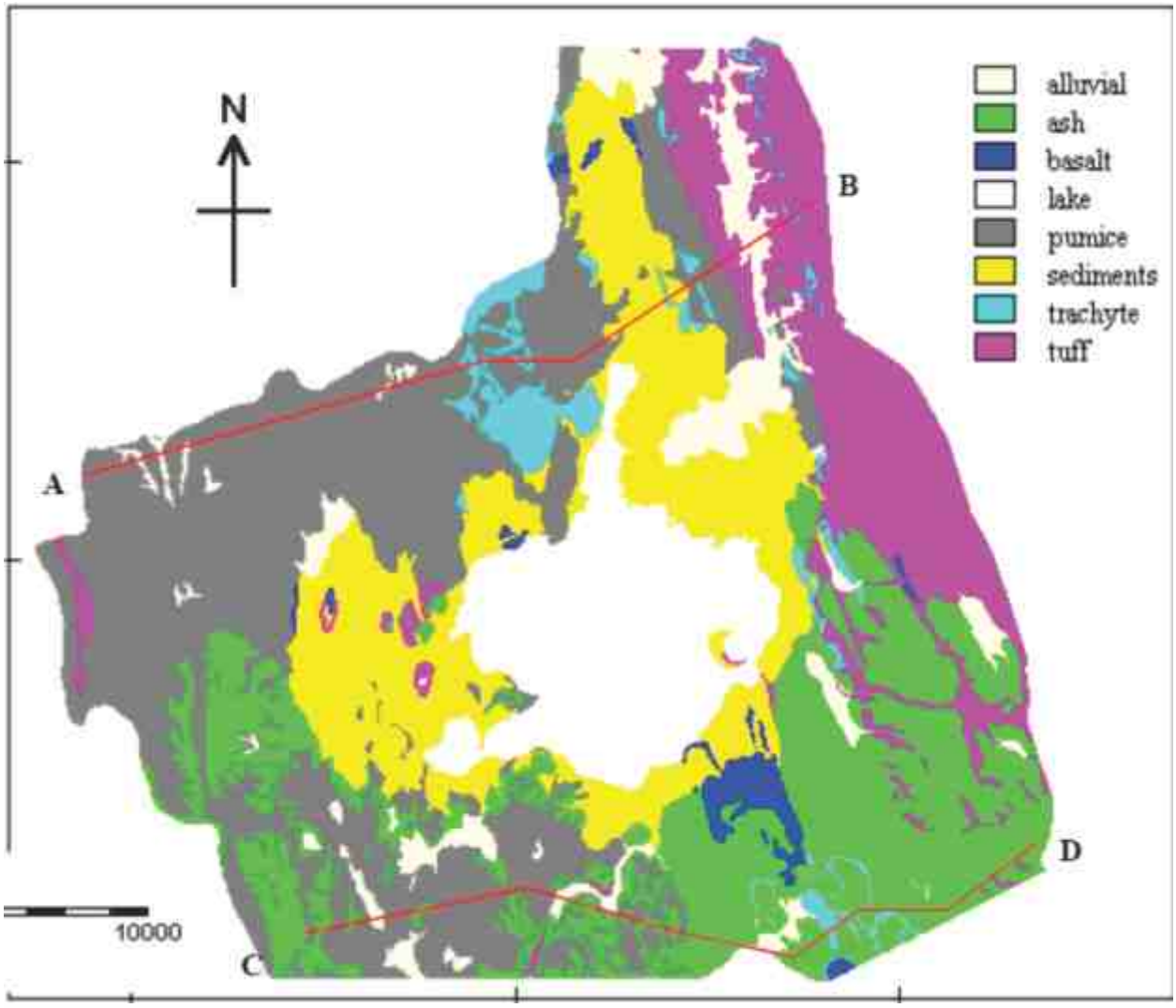



**Figure 2.3**
A geological map of the Naivasha region *(Thompson & Dodson, 1963)*

the Eburru area are mainly Andosols, derived from pyroclastic parent material.

**Hydrology and Drainage**

The lake receives up to 90% surface inflow from various sub-catchments; the Malewa (1730 km2), Gilgil (527 km2) and Karati (149 km2) (Ase et al., 1986), rivers, which originate from the Kinangop-Turasha-Kipipiri area on the leeward side of the Aberdare and the Ol Kalou-Upper Gilgil region respectively. Additional recharge is provided by several ephemeral rivers, with a total catchment size of 1000 km2, such as Nyamamithi and Marmanet as well as substantial underground seepage from the previously almost permanently waterlogged, meadows and bogs environments in the Kinangop plateau which have nowadays been heavily desiccated by the widespread introduction of eucalyptus trees. Figure 2.4 shows the key rivers and drainage zones of Lake Naivasha Basin.

***The Malewa River***

Malewa River which is the principal inflow into the lake arises on the western slopes of the

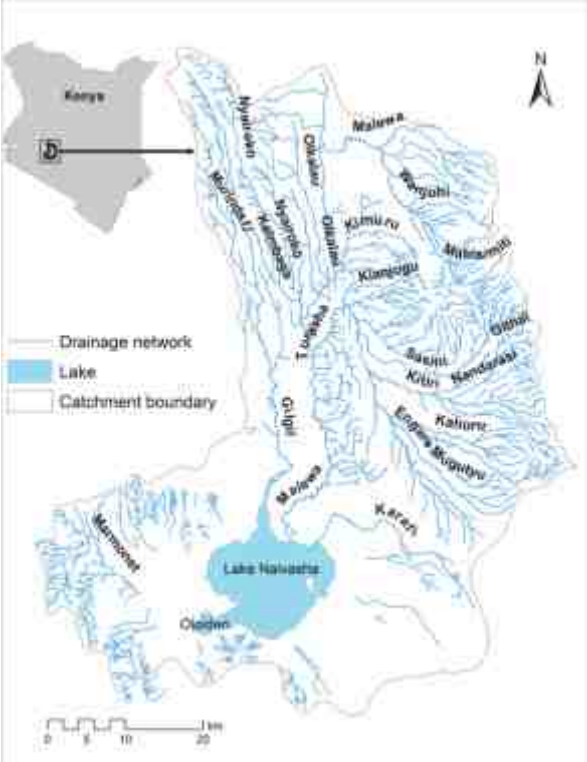



**Figure 2.4**
Major inflows of Lake Naivasha and catchment boundary

Nyandarua (Aberdare) Ranges and flows for over 100km with a maximum height drop of 1921m. It is the largest river in the basin and forms from four main tributaries namely: Mkungi-Kitiri, Kinja, Wanjohi and Turasha, all which flow from the North-South. The Malewa and Turasha Rivers have a combined drainage area of about 1,730 km2. The tributaries of the Turasha River, namely Mkungi and Kitiri deeply incise the Kinangop plateau flowing in a westerly direction and eventually joining the Malewa River. The headwaters of the Malewa River which originate from the high altitude zones of the Nyandarua (Aberdare) Ranges constitute the upper catchment.

The middle catchment consists of several small rivers in the Wanjohi and Lake Ol Bolossat region which lie at an altitude of 2400 masl. The middle catchment also contains most of the Turasha sub-catchment with some of the water from the Turasha River being abstracted through the Konoike Dam to supply water to Gilgil and Nakuru towns through the gravity associated with a sharp descent from the middle catchment to the lower catchment. Malewa serves an important ecohydrological function all along its course. However, the river has many environmental challenges including reduced river flow, variable water levels, loss of riparian habitat and associated biodiversity and soil erosion which eventually results in increased sedimentation of Lake Naivasha.

***The Gilgil River***

The Gilgil River originates from the Ol Kalou Highlands (2740 masl) and flows for about 60 km. The river flows in a narrow basin and southerly direction eventually draining about 420 $km^2$. It is fed by three headwaters streams, namely; Murindati, Kiriundu and the Little Gilgil whose sub catchments lie at an altitude of between 2400 masl and 2700 masl.

***Other Rivers***

Lake Naivasha is also supplied by several ephemeral streams including Karati, Nyamamithi and Marmanet. Karati River flows from the north in the Kinangop plateau at an altitude of 2620 masl. The Nyamamithi River is relatively shorter and steeper with a source in South Kinangop near the Magumu area. None of the numerous streams that originate from the Eburru hills and Ndabibi plains ever reach Lake Naivasha directly; however, the most prominent stream is Marmanet which disappears underground around Moi Ndabi.

**Biodiversity**

The Lake Naivasha basin is well endowed with biodiversity and is one of the important biodiversity hotspots in Kenya with several hundred species of plants and animals (Fig. 2.5).

***Vegetation (including forests)***

The upper catchment areas of the Naivasha basin have several upland forests which include the Aberdare, Kipipiri, and part of Mau East (Eburru and Ol Turoto). These forests form very special areas providing water that supports diverse

habitats, livelihoods and economic sectors. The Aberdare forest is tropical montane forest and hosts a rich diversity of over 778 plant species including meru oak *(Vitex keniensis)*. The dominant species are; cedar *(Juniperus procera)*, stinkwood *(Prunus africana)*, rosewood *(Hagenia abyssinica)*, podo *(Podocarpus falcatus, P. gracilior; Podocarpus latifolia, Podocarpus milanjianus)* and camphor *(Ocotea usambarensis)*. The vegetation descends from the area below the Aberdare National Park consisting of afro-alpine forest, down to the afro-montane forest composed of indigenous bamboo and cedar. The vegetation declines sharply in the densely populated areas.

The Eburru and Ol Turoto forests host indigenous hardwood forests which rise from about 2,400masl to 2,800masl and cover an area of 8,760 ha and 400ha, respectively. The vegetation consists of a wide range of species such as Acacia sp., *Dombeya torrida*, *Podocarpus latifolia* and bamboo. On the northern side, the vegetation is characterized by open scrubland dominated by *Crotalaria agatifolia*, *Abutilon mauritianum*, *Tarconanthus camphoratus*, *Nuxia congesta* and *Dombeya torrida*. The vegetation is strongly influenced by altitudinal gradient from the hilltops to the valley bottoms, with bamboo and *Podocarpus* at higher elevations, *Prunus africana*, *Erica spp*. and *Lobelia gibberoa* in exposed sites.

The natural vegetation around the lake is dominated by the 'yellow fever tree' *(Acacia xanthophloea)*, *Euphobia candelabrum* and the fire resistant *Acocanthera schimperi*. Several other Acacia species are common in the lower catchment including; *A. drepanolobium*, *A. seyal* and *A. nilotica* which are often intermixed with the Leleshwa bush *(Tarconanthus camphoratus)*.

The common grasses are *Themeda triandra* and *Cynodon plectostachys*. The lake edges have a complex vegetation of terrestrial and water tolerant wetland plants, due to frequent changes in water level. The littoral zone is characterized by papyrus swamps. The sodic crater-lake is dominated by blue-green algae, with soda tolerant *Cyperus laevigatus* around its rim.

***Wildlife***

The basin has quite a rich and diverse mammalian fauna. The Aberdare National Park has the richest biodiversity base in the basin. Some of the animals in the park include; elephant *(Loxodonta africana)*, black rhino *(Diceros bicornis)*, mountain bongo *(Boocercus melampus)* which are endangered species, the giant forest hog *(Phacochoerus meneitxhageni)*, red duiker *(Cephalophus natalensis)* and various rodent species. Some carnivorous animals in the area include; leopard *(Panthera pardus)*, civet cat *(Vivera civeta)*, genet cat *(Geneta geneta)*, hyena *(Crocuta crocuta)* and side-striped jackal *(Canis mesomelas)*. In addition, the forest has abundant bushbuck *(Tragelaphus scriptus)*, mountain reedbuck, waterbuck *(Kobus defassa)*, Cape buffalo *(Syncerus caffer)*, and eland *(Taurotragus oryx)*. The park has abundant primates including black and white colobus (*Colobus guereza*) whose ranges extend all the way from Aberdare to Lake Naivasha, especially along river courses like Malewa.

The Aberdare is also an IBA with over 250 species of both endemic and migratory bird species. These include; alpine chat, crowned eagle, the rufous-breasted sparrow-hawk, african black duck, golden-winged sunbird, silvery-cheeked hornbill, and the white-eyed slaty flycatcher with some endangered species like the sparry hawk, Jackson's Francolin eagles, goshawks, plovers and sunbirds among others *(Bennun & Njoroge, 1999)* Some of the threatened species include; African green ibis, Ayres's hawk eagle, crowned eagle, African grass owl, cape eagle owl and long-tailed widowbird, Aberdare cisticola, Baillon's crake and the striped fluff-tail. The forest has a number of reptile species and insect life, and also amphibians and fishes in the aquatic environments.

The middle catchment is in form of a plateau known as Kinangop, that was once rich in plains

game but land use changes has led to a decline in wildlife numbers. However, the plateau is still rich with birdlife and has been identified as an IBA. It is probably the world's stronghold of Sharpe's long-claw *(Macronyx sharpei)*, a threatened Kenya endemic bird species *(Bennun and Njoroge, 1999)*. The species is confined to grassland, preferring short-grass fields with tussocks, and in good habitat occurs at densities of 0.8 individuals/ha. The Aberdare cisticola is thought to occur in the higher parts of the plateau, close to the Aberdare Mountains. In addition, the grasslands also support distinctive localized species such as the black-winged lapwing *(Vanellus melanopterus)*, the wing-snaping *(Cisticola ayresii)*, Jackson's widowbird *(Euplectes jacksoni)*, a seasonal visitor, nesting in tussock grassland and at times in wheat fields and Euplectes progne (a regionally threatened species). Large numbers of Palaearctic migrants use the area on transit, notably *Circus macrourus, Falco subbuteo, Buteo buteo, Ciconia nigra, Apus apus, Merops apiaster, Motacilla flava* and *Oenanthe oenanthe*.

The lake has a wide a variety of water bird species, both resident and migratory and currently holds over 150 species. The key indicator species include the African Fish eagle and the red-knobbed coot. However, endangered and rare species are now hardly ever seen, e.g., great crested grebe, maccoa duck (endangered), African darter, great egret, saddle-billed stork, white-backed duck, Baillon's crake and African skimmer (all vulnerable).

Various wildlife species are found within and around the lakeshore and its riverine entries. Hippopotamus amphibious is the largest fauna found in the riparian zone, followed by the ungulates such as antelopes, buffaloes, waterbucks, zebras, giraffes and elands.

***Fisheries***

Lake Naivasha originally contained only one endemic fish species, *Aplocheilichihys antinoni*, which was last recorded in 1962. Over 10 fish introductions have been made since 1925 and only 3 have successfully established a fishery in the lake – *Oreochromis leucostictus* (blue spotted tilapia), *Tilapia zillii* (red belly tilapia), *Micropterus salmoides* (black bass) (Muchiri & Hickley, 1991). The three formed the Lake Naivasha commercial fishery as well as sport fishing (KMFRI, 2002). In 2001, the common carp (Cyprinus carpio) also invaded the lake and is now the major commercial species being landed with a contribution of over 95% of the total catch. This latest introduction has changed the whole fishery as evidenced by changes in species catch composition. It has interfered with the ecosystem and species such as *Micropterus salmoides* which have become vulnerable *(Hickley et al., 2004)*. The rainbow trout *(Oncorhynchus mykiss)* fishery occurs in the upper catchment in aquaculture systems and in the rivers.

**Conservation Status**

Lake Naivasha was nominated by the Government of Kenya and designated as Kenya's second Ramsar site (a wetland of international importance) in 1995. This is a unique Ramsar site, which is entirely surrounded by private land. Kenya Wildlife Services (KWS) is the custodian of Kenyan Ramsar sites and as such is an important and influential stakeholder in Lake Naivasha. Birdlife International has also designated Lake Naivasha as an Important Bird Area (IBA). Lake Naivasha itself is not legally gazetted as a protected area under the Laws of Kenya, however, there are other areas within the basin that are legally protected. These areas include the Aberdare National Park, Mau Forest (including Eburru), Hells Gate and Longonot National Parks and Kenya Wildlife Service Training Institute with its sanctuaries. There are also several privately owned game sanctuaries and pro-wildlife establishments including Oserian Wildlife Sanctuary, Kedong Ranch and Kigio Wildlife Conservancy among others.

Most of the lake is surrounded by riparian land defined by the 1906 highest lake level (1810masl) and the water edge. The lake riparian land was previously under the custodianship of Lake Naivasha Riparian Association (LNRA) which is a

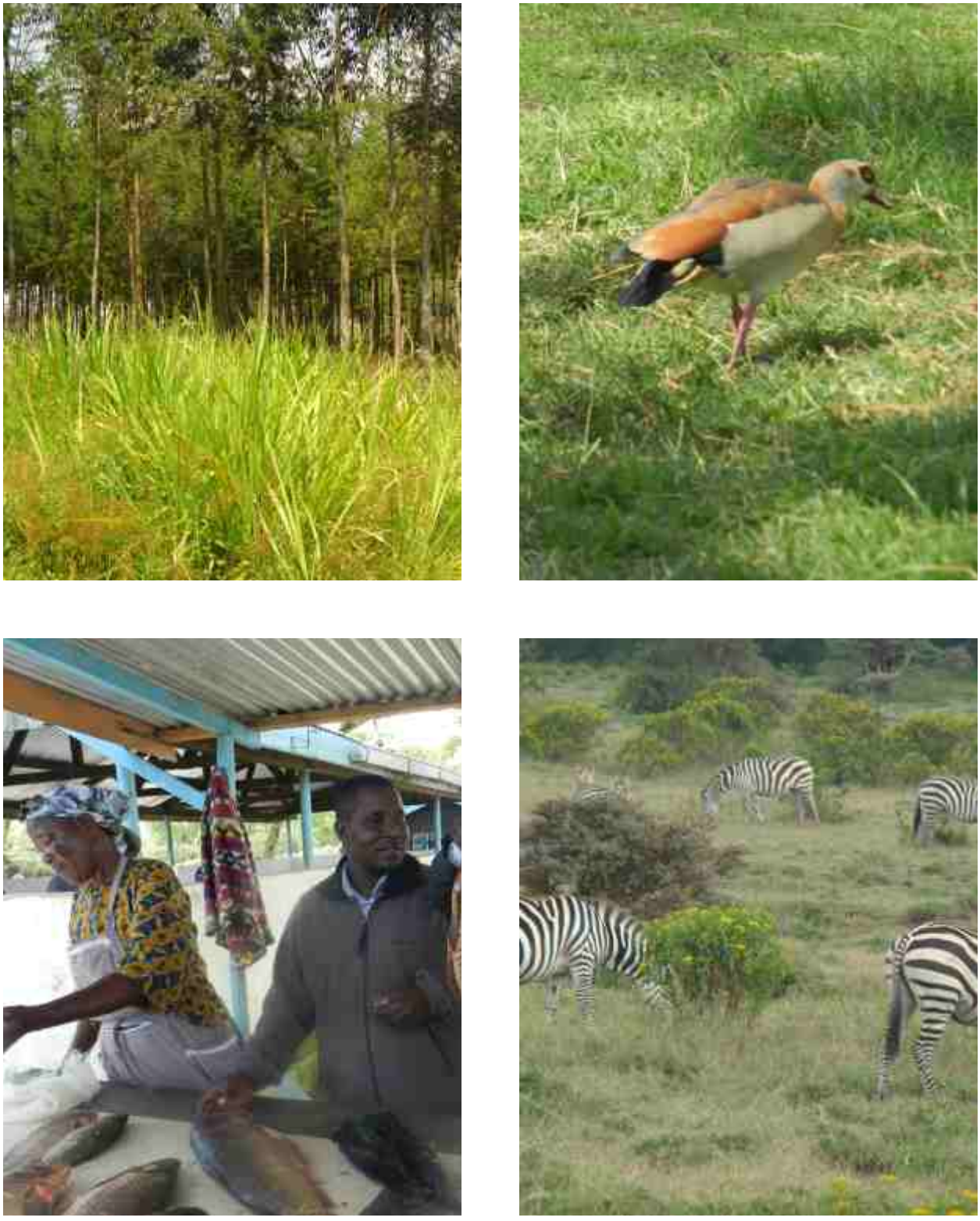


**Figure 2.5**
Some biodiversity in the upper catchment and around the Lake Naivasha

CBO formed in 1927 composed of landowners around the lake.. Under the new constitutional dispensation, the custodianship of the riparian land is under the National government.

**Human Population**

According to the recent 2009 census, the total population of the basin was estimated to be 650,000 people with approximately 160,000 living around the Lake. The basin has experienced significant population growth over the past 30 years growing from a base of approximately 237,902 in 1977 (Figure 2.6) to the current figure mentioned above. During the boom years of the horticulture industry (1989 and 1999), the population of the basin grew by 64% and in the last ten years, the population growth has slowed down to approximately 13%. There are 28 urban settlements in the basin with population ranging between 5,000 and 50,000. The five largest divisions in population size in the basin are Hells Gate (64,000) Gilgil (45,000), Engineer (45,000), Naivasha Town (45,000), Kinangop North (40,000) and Ndundori (35,000) (WWF

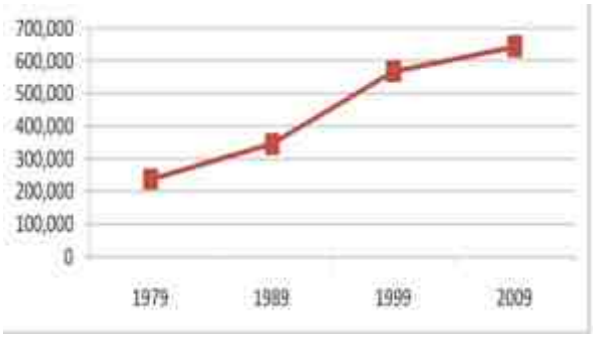



**Figure 2.6**
Population growth in the Naivasha basin between 1979 and 2009 *(WWF, 2011)*

**Resource Utilization**

Lake Naivasha basin is recognized for its diverse socio-economic and environmental significance. However, the land tenure and resource utilization patterns vary radically in the upper, middle and lower catchments. There are various land ownership types in the basin which include state, trust and individual freehold land (Kut & Agvedi 2007). The basin supports both rural and urban land use as shown in Figure 2.7(a) and 2.7(b) but

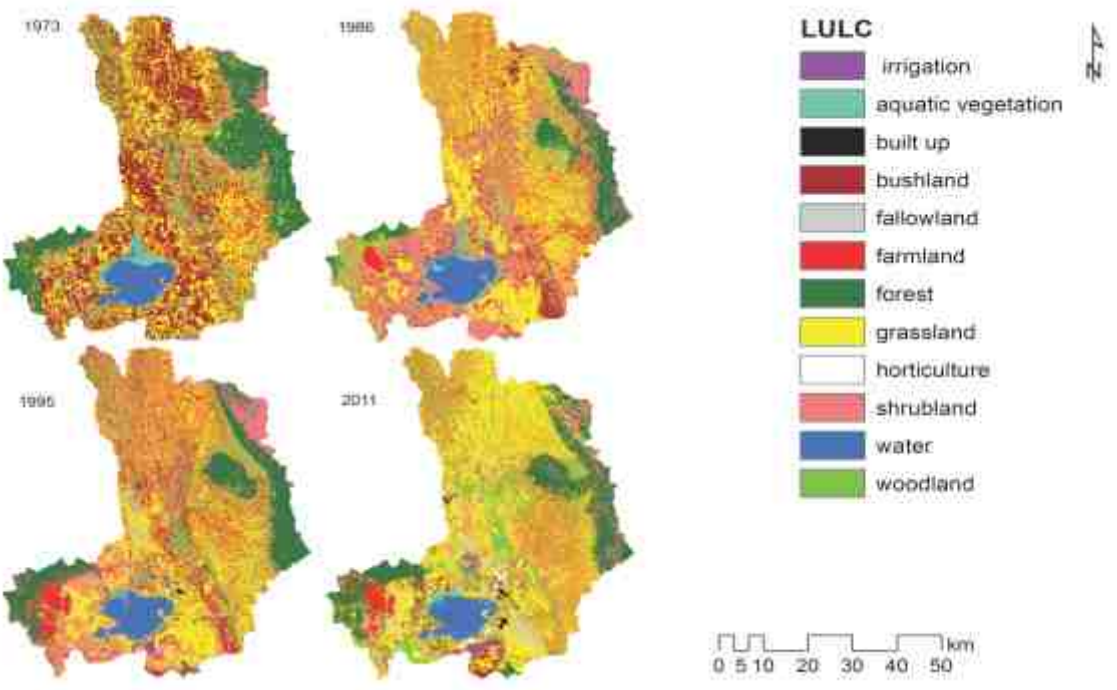



**Figure 2.7(a)**
Land use/cover maps of Lake Naivasha Basin between 1973 and 2011 *(Odongo et al, 2014)*

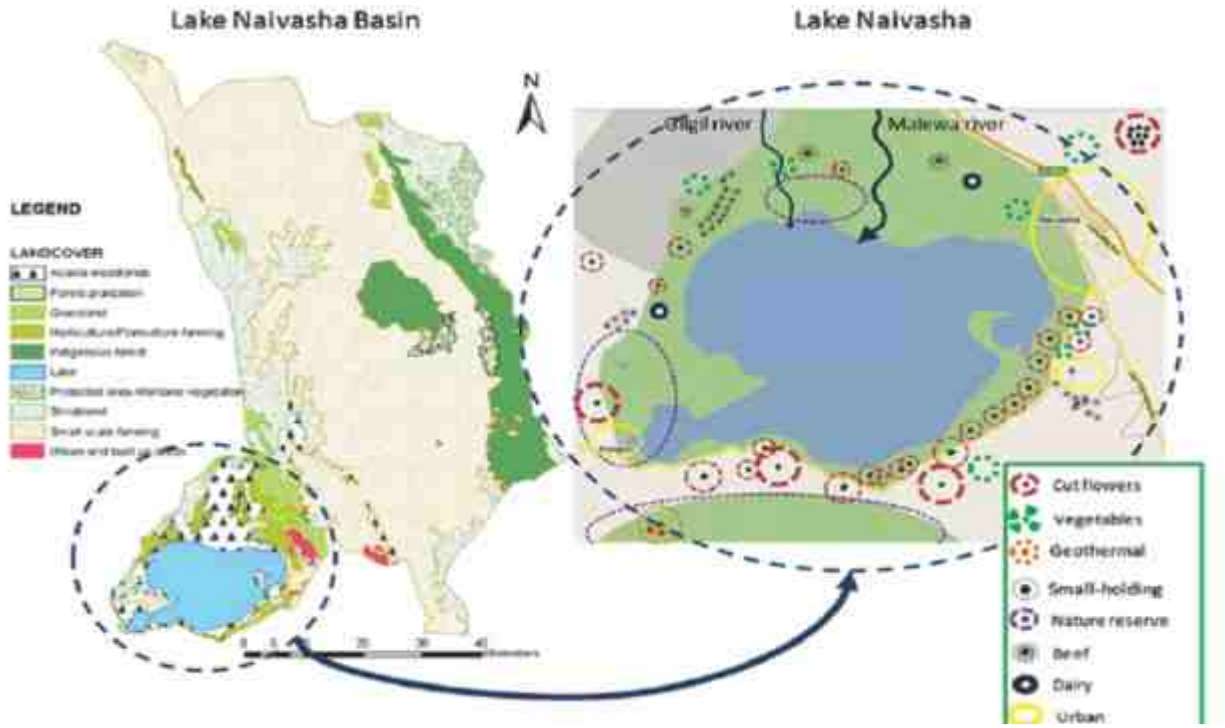



**Figure 2.7(b)**
A land use map for the Naivasha basin *(WWF 2011)*

has undergone changes in the past 30 years. Upper and middle catchments are mainly dominated by small-scale mixed farming (figure 2.9). Communities living in these areas are agriculturalists who grow a variety of food and fruit crops such as maize, cabbages, carrots, peas and apples. Other livelihood practices include aquaculture, dairy keeping, beekeeping and tourism. Urban land use comprise mainly the major centers; Geta, Wanjohi, Ndunyu-Njeru, Njabini, Engineer, Murungaru, Miharati and Ol Kalou.

The lower catchment including the lake is characterized by a wide range of land-uses which include; pastoralism, wildlife conservation, horticulture, tourism, fishery, urban settlement and geothermal power generation. The key urban environments include; Naivasha and Gilgil towns. Apart from the area being highly cosmopolitan, it is also densely populated, especially because of the horticulture farms that have attracted a lot of migrant workers and other people who either end up in business or as workers in the flower farms and/or in industries.

The lake area has many tourist attraction sites that include; the Hells Gate National Park, Mount Longonot National Park, KWS Training Institute sanctuaries, Green Park, the Naivasha Lakes, Geothermal Power Stations, Olkaria Maasai Cultural Centre and private game sanctuaries.

**Management Issues**

The Naivasha basin has continued to exhibit signs of widespread environmental degradation. Landscape transformations in the catchment through deforestation and intensive small-scale agriculture have disrupted hydrological flows into all the major tributaries discharging to Lake Naivasha. Rivers and streams in the basin are marked by torrential flows with highly turbid waters during rainy seasons (Kitaka, 2001), which are indicators of degraded catchment. The water

**Figure 2.8**
Photographs showing farmlands within the upper catchment (Tulaga) and farm produce being cleaned and packed for local markets

levels in the lake have exhibited major fluctuation in the last decade. The levels declined in the last couple of years with significant drop being observed in 2009 (Figure 2.9), due to reduced flows and uncontrolled water abstraction. High rainfall received between 2010 and 2013 have resulted in improved lake levels.

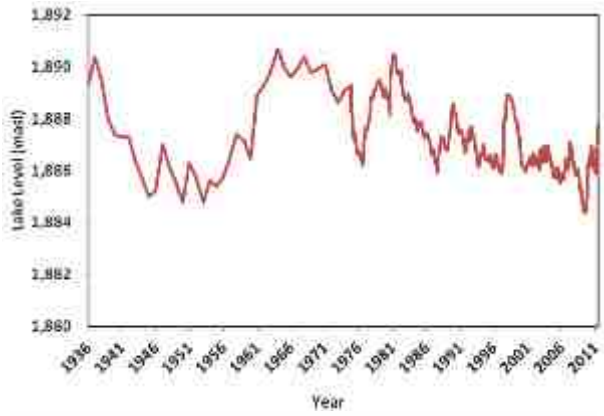



**Figure 2.9**
Lake Naivasha water levels

## Agriculture

Intensive fragmentation of agricultural land coupled by poor cultivation practices in the catchment has enhanced soil erosion, accelerated the siltation of rivers and increased the sedimentation of Lake Naivasha (Kitaka, 2001; Becht 2007). Run- off from farm fields where there is intensive use of agro-chemicals and fertilizers causes pollution in water bodies. Soil erosion is especially rampant in the middle catchment where improper farming is undertaken very close to the rivers. Although soil erosion is not widespread in the Kinangop Plateau, dams and water bodies in the area have shown evidence of eutrophication (Mwaura, 2003).

Increasing irrigated agriculture has potential to reduce river flows, lake levels and depletion of underground aquifers due to over abstraction (Becht, 2007). The distribution of horticultural farms around Lake Naivasha is shown in Figure 2.7(b). It is estimated that the total area under commercial irrigation around the lake is between 3,000ha and 5,000ha with farm sizes of over 5ha. There is concern that the horticultural farms have contributed towards the deterioration of water quality in the lake (Kitaka et al., 2002). A large number of the flower farms and other land owners around the lake have encroached and transformed the fragile environment in the riparian zone to farmland thereby threatening the future of the lake.

## Water Resource

Water resources assessment, planning and management ultimately rely on the availability of hydrological and hydro meteorological data. Land use and land cover changes also play a vital part on water resources availability. The Lake Naivasha basin is a complex hydrological system that comprises surface water and groundwater systems. The actual water resources potential of the Lake Naivasha catchment is yet to be established due to lack of critical information on

the ground water system. The major issues relating to water resource management within the basin are centred around degradation, encroachment of riparian lands and non-compliance to natural resources management laws which lead to declining water quantities and quality.

***Water Quality Issues***

Rivers and streams in Naivasha basin are marked by torrential flow with high turbid waters during the rainy seasons (Kitaka, 2001). This means that surface run off from the upper catchment carries a lot of nutrient soils. In addition, the streams pass through areas polluted by high ammonium-nitrogen concentration. Overgrazing in the upper catchment has a huge impact on the water quality of the rivers and ultimately the lake. Nutrient analysis of water samples collected by Tiruneh (2003) for a period of nine days in September and October 2003 along the main River Malewa indicates that the Nitrogen (NO3-N) levels vary from 2.0 to 3.8 mg/l and the Phosphorus levels from 0.01 to 0.07 mg/l.

***Water Quantity Issues***

There is increasing demand for water resources as a result of population growth and agriculture expansion. According to the Water Abstraction Survey (WAS 2010) water abstractions in the area around the lake are most dense and also account for about 2/3 of the total abstraction in the basin

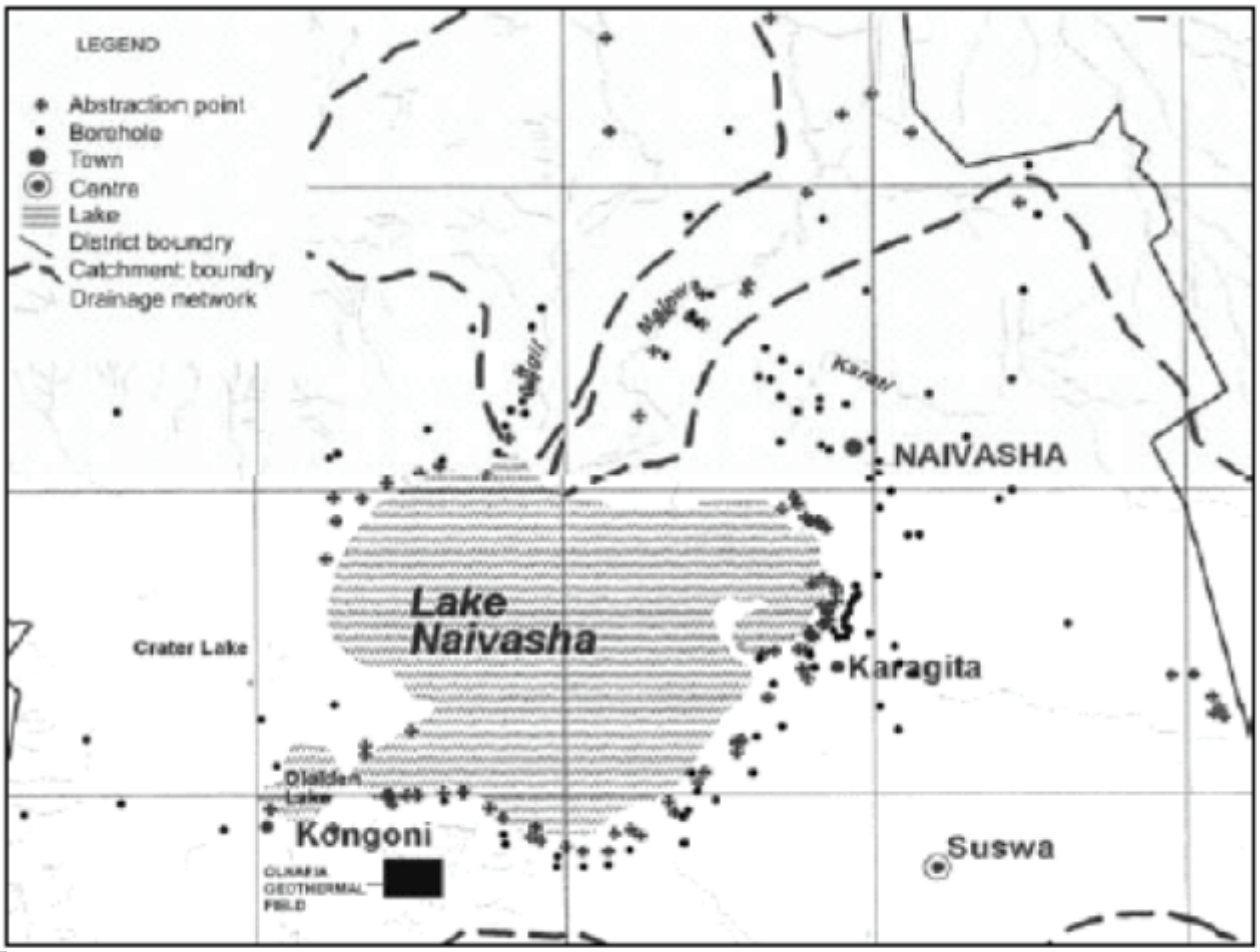



**Figure 2.10**
Water abstraction points and boreholes in the Naivasha area

(Figure 2.10). In the catchment area the total river abstraction (77,871 m3/day), according to the WAS results, is in the same order of magnitude as direct abstractions from the lake (73,932m3/day). The out–of-the-basin transfer at the Turasha dam accounts for 20% of the total river abstraction in the basin. Compliance on installation of measuring devices on abstraction points is low in the upper catchment area and high in the lake region.

**Forestry**

The upper catchment of the basin which has historically consisted of indigenous forest and open woodland has experienced significant changes in land use over the past 50 years as the forest has been converted into rain-fed small farm holdings. Consequently, the forest cover has decreased significantly as shown in Figures 2.7(a) and 2.11.

The forest adjacent communities in the basin derive a lot of their subsistence needs from the forest goods and services. Illegal logging, encroachment, illegal grazing and charcoal burning have resulted in widespread depletion of forests within the basin. Forest fires have been a great challenge and are more common in Eburru and Geta block of the Aberdare forest. They are mainly caused by honey harvesters, charcoal producers, arsonists, smokers and grazers particularly during prolonged dry spells. Species like wild olive *(Olea Africana)*, African red wood *(Hagenia abyssinica)*, and podo *(Podocarpus*

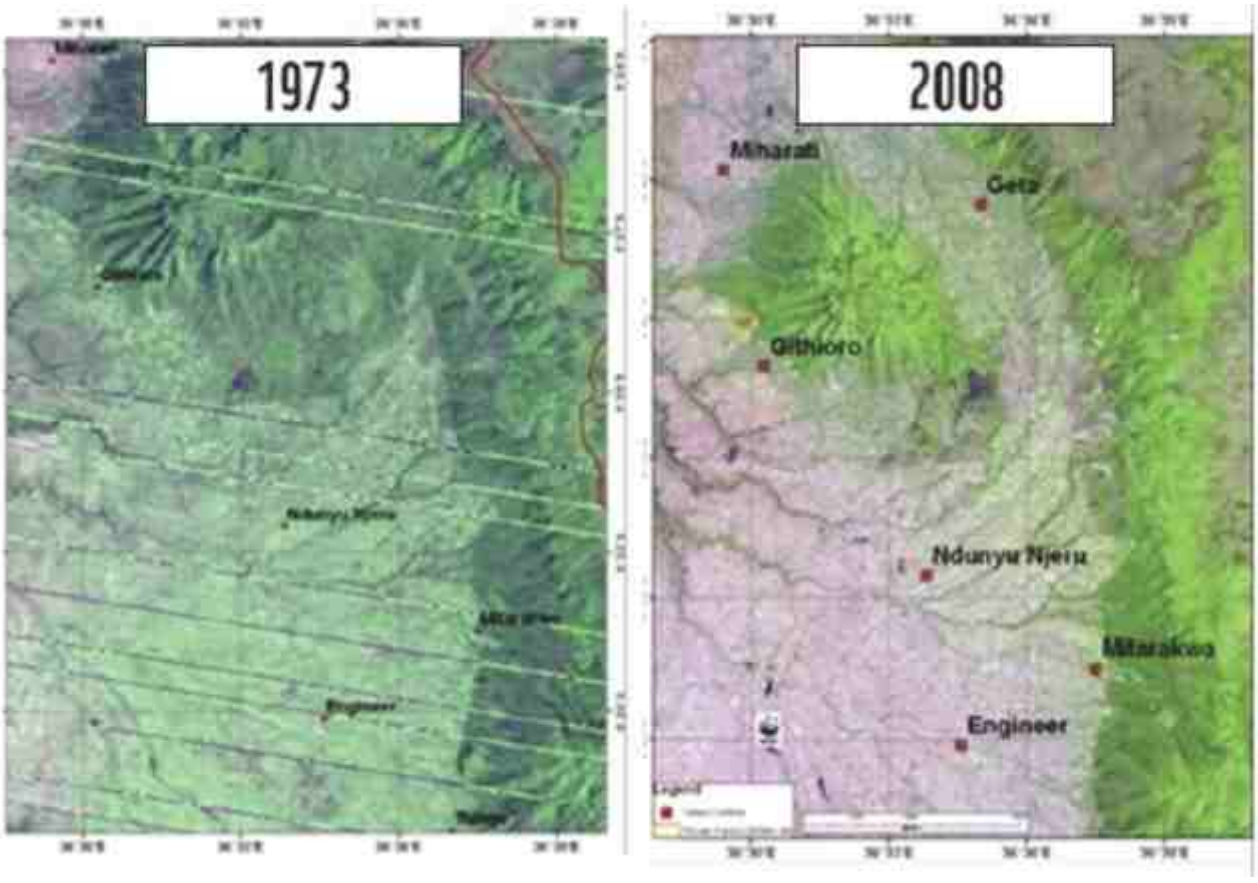



**Figure 2.11**
Forest cover change in Kipipiri and Aberdare forests

*falcatus)* are threatened due to their valuable wood, whereas red stink wood, *Prunus africana* and *Rhamnus Prinoides* for medicinal value. Other tree species which have been decreasing include *Juniperus procera*, *Dombeya goetzenii*, *Ekebergia capensis* and *Arundinaria alpina*.

**Livestock Development**

The livestock industry is a key sector in the economy of the Lake Naivasha basin. In the upper and middle catchment, livestock production is limited to small scale farmers who keep a mixture of livestock. Poor livestock management processes such as poor siting of cattle dips and livestock overgrazing along the riverine riparian areas in the drainage basin is frequently accompanied by deleterious impacts such as reduced soil infiltration, soil erosion, nutrient enrichment and contamination from dung and urine (Fig. 2.12).

In the area around the lake, apart from resident livestock, there is significant influx of livestock brought about by pastoralists who still use the traditional pastoral route from Suswa to Gilgil. During the dry season, approximately 35,000 heads of nomadic livestock visit the lakeshore for watering. The most affected area is Oloidien Bay opposite Kongoni Police Station *(Ouma 2001)*, due to limited access to the main lake because most of the riparian land around it is privately owned.

Livestock watering directly at the lakeshore is destructive to the riparian habitat because trampling and feeding on the riparian vegetation destroys the littoral vegetation and reduces the filtering capacity of the buffer zone. The livestock dung also increases the nutrient levels and enhances the level of eutrophication of the lake. As a result of animal grazing, the papyrus swamps around the lake and the mouth of River Malewa and Gilgil have shrunk since 2002 (Everard & Harper, 2003). In summary, livestock grazing depending on the numbers has been shown to have the following effects on riparian vegetation:

i). Consumption of plant biomass, including selective grazing of palatable and accessible plant tissues and species, and defoliation.
ii). Trampling of plants, including damage to underground rhizomes.
iii). Purging, compaction, erosion, and re-suspension of lakeshore/river banks substrates.
iv). Nutrient addition and bacterial contamination from dung and urine.
v). Creation of plant invasion micro-sites.
vi) Introduction and dispersal of seeds and other plant propagules.

**Figure 2.12**
Livestock grazing in the riparian zone

**Fishery Development**

A commercial fishery established in Lake Naivasha is based on fish species introduced between 1925 and 1970 for different purposes. The introduced species included; the large mouth black bass *(Micropterus salmoides)*; *Oreochromis nigra*, a mouth brooding cichlid, and other three tilapiine species (i.e. *Tilapia zillii* and *Oreochromis leucostictus*, *Oreochromis niloticus*). A crustacean species, *Procambarus clarkii* (Girard) was introduced in the lake in 1970 as food for black bass, but formed a fishery component until the late 1980s. Natural intruders into the lake from the rivers are *Oncorhynchus mykiss* (Rainbow trout) and *Barbus amphigramma (Palcidinosus)*. The latter supported a riverine fishery until 1989 with catches of about 69 tons. Invasion of the lake ecosystem by common carp

*(Cyprinus carpio)* was reported in 2001/2002. This species has established in the lake and transformed the fishery of the lake.

The Lake Naivasha fishery has experienced considerable fluctuations over the past two decades due to fishing pressure, lake level fluctuations and loss of macrophytes *(Muchiri and Hickley, 1991; Njiru and Ojuok, 1997)*. The lake's fish production, which performed at over 500 metric tons per year drastically declined in the late 1990s and nearly collapsed by end of 2000 when a paltry 66 ton of fish were landed (Fig. 2.6).

In 2001, the Government of Kenya, through Fisheries Department, imposed a year-long ban on all forms of fishing activities in Lake Naivasha, in order to allow fish stocks recovery. This measure was followed by the reduction of licensed fishing vessels from 113 canoes in 2000 to 50 canoes at present. Each canoe is restricted to deploy only 10 gillnets of over 4 inches mesh size. Additionally three months closed period is imposed annually to allow fish stock replenishment.

These control and regulatory measures to some extent resulted into loss of livelihoods of the fishing dependent community around the lake. Although the fish catches have improved to over 200 metric tons at present, the fishery is dominated by a single species, the common carp. Available data show that since 2006, the species accounts for over 95% of the total fish catches of Lake Naivasha while the rest of the species have disappeared. Therefore, further introductions of fish species into the lake basin have been recommended and attempts made to re-introduce *Oreochromis niloticus*. Furthermore, the Lake Naivasha basin has high potential for fish farming and aquaculture activities.

**Tourism**

Tourism in the Lake Naivasha basin is centered around the Aberdare National Park and the Lake itself with Naivasha having several tourist attraction sites; two National parks (Hell's gate and Longonot) and sanctuaries (KWSTI, Marula,

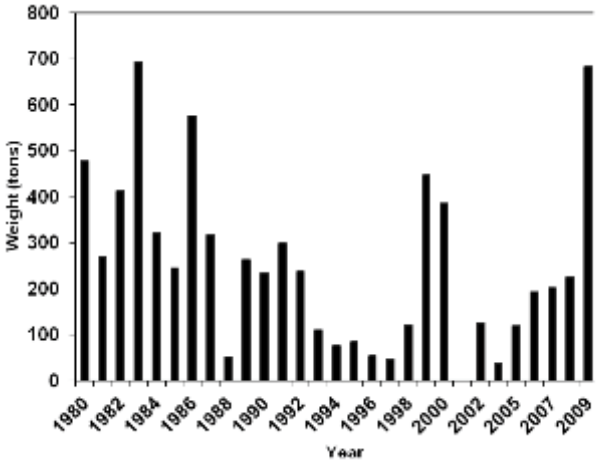



**Figure 2.13**
Lake Naivasha fish catches 1980-2010

Kedong, Oserian, Crater Lake, Mundui, Crescent Island and Sanctuary farm). The aesthetic beauty of the Lake Naivasha riparian area, rich wildlife including birds, proximity to Nairobi, and availability of hotels and campsites attract both local and international visitors.

There are approximately 4,000 accommodation beds in Lake Naivasha that cater across a range of markets from international, political and business delegations to truck drivers carrying freight to Uganda (WWF, 2011). It is estimated that about 5% of all international tourists visiting Kenya (1.8 million in 2007) pass through Naivasha either on their way to Lake Nakuru, Aberdare National Park, Masai Mara Game Reserve and the recently marketed Western Circuit. The total value of the tourism sector in Naivasha was estimated to be approximately KSh 600 million a year in 2010, which is relatively small (less than 5%) compared with the horticulture industry (WWF, 2011).

There are several issues affecting tourism industry within the Lake Naivasha basin namely; lack of connectivity to the main tourist circuit, poor marketing, no defined tourism structure, poor diversification of products and poor road infrastructure to the upper catchment amongst others. Furthermore, the invasive species and fluctuations in lake levels affect recreational tourism activities within the lake.

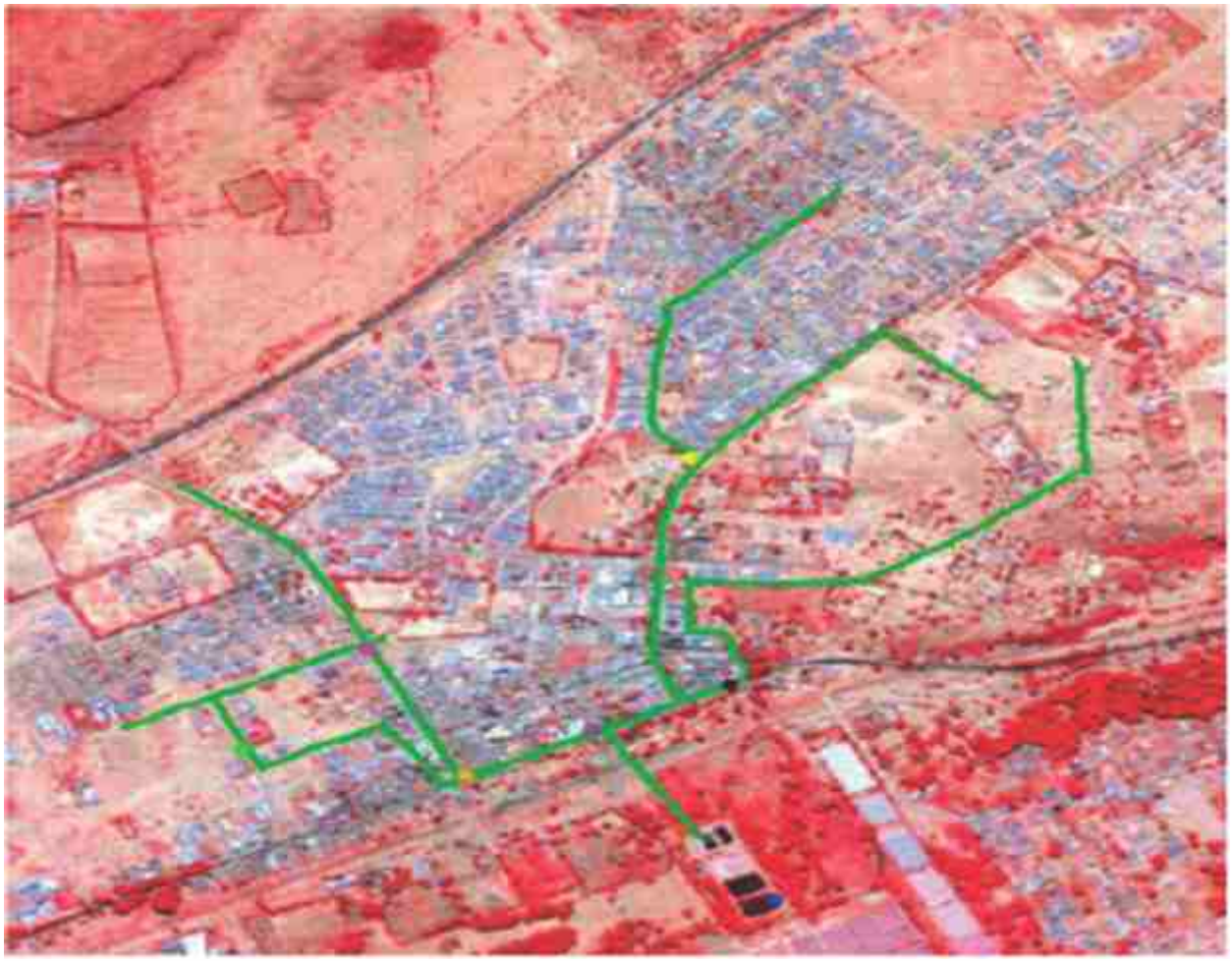


**Figure 2.14**
Sewage network in Naivasha town

**Urbanization**

The urban developments in the Lake Naivasha basin has led to land use transformation, increase in waste water and solid waste management problems, settlement on fragile zones, increasing water demand for domestic use and poor planning of the urban centers. Growth and expansion of the urban centres have many benefits but these also puts pressure on the environment and quality of service delivery.

There are 28 urban settlements spread out in the entire basin with population ranging between 5,000 and 50,000 (WWF 2011). High population growth rate is being observed in the basin and this is becoming more concentrated in the urban centres due to rural-urban migration as a result of the vibrant economic environment. The vibrant economic environment is mainly fuelled by factors that include the thriving horticulture and commercial agriculture (small and large scale), geothermal power generation, fishing and tourism.

The problems of urbanization are more critical in Naivasha town and in the satellite settlements around the lake than in the upper catchment. The municipality of Naivasha is one of the biggest municipal councils in Kenya covering an area of 941 km2 and with a population of over 250,000

people. Although a large area of the town is within reach of the sewerage infrastructure, only around 10 –15 % of the population is connected to the network (Figure 2.14). The town also lacks comprehensive solid waste management system and plan.

**Geothermal Energy**

The first geothermal plant in Africa was established in Olkaria in 1981 when a 15 MW Olkaria I station was commissioned 7km south of Lake Naivasha. Currently, 45 MW is generated by Olkaria I, 70 MW by Olkaria II and 12 MW by Olkaria III. Oserian Geothermal plant generates 2 MW for use in their farm. The production is expected to increase to 576 MW in the next 20 years. KENGEN claims that actual use of lake water for geothermal production does not exceed 59,000 m3/yr (160m3/d) except when drilling geothermal boreholes when approximately 100,000 m3 of water is required to drill a well, however, there are significant uncertainties associated with geothermal water usage over time. In addition, with further drilling planned for Olkaria IV which is expected to generate 280 MW, water demand by the industry is likely to increase in the foreseeable future. The main challenges related to geothermal power production include, air pollution (hydrogen sulfide gas), noise emission/pollution, surface disturbance and habitat encroachment/destruction, thermal effluents, chemical discharge and solid waste. However there are also social economic benefits associated with geothermal energy production,: these include cleaner and reliable energy, reduced carbon emissions (which mitigate against global warming) and job creation.

**Climate Change**

Observational evidence within Kenya shows climate change is a reality that is affecting natural ecosystems. In addition, the impacts of the projected climate change are expected in many sectors such as environment, human health, food security, economic activities, natural resources and physical infrastructure (GoK 2010). The effects of climate change are however unpredictable and the following predictions may suffice for the climate change impacts for the Lake Naivasha basin:

a) Increased rainfall intensity may lead to increased runoff and river flows, increased intensity of flash floods that would lead to damage and loss of property and lives, landslides increased soil erosion with subsequent loss of fertility and increased siltation of water bodies, crop damage, increased incidences of water borne diseases and increases in charcoal prices.
b) Decreased rainfall coupled with increased temperatures and drought may lead to increased crop failure thus affecting food security, livestock production, loss of livelihoods, decreased river flows and lake levels which may increase the concentration of pollutants, lowering of groundwater levels, denudation of soil cover and subsequent soil erosion, increased water scarcity, decline of biodiversity and increase of human-wildlife conflict in some areas.
c) Variation in diurnal temperatures increasing probability of water, heat and cold stress in some areas of the basin.

The adverse impacts of climate change can be compounded by local environmental degradation (land use change, unplanned settlement, encroachment, logging, livestock grazing) which have among others further aggravated deforestation and land degradation. With regards to the Lake Naivasha basin, the peoples' understanding of climate change is perceived in the following ways; change in weather patterns exhibited through severe droughts, frosts and erratic rainfall. The consequences of these include crop failure, livestock and wildlife deaths, increased wild fires, limited access to water for both domestic and agricultural production and drying up of rivers leading to low water levels in the lake. In conclusion, climate change will exacerbate the already stressed ecosystem.

**Land Use**

Land tenure in the lake Naivasha basin has a direct impact on the use and management of natural

resources. Where tenure rights are certain, they provide incentives to use land in a sustainable manner or invest in resource conservation whether as individuals or groups of individuals. Different stakeholders practice various forms of land use based on their socio-economic needs and cultural practices determined mainly by weather patterns, soil fertility and level of social development. Table 1.0 summarises the land use patterns and challenges within the basin.

**Table 1.0**
Summary of Land Use and Challenges within the Basin

| Area | Land Use | Challenges |
|---|---|---|
| Marmanet | • Subsistence cultivation<br>• Plantation farming (Wheat, maize)<br>• Wildlife dispersal area<br>• Livestock production<br>• Settlement | • Human wildlife conflict<br>• Illegal activities (charcoal burning, poaching)<br>• Fragile & friable soils |
| Lake Naivasha area | • Fishing<br>• Intensive agriculture (horticulture & floriculture)<br>• Pastoralism<br>• Tourism<br>• Geothermal power production<br>• Wildlife conservation<br>• Livestock and dairy production<br>• Urban Settlement | • Pollution<br>• Water over abstraction<br>• Encroachment of riparian area<br>• Unplanned settlement<br>• Expanding population<br>• Poor waste management<br>• Over fishing<br>• Land conversion<br>• Invasive species |
| Mkungi / Kitiri / Turasha / Kinja / Wanjohi, Upper Malewa | • Agriculture (potatoes, cabbages, peas, carrots)<br>• Forests<br>• Settlement<br>• Floriculture<br>• Beekeeping<br>• Livestock production<br>• Mining of stones (quarrying) | • Deforestation<br>• Human wildlife conflict<br>• Soil erosion<br>• Water pollution<br>• River bank degradation |
| Lower Malewa, Middle Malewa | • Agricultural production<br>• Floriculture<br>• Livestock production<br>• Settlement | • Water abstraction<br>• Inadequate rainfall<br>• Soil erosion |
| Eburru | • Subsistence agriculture<br>• Livestock production<br>• Bee keeping<br>• Tourism<br>• Settlement | • Deforestation<br>• Charcoal production<br>• Human Wildlife conflict<br>• Soil Erosion<br>• Forest Encroachment |

| Area | Land Use | Challenges |
|---|---|---|
| Gilgil (Upper and Lower) / Karati | • Agricultural production<br>• Irrigation farming<br>• Wildlife conservation<br>• Sand mining (quarrying)<br>• Floriculture | • Soil erosion<br>• Land conversion<br>• Conversion of riparian land for agriculture (along Gilgil river)<br>• Charcoal production<br>• Human wildlife conflict<br>• Collapsing quarries |
| Aberdare Forest Block | • Forestry<br>• Tourism<br>• Beekeeping<br>• Settlements<br>• Livestock production (intensive sheep and dairy production) | • Deforestation<br>• Encroachment<br>• Charcoal production<br>• Collection of forest product<br>• Land fragmentation (Geta)<br>• Human Wildlife conflict<br>• Soil erosion<br>• Siltation of rivers streams and water pans |

**Natural Resource Conflicts in Lake Naivasha Basin**

Sustainable management of Lake Naivasha basin is underpinned by complexity, which is defined by two related realities; diverse stakeholder groups whose interests and mandates often compete and sometimes conflict. These interests are at global, national and local levels. The glaring conflict issues within Lake Naivasha basin include the following:

1. Human population pressure and land fragmentation. Land fragmentation and subdivision from the former large scale white settler farms to very small units of approximately 1-10 acres per family that is progressively becoming unviable for social and economic sustainability of the people
2. Land use and natural resources management practices in the catchment. There is intensive land use in the catchment to meet the social and economic needs of the increasing human population. Issues of conflict include; overstocking and over-grazing, clearing of indigenous plant species in the gazetted forests and on the community farms, encroachment and deforestation of the protected forests, blocking of the rivers and water courses, diversion of water from the rivers into the farms for irrigation, loss of land cover, soil fertility and creation of gullies from mining activities, increased soil erosion and sedimentation of watercourses including the main rivers (Malewa, Gilgil and Karati rivers within the Lake Naivasha basin). The high dependence on natural resources for livelihoods and the minimal formal opportunities to participate in sustainable management of the resources exacerbates the conflicts
3. Encroachment into protected areas i.e. national parks, forest reserves and other conservation areas. People encroach into the protected areas for the following reasons: logging of timber and collection of fuel wood, cultivation of crops in the forests, settlement, grazing of livestock, harvesting of honey, poaching of game meat and harvesting of medicinal plants among others. These have led to uncontrolled forest fires and indiscriminate felling of indigenous and valuable forest trees with consequent reduction in the forest cover and increased soil erosion and

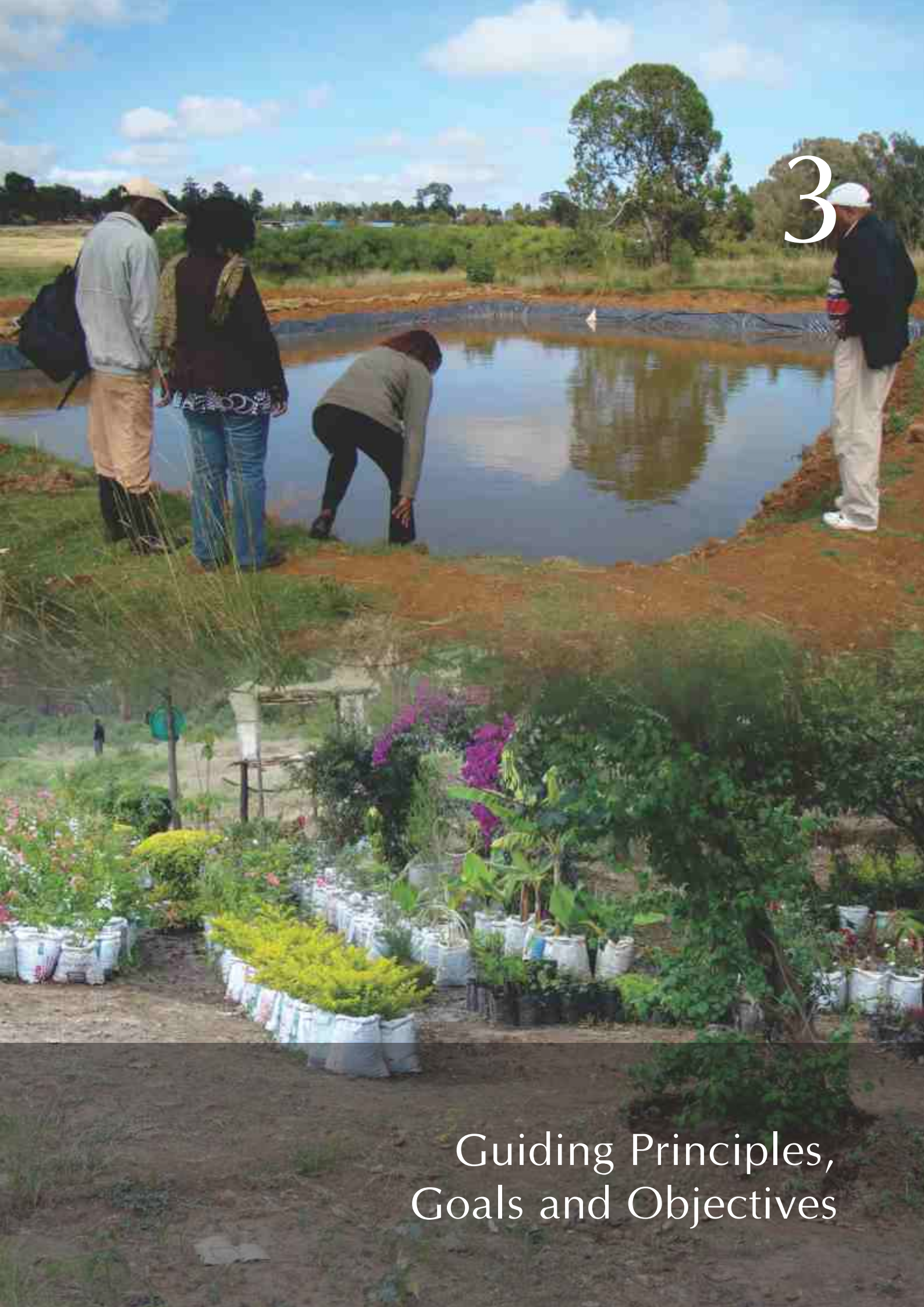
reduced water flow into the lake. There have also been cases of excision and grabbing of forest land and arbitrary changes in policy by the State. These conflict issues are common in the Mau Forest complex including the Eburru, Satima escarpment, Kinangop Forest, Turasha and parts of the Aberdare Forest Reserve. The National parks like Hell's Gate and Mt. Longonot often encounter increased encroachment from dense human populations in the adjacent areas and illegal grazing by the pastoralists during the dry seasons.

4. Gazettement of protected areas (National Parks, Reserves and Forest Reserves) Protected areas within the basin include Hell's Gate National Park, Mt. Longonot National park, Eburru Forest Reserve, Parts of Aberdare National Park and Kinangop Forest Reserve. Traditionally, most of the land within the basin belonged to the Maasai community where they depended on the natural resources for their social, cultural and economic sustainability. These have been gazetted without prior consent from the communities creating discontent and conflicts with the managing institutions.
5. Riparian Land tenure. Conflict here emanates from the fact that some farmers have alienated and acquired titles for some sections of the riparian land which is government or public land. Most of the access corridors on the riparian land to the lake have been closed to the public, effectively denying them access to the lake and use of its natural resources. Some local land owners claim custody of the riparian land on behalf of the State while others, particularly the pastoralists and some local communities feel that they are being denied access and use of natural resources on the riparian land.
6. Water Allocation/Abstraction for commercial horticulture in the Lake Naivasha basin. The amount of water abstracted for irrigation is controversial and generates conflicts among stakeholders, especially with respect to the extent it impacts on the water quality and quantity, other water dependent resources like livestock, fisheries, biodiversity, wildlife, tourism, pastoralism, and subsistence agriculture which are the lifeline of the majority of community groups within the basin. Serious conflicts also manifest in the blame game experienced between the upper and lower catchment communities over reduced river flows and water scarcity in the lower zones, especially during drought periods.
7. Equitable sharing of benefits from natural resources management. Altogether, the basin generates well over Kshs 350 billion from various income generating activities every year. The extent to which the benefits are equitably shared amongst different stakeholders varies between different sectors and remains a highly contentious subject.
8. Poor compliance. Lack of compliance is a source of conflicts between the resource users and the regulatory authorities, and also between those who seek permits and those who do not bother to obtain permits for use of natural resources.
9. Weak enforcement. The majority of government institutions have inadequate resources, political will, commitment and the required seriousness to undertake effective enforcement of natural resources policies, laws and regulations.
10. Lack of access to information. On the state or actual use of natural resources for example water abstraction, estimates from research documents, although varied, provide the only useful information. Most of the information is however, held by different institutions in formats that are not readily accessible to the majority of stakeholders. Lack of access to data and information has curtailed informed decision making processes and contributed to conflicts among resource users and researchers.

11. Weak permit data. All public sectors responsible for the management of natural resources issue permits to control and regulate the utilization of such resources. These sectors include water, forests, wildlife and fisheries; however, there are several instances where resources are exploited without permits from the authorities concerned. There are also many cases where permits are issued but the conditions attached to the permits are not complied with or enforced by the same authorities.

**Impacts of Conflict Issues on Resource Use and Management**

Conflicts have several potential adverse impacts on natural resources use and management within the Lake Naivasha basin. Potential impacts include; ineffective decision making processes, poor implementation of EIA and Environmental Audit procedures, ineffective inventory of all natural resources within the basin, lack of integrated planning and management, ineffective communication and sharing of information, ineffective enforcement and compliance, inadequate technical capacity among stakeholders, ineffective resource mobilization and sharing of available resources, poor local, national and international linkages.



# 3

# Guiding Principles, Goals and Objectives

## Vision

The envisaged vision of the LNBIMP is:

*"A clean, healthy and productive environment and sustainable livelihoods in the Lake Naivasha basin for the benefit of the present and future generations"*

## Mission

*"To improve environmental, economic and social sustainability of the basin for present and future generations through enhanced governance of natural resources."*

**The Guiding Principles**

The guiding principles of the Lake Naivasha Basin Integrated Management Plan (LNBIMP) are:

I. ***Wise use:*** Due to the significant contribution of natural resources to the health and well being of Kenyans, these resources should be integrated into national economic planning for sustainable development, wealth creation and environmental management.

ii. ***Precautionary principle***: Where information is inadequate for decision making, the precautionary principle will apply. Lack of full scientific information should not prevent implementation of measures to minimize/ manage ecosystem degradation.

iii. ***Collaborative and participatory approach:*** An integrated approach to ecosystem conservation and management should involve stakeholders at all levels including; government, local community, civil society and the private sector.

iv. ***The Global dimension:*** Environmental impacts of actions and policies should be recognized and considered at local levels to impact globally

v. ***Polluter pays principle:*** Persons who pollute environments should meet the cost of cleaning them up, and also meet the cost of the pollution to resource users.

vi. ***User pays principle:*** People who benefit from natural resources should pay for them; One way is through payment of ecosystem services - a practice of offering incentives to landowners in exchange for managing their land to provision of ecological services.

vii. ***Inter-generational and Intra-generational Equity:*** the present generation needs must be considered without compromising the needs of the future generations.

viii. ***Cultural and Social Principles:*** traditionally applied by any community in Kenya for the management of the environment or natural resource in so far as the same are relevant and are not repugnant to justice

**Goals and Purpose of the Plan**

The goal of Lake Naivasha Basin Integrated Management Plan is to provide a strategy that will guide the protection, maintenance and restoration of Lake Naivasha basin and balance the environmental, social and economic needs of the area.

The purpose of the plan is to harmonize the diverse interests within the Lake Naivasha Basin and reduce natural resource use conflicts. The Integrated Management Plan aims at achieving the following, in addition to the aims of other existing plans:

I). Identify the scope, goals objectives and management activities for the next ten years (2012-2022);

ii). Provide a means for stakeholders to make natural resources management investment decisions;

iii). Build a holistic vision for the sustainability of Lake Naivasha basin;

iv). To participate effectively in environmental and natural resources management and planning in the Lake Naivasha basin;

v). Create new opportunities for dialogue and collaborative problem-solving among government, non-governmental organizations (NGOs), community groups and the private sector;

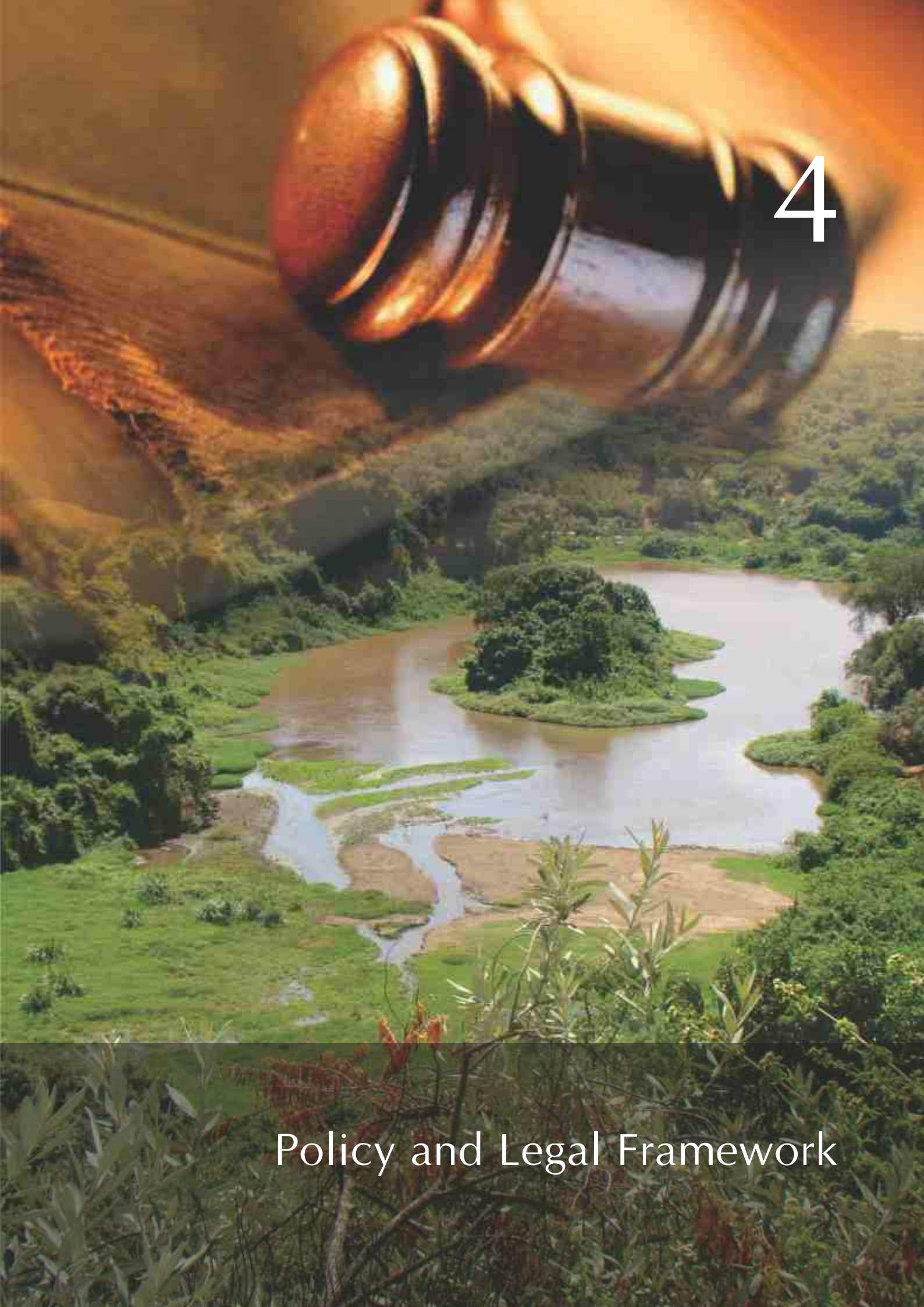
vi). Improve the management of the Lake Naivasha basin in terms of planning, implementation and monitoring so that it is more transparent, accountable, all inclusive and practical based.

**Strategic Objective**

By 2022, Lake Naivasha basin stakeholders' level of participation in natural resources conservation and management has increased by five percent leading to reduction in natural resources use conflicts, enhanced sectoral linkages and improved benefits.

**Specific Objectives**

1. To enhance public participation in natural resource management
2. To promote sustainable land use practices to secure biodiversity hotspots.
3. To promote alternative livelihood options to reduce pressure on natural resources
4. To improve water use efficiency by promoting appropriate technology
5. To strengthen institutional synergy in the management of natural resources in the basin



# 4

# Policy and Legal Framework

A wide range of policy, legal and institutional frameworks are relevant in the management of Lake Naivasha basin.

**International Frameworks**

Kenya is a party to a wide range of global and regional MEAs including conventions, treaties and protocols, which is a clear indication of a strong commitment towards environmental security.

Kenya has international obligations for the domestication of the following international frameworks:

1. ***Convention on Wetlands of International Importance (Ramsar)***
   The aim of the Ramsar Convention is to promote conservation and wise use of wetlands, by national actions and international cooperation as a means to achieving sustainable development throughout the world.
2. ***Convention on Biological Diversity (CBD)***
   The purpose of this convention is to ensure the conservation and sustainable use of biodiversity, both on aquatic and terrestrial ecosystems.
3. ***Convention of Migratory Species of Wild Animals (CMS) or Bonn Convention***
   The purpose of this convention is to ensure that migratory species are protected. Lake Naivasha basin is known to sustain a wide range of migratory birds especially from the Paleoarctic region.
4. ***African Convention on the Conservation of Nature and Natural Resources***
   The aim of the convention is to ensure measures necessary for conservation, utilization and development of soil, water, floral and faunal resources in accordance with scientific principles and with due regard to the best interests of the people.
5. ***United Nations Framework Convention on Climate Change (UNFCCC)***
   The primary purpose of the convention is to establish methods to minimize global warming and in particular the emission of the greenhouse gases. This includes the protection and conservation of forests as principal mitigation agents for climate change.
6. ***Convention on International Trade in Endangered Species of wild flora and fauna (CITES)***
   Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival
7. ***Africa Eurasian Water Bird Agreement (AEWA)***
   It aims at the conservation of migratory water birds with Lake Naivasha being a unique waterfowl area.
8. ***Convention on the Protection of the World Cultural and Natural Heritage (Paris, 1972)***
   It aims to ensure that effective and active measures are taken for the protection, conservation and preservation of the cultural and natural heritage in the country.
9. ***Convention to Combat Desertification***
   It aims at combating desertification and mitigating effects of droughts through national action programmes supported by international cooperation and partnerships.
10. ***Rotterdam Convention***
    Its objective is to promote shared responsibility and collaborative effort among parties in the international trade of certain hazardous chemicals in order to protect human health and environments from potential harm and to contribute to environmental sound use.

**Regional Frameworks**

***East African Community Treaty***

It aims at widening and strengthening co-operation among partners states in, among others, political, economic, social and natural resources areas for their mutual benefits.

***Intergovernmental Authority on Development (IGAD)***

The IGAD aims at assisting and complementing

the efforts of the Member States to achieve, through increased cooperation, food security, environmental protection, maintenance of peace and security as well as economic cooperation and integration.

**National Legal Frameworks**

Kenya's Acts of Parliament, which mention environmental and natural resources are numerous and diffuse in nature with provisions being contained in about seventy seven statutes. The current Constitution of Kenya has a direct provision on the protection of the environment to ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and equitable sharing of the accruing benefits.

The Legal and institutional frameworks are highlighted in table 2.0

**Table 2.0**
Legal and Institutional Frameworks focusing on Environment in Kenya

| Legal Framework | Institution /Lead Agency | Mandate |
|---|---|---|
| Environmental Management and Coordination Act (EMCA )1999 and related regulations | National Environment Management Authority (NEMA) | Coordination of environmental management |
| Water Act 2002 | Water Resources Management Authority (WRMA) | Water resources management |
| Agricultural Act (Cap 318) | Ministry of Agriculture, Livestock and Fisheries | Coordinate agro-based activities, livestock development and fisheries |
| Physical Planning Act 1996 | Ministry of Devolution and Planning/ National development and Vision 2030 | Land use planning and development |
| Penal Code (Cap 63) | Judiciary | Penalties on environmental offences |
| Forest Act 2005 | Kenya Forest Service | Conservation and development of forest resources |
| Fisheries Act (Cap378) 1989 | Ministry of Agriculture, Livestock and Fisheries | Management and conservation of fisheries resources and research |
| Wildlife (Conservation and Management) Act 2013 | Kenya Wildlife Service | Protect, conserve and allow for sustainable use and management of wildlife in Kenya including enforcement of related laws and regulations |

| Legal Framework | Institution / Lead Agency | Mandate |
|---|---|---|
| Livestock Act (Cap 321) | Ministry of Agriculture, Livestock and Fisheries | Promote and coordinate sustainable livestock production |
| Tourism Act 2011 | Kenya Tourism Board | Tourism marketing and development |
| Land Planning Act (Cap 303) | Ministry of Lands, Housing and Urban Development | Planning the use and development of land |
| Land Control Act (Cap 302) | Land Controls Board | Controls transactions of agricultural land |
| Local Government Act (Cap 265) | Local Authorities | Manage resources within their jurisdiction |
| National Land policy 2011 | National Land Commission | Guide in sustainable and equitable use of land |
| Public Health Act (Cap 242) | Ministry of Health | Regulation on waste management, pollution and human health |
| Kenya Tourist Development Act( Cap 382) | Ministry of East African Affairs, Commerce and Tourism | Tourism development in an area |

# 5

# Stakeholder Analysis and Involvement

**Stakeholders Analysis**

In the Lake Naivasha Basin five categories of stakeholders have been identified in this plan; Government institutions, National and International NGOs/Organizations, Local Civil Society Organizations, Private Sector Organizations and Research Organizations. Government institutions include Ministries, Departments and Parastatals that have legal mandate and responsibility to manage various components of environment including natural resources. National and International NGOs/Organizations provide capacity support to local institutions and communities in the management of the natural resources.

Local Civil Society Organizations (CSOs) are groups which are registered as Self Help Groups (SHGs), Community Based Organizations (CBOs) and local Non Governmental Organizations (NGOs). There are close to eighty (80) CSOs operating within the Lake Naivasha basin. Their areas of concern include natural resources management, development of alternative community livelihood, capacity building, governance and democracy, advocacy, water and sanitation etc. Key CSOs are shown in the table 3.0.

Majority of Private Sector Organizations are using natural resources or products for processing into goods and services which are used for commercial and business purposes. The natural resources range from aesthetic landscape, water, wildlife, bees, butterflies, forests, timber, medicinal herbs, pasture, energy, fisheries and genetic resources. Table 3.0 below depict the five categorizes of stakeholders operating within the lake Naivasha Basin.

**Table 3.0**
Categories of Stakeholders operating within the Lake Naivasha Basin

| Government Institutions |
|---|
| • County Administration<br>• Ministry of Lands, Housing and Urban Development<br>• Ministry of Environment, Water and Natural Resources - together with NEMA, WRMA, KFS, KWS, KMFRI and Imarisha Naivasha Board<br>• Ministry of Agriculture, Livestock and Fisheries-together with KARI, KEPHI<br>• Ministry of East African Affairs, Commerce and Tourism - together with the Kenya Tourism Development Corporation and Kenya Tourism Board<br>• Ministry of Energy and Petroleum- together with KenGen and GDC<br>• Ministry of Health<br>• Ministry of Sports Culture and the Arts - National Museums of Kenya<br>• Ministry of Industrialization and Entreprise Development |
| **National and International NGOs / Organizations** |
| • Green Belt Movement<br>• World Wide Fund for Nature (WWF)<br>• Wetlands International<br>• SNV<br>• World Vision |

- Nature Kenya
- Care Kenya
- International Union for Conservation of Nature (IUCN)
- GiZ
- Alliance for Water Stewardship
- RECONCILE
- Elsamere Conservation Trust
- SELF-HELP Africa
- Water and Sanitation for the Urban Poor (WSUP)
- Earth Watch
- UNEP
- African Network of Animal Welfare (ANAW)

## Local Civil Society Organizations (CSOs)

- Naivasha Civil Society Organizations Forum (CSOs Forum)
- Lake Naivasha Riparian Association (LNRA)
- Naivasha Watershed Conservation and Management Programme (NAWACOMP)
- Lake Naivasha Conservation and Development Forum (LNCDF)
- Kinangop Birds Conservation Center
- Lake Naivasha Friends of Environment
- Indigenous Biodiversity Environmental Conservation Association (IBECA)
- Nature and People Network (NAPNET)
- Water Resource Users Associations (WRUAs)
- Community Forest Associations (CFAs)
- Beach Management Unit (BMU)
- Lake Naivasha Tourism Group (LNTG)
- Centre for Pastoralist Development (CEPAD)
- Environmental Clubs/Groups-in local schools and colleges
- Wildlife Clubs of Kenya Groups-in local schools and colleges
- Environmental Training/Educational Organizations - e.g. Elsamere Education Centre
- Small scale farmers

## Private Sector Organizations

- Lake Naivasha Growers Group (LNGG) and Individual Commercial Flower Growers/Horticultural who are not members of LNGG
- International Horticulture and Flower Markets (standards and demands) -Holland, Great Britain, Germany, Italy, USA etc
- Nakuru Wildlife Conservancy (NWC)
- Commercial Livestock Ranchers-Beef and Dairy farmers
- Tour Transport Operators
- Tourist Hotel operators
- Naivasha Water and Sanitation Company (NAIVAWASS)
- KenGen and Independent Geothermal Power Producers (IPPs)
- Industrialists e,g. Keroche and the units in Naivasha town
- Kenya Chamber of Commerce
- Kenya Creameries Cooperative (KCC)

- Kenya Flower Council
- Kenya Horticultural Council

**Research Organizations**

- ITC and University of Twente (Netherlands)
- Leicester University
- Earth Watch
- University of West Ontario (Canada)
- Egerton University
- University of Nairobi
- Kenyatta University
- Moi University
- Kenya Forestry Research Institute (KEFRI)
- Kenya Agricultural Research Institute (KARI)
- Kenya Marine Fisheries Research Institute (KMFRI)
- Kenya Dairy Research Institute (KEDRI)
- Geothermal Development Company (GDC)
- Kenya Plant Health Inspectorate Service (KEPHIS)
- International Development for Research Cooperation - (IDRC- Canada)

## ROLES AND RESPONSIBILITIES OF THE STAKEHOLDERS IN THE IMPLEMENTATION OF THIS INTEGRATED MANAGEMENT PLAN

**Ministry of Environment, Water and Natural Resources**

The role of this ministry generally includes:

- Environmental and Natural Resources Policy Management
- Conservation and Protection of National Wildlife
- Meteorological Management
- Water Catchment Area Conservation, Control Protection, and Restoration
- Development of Forests, Reforestation and Agro-Forestry
- Sanitation Management
- Water infrastructure Management and Flood Control
- Coordination of Climate Change programmes,
- Management of Public Water Schemes and Community Water Project

The five departments listed below namely NEMA, KWS, KFS, Imarisha and WRMA are within this Ministry and each will play a role in the implementation of this plan.

1. ***National Environmental Management Authority (NEMA)***

   NEMA is the overall institution mandated by EMCA 1999 to coordinate, supervise and regulate the management of environment and natural resources. The NEMA will;

   - Ensure and support the IMP implementation
   - Ensure gazettement of the plan and provide its link to government
   - Act as an executive organ to ensure all development projects are environmental friendly
   - Ensure compliance to all plan regulations and prescriptions

2. ***Kenya Wildlife Service (KWS)***

   KWS will provide technical advice in accordance with the Wildlife Act and Ramsar Convention. KWS will be response for;

   - Promotion of wildlife conservation, education and research in the basin
   - Enforcement of the law and regulations related to wildlife management

# Who Wants What in the Lake Naivasha Basin?


Otiang'a-Owiti et al. 2011.

- Promotion and supporting initiatives that would increase wildlife diversity and density in the region
- Promotion of community wildlife incentive programmes
- Ensuring that the water catchment areas are adequately protected

***3. Kenya Forest Service (KFS)***

The KFS is responsible for conservation and development of forest resources as stipulated in the Forest Act. KFS will be responsible for:

- Rehabilitation and conservation of forested areas within the basin
- Controlling forest excision, fires and encroachment
- Supporting the implementation of forest management plans
- Undertaking forest related education, awareness and extension services
- Providing a lead in forest research, monitoring and conservation
- Promoting development of carbon projects (REDD & REDD+)

***4. Imarisha Naivasha Board***

This Board is an initiative of the Government of Kenya established through gazette notice no. 5368.of 20th May 2011. It is mandated to oversee all basin restoration and research activities.

The role of Imarisha Naivasha Board;

- Resources mobilization for the implementation of this management plan
- Coordination of the implementation of this management plan
- Coordination of the monitoring and Evaluation of the plan implementation
- Enhancement of the capacity of the participating institutions
- Participatory development and implementation of Action plans

***5. Water Resource Management Authority***

The WRMA will;

- Ensure protection of water catchment areas
- Develop capacity building initiatives on water conservation.
- Monitor and enforce water quality standards.
- Apportion water resources through permits and licenses.
- Ensure gazettement of water catchment areas within the basin.
- Maintain hydrological data and act as custodians of information and database related to water conservation.

**County Governments**

The County Governments have the mandate to manage the resources within their jurisdiction. The roles of the Governments will be to:

- Ensure ecological health of urban areas through proper planning and management
- Establish network and collaborative linkages with other stakeholders and government departments for the successful implementation of this IMP
- Develop and put in place disaster response mechanisms
- Enforce security and environmental regulations within the basin
- Provide an enabling environment for IMP implementation
- Crisis management

**County Development Committees (CDC)**

The CDC is responsible for coordinating all development and projects within the District

The role of the CDC:

- Address poverty reduction issues
- Ensure environmental standards are adhered to in development projects.
- Coordinate development programmes in the region.
- Promote peace and create conducive environment for investment
- Promote the agenda for infrastructure development in Lake Naivasha basin
- Coordinate and focus the initiatives of CBOs and NGOs towards the goals of this plan

**National Museums of Kenya (NMK)**

The Role of NMK;

- Identify and secure cultural heritage and monuments within the basin

- Coordinate research and monitoring of flora and fauna
- Support stakeholders in the development of natural resources database

**Ministry of Agriculture, Livestock and Fisheries**
The role of Ministry of Agriculture, Livestock and Fisheries will include;
- Policy Guidance on Fisheries, Livestock and Agriculture
- Extension service provision
- Research and Inventory of Resources
- Permitting and resources management
- Quality Assurance and Value Chain development
- Capacity Building
- Food Security
- Bio-Safety Management

**Ministry of Lands, Housing and Urban Development (MoLH&UD)**
Role of the MoLH&UD will include;
- Policy Development and management
- Physical Planning
- Land Transactions
- Survey and Mapping and land Tenure
- National Spatial data Infrastructure
- Administration of Public land as designated by the constitution
- Land Information System

**Ministry of Health**
The role of this ministry will include;
- Health Policy and Standards Management
- Public Health and Sanitation Management
- Health Education
- Co-ordination of Campaign Against HIV/AIDS

**Ministry of East African Affairs, Commerce and Tourism**
The role of this Ministry will include;
- Promotion of Retail and Wholesale Markets
- Policy Development and Management
- Development and Promotion of Tourism

**Ministry of Energy and Petroleum**
The role of this ministry will include;
- Energy Policy and Development
- Geothermal Exploration and Development
- Thermal Power Development
- Rural Electrification Programme
- Renewable Energy Promotion and Development
- Energy Regulation, Security and Conservation

The two main companies involved in the basin are Kenya Electricity Generating Company(KenGen) and Geothermal Development Company(GDC). Role of KenGen and GDC;
- Manage electrical energy production in the area
- Manage impacts associated with power production
- Explore alternative source of renewable energy e.g. wind and solar

**Institutions of Higher Learning**
The Institutions of Higher Learning will;
- Collaborate with other stakeholders to develop proposals for funding
- Undertake research activities in collaboration with stakeholders.
- Assist in monitoring of trends in the basin.
- Provide technical support to the stakeholders
- Enhance capacity building for stakeholders.

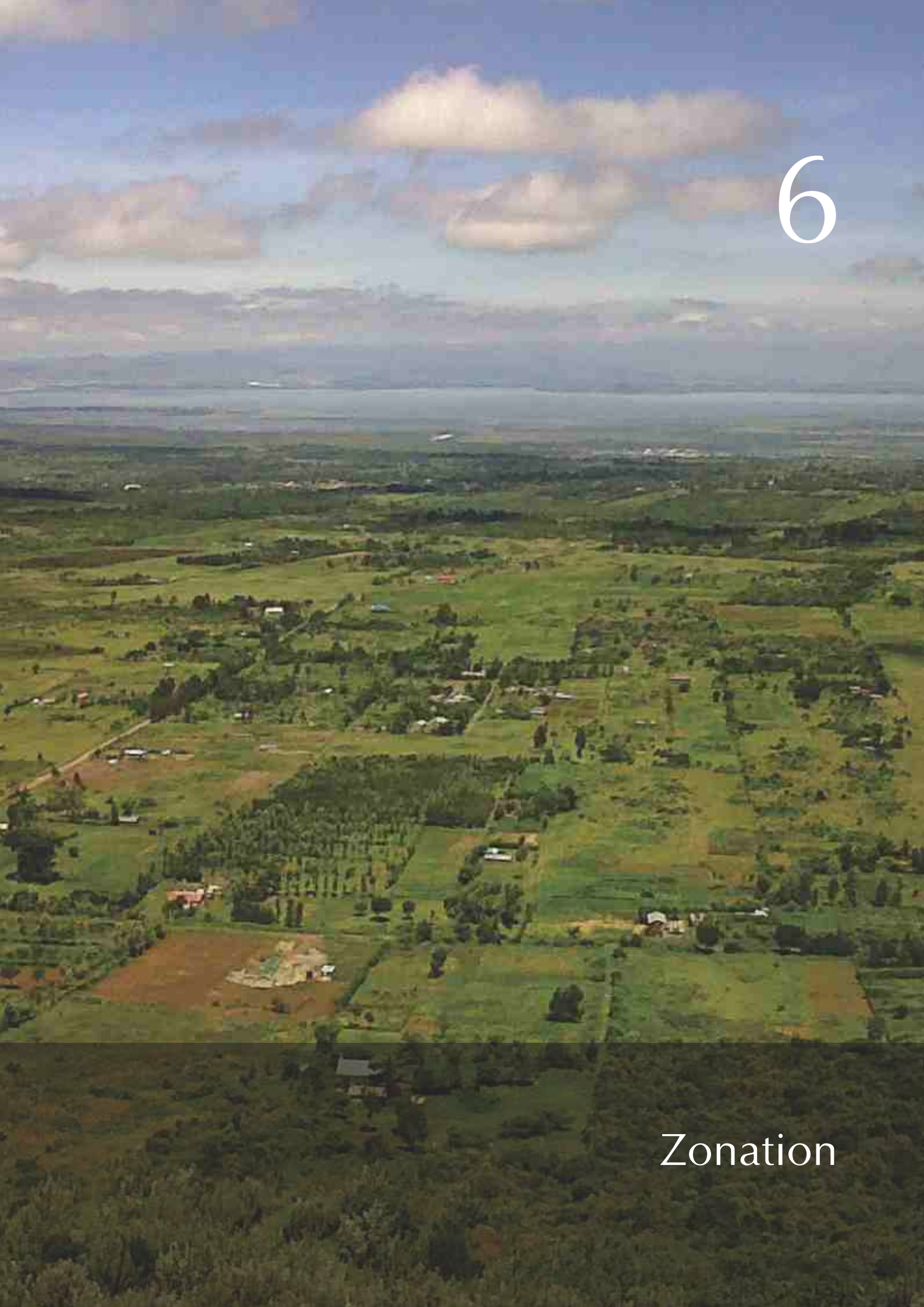
**Civil Societies Organizations (CSOs) - Non-Governmental Organizations (NGOs) and Community Based Organization (CBOs)**
The CSOs and CBOs will;
- Support in the implementation of conservation and development initiatives
- Collaborate with the stakeholders in operationalizing the plan
- Mobilize resources to support implementation of the plan
- Provide networks and linkages
- Mobilize community support and participation
- Participatory development and implementation of Action plans

**Water Resources Users Associations (WRUAs)**
The WRUAs will;
- Provide networks and linkages between the lead agencies and the community
- Mobilize community support and participation

- Mobilize resources and undertake education and awareness
- Participatory development and implementation of Action plans

**Community Forest Associations (CFAs)**
The CFAs will;
- Provide networks and linkages between the lead agencies and the forest adjacent communities
- Mobilize community support and participation
- Mobilize resources and undertake education and awareness
- Participatory development and implementation of Action plans

**Beach Management Unit (BMUs)**
The BMUs will;
- Provide networks and linkages between the lead agencies and communities around the lake
- Mobilize community support and participation in beach clean-ups
- Mobilize resources to undertake capacity building (Institutional, education and awareness)
- Participatory development and implementation of Action plans



# 6

# Zonation

## MANAGEMENT ZONES

**Rationale for Selection of Management Zones**

The Management plan proposes to use the existing local institutional frameworks in its implementation. The delineation of the management zones have been guided by:

(i) The environmental characteristics
(ii) Land use practices
(iii) The need for protection, conservation and integrity of habitats
(iv) Stakeholders' interests

Seven Management Zones were identified using the above criteria. These are;

i. Open waters (lake, dams and rivers)
ii. Riparian buffers (along rivers and around lakes)
iii. Wetlands areas (marshes/swamps)
iv. Protected Areas
v. Sustainable utilization areas
vi. Intensive agricultural area
vii. Urban and settlement areas

### *Management Zone I: Open Waters (Lake, Dams and Rivers)*

This zone includes all lakes, rivers and reservoirs with an open water surface.

***i). Purpose***

This area should be strictly protected and preserved in near pristine state and should only be used for domestic use, water conservation, wildlife conservation, fishing, tourism (sports and site seeing), research and any other environmentally sustainable activities.

***ii). Extent/Boundaries***

This zone includes among others the following; lakes, rivers, dams and other reservoirs distributed across the basin. In this zone strict adherence to the provisions of EMCA (1999), on boundaries and extent will apply. All public access routes and buffer strips to all areas under this zone are to remain clear and open in accordance with the Physical Planning Act, EMCA and Survey Act.

***iii). Resource Values***

The natural resources in this zone include the large volumes of water mass, very diverse assemblage of waterfowl, high potential for recreational sports, untapped tourism potential and fisheries. This zone has high potential for revenue generation through water use levies, environmental friendly-agriculture, tourism and fishery.

***iv). Permitted Activities***

In this zone, permitted activities include; fishery, tourism and sport activities, controlled water abstraction, nature trails and other ecologically sustainable revenue generating activities should be encouraged. However, any forms of settlements and infrastructural development should not be allowed and land use around this zone will be vetted.

### *Management Zone II: Riparian Buffer Zones of Rivers, Lakes and Dams*

***i). Purpose***

This area should be strictly protected and conserved so that it can act as a buffer zone to shield water from pollution and other threats arising from unsustainable land use practices. The integrity of this zone should be protected so that the zone will maintain stability to enhance river flow, water quality and quantity and to reduce erosion and sediment load. These sites may be used for research and education.

***ii). Extent/Boundaries***

Riparian strips and buffers including all areas on either side of a river, stream, and water reservoir as described in the EMCA (1999), Water Act 2002 and Agriculture Act (Cap 318). It includes all the riparian zones of all lakes, rivers and their tributaries, dams and reservoirs within the basin.

***iii). Resource Values***

Natural riparian habitat provides important ecosystem services and is rich in biodiversity. It acts as filter of nutrient loads, reduces river bank erosion, controls siltation, acts as habitat and corridors for wildlife, and habitat for aquatic species.

***iv). Permitted Activities***

The riparian zone should be left in its natural state. No infrastructural developments, agriculture, mining, livestock grazing or prospecting should be allowed. Any illegal activities should be punishable according to the relevant laws. Degraded riparian areas should be rehabilitated. Permitted activities include; recreation, wildlife conservation, research and education.

### *Management Zone III: Wetland Areas (Marshes and Swamps)*

***i). Purpose***

This area should be strictly protected and preserved in near pristine state and should only be used for water conservation, wildlife conservation, research/education, tourism, sporting and any other environmentally sustainable activities.

***ii). Extent/Boundaries***

This zone includes among others, all swamps, marshes and all other areas containing water and not included in zone I or II. All relevant laws and regulations that govern sustainable utilization of such habitats will be applicable. Strict adherence to the provisions of EMCA (1999) on boundaries and extent will apply. All public access routes and buffer strips to all areas under this zone are to remain clear and open in accordance with the Physical Planning Act, EMCA and Survey Act.

***iii). Resource Values***

Wetlands act as reservoirs for water and as sponges against pollutants and flooding. The natural resources in this zone include the large volumes of water in reservoir state, very diverse assemblage of wildlife including waterfowl, with high potential for recreational tourism. The zone also acts as migratory corridors for waterfowl.

***iv). Permitted Activities***

No infrastructural developments, reclamation or irrigation should be allowed here. Recreation, research and education and other ecologically sustainable revenue generating activities should be encouraged. However, any form of settlements should not be allowed in this zone.

### *Management Zone IV: Protected Area Zone*

***I). Purpose***

This zone should be strictly protected and preserved in near pristine state and should only be used for water conservation, wildlife conservation, research, tourism, legal and regulated cultural activities and any other environmentally sustainable activities within the Laws of Kenya.

***ii). Extent/Boundaries***

This zone includes all government gazetted areas targeting natural resource conservation such as Forest Reserves, Forest conservancies and National Parks. The zone includes most land upwards from the slopes of the Aberdare above the current electric fence line and all such land that fall under similar categories. The zone also includes Eburru Forest, Hell's Gate and Longonot National Parks, Kenya Wildlife Service Training Institute Sanctuaries and Kinangop Plateau Nature Reserve.

***iii). Resource Values***

Gazetted Conservation areas are nationally recognized as refuge for biodiversity, and they also act as important water catchments areas in the Lake Naivasha basin. The natural resources in this zone include large diversity of flora and fauna, large volumes of water in reservoir state with high potential for recreation and tourism.

***iv). Permitted Activities***

No developments should be allowed within this zone. All activities carried out here are governed by the Wildlife Conservation and Management Act (CAP 376 of 1976), the Forestry Act (2005), EMCA (1999), and Water Act 2002. Tourism, research and education are permitted in these areas as governed by the above legislations.

### *Management Zone V: Sustainable Utilization Zone*

***i). Purpose***

To ensure land use in this zone is compatible

with environmental conservation because they (i) are large enough to practice extensive agriculture leaving natural patches (ii) have potential to accommodate diversity of natural fauna and flora (iii) practice mixed agriculture and conservation and (iv) practice conservation. These establishments should be supported to maintain the environmental friendly production practices.

***ii). Extent/Boundaries***

This zone includes all privately owned land in the basin with a holding of greater than 10 acres. This land may be practicing large scale non-irrigated agribusiness, ranching, pastoralism or any other form of land use that is deemed friendly to conservation. Land under such zones would have natural habitat patches or remnant indigenous vegetation; act as dispersal areas and/or corridors for wildlife.

***iii). Resource Values***

These forms of land use create refuges for biodiversity. Sites that contain stone and sand mines also create a resource base and employment for a significant section of local community. Geothermal power is an important natural resource in this zone.

***iv). Permitted Activities***

All development must be vetted by the relevant Government Authorities

### *Management Zone VI: Intensive Agricultural Zone*

***i). Purpose***

This is the zone that is currently occupied by both small scale and large scale farmers and is important for the provision of food production, employment and foreign exchange promotion through agricultural product exports.

***ii). Extent/Boundary***

This zone is characterized by intensive subsistence agricultural practices and large scale irrigated agriculture. This zone also includes all the area covered by the large scale holdings (>5ha) around Lake Naivasha and small scale holdings (< 5ha) in the middle and upper catchment that practice intensive irrigated or rain-fed horticulture. The zone is in rapid expansion at present due to high population growth rate and need to provide financial support for the population within the basin.

***iii). Resource Values***

This zone is important as a source of food, employment, and generation of export products. The zone is also important for research and education.

***iv). Permitted Activities***

Sustainable development land use practices are permitted here. Developers are required to abide by all legislation requiring duty of care to the environment and sustainable production.

### *Management Zone VII: Urban and Settlement Zone*

***i). Purpose***

This zone is important for human settlement, to facilitate trade, communication and development. This zone is characterized by high density of housing and human population.

***ii). Extent/Boundary***

All commercial centres, industrial and settlement areas including towns, workers settlements, schools, market centres and all areas of high concentrations and occupation of human population.

***iii). Resource Values***

This zone is important for housing, communication, trade and development.

***iv). Permitted Development***

Sustainable development land use practices are permitted here. Developers are however required by law to abide by all legislation requiring duty of care to the environment.


7

# Management Options and Implementation Strategies

**Previous Conservation Initiatives and Planning Considerations**

In 1993, the Lake Naivasha Riparian Association (LNRA), an association of land owners around Lake Naivasha, started the process of drawing up a management plan for the lake which was finalized and adopted in 1995. The plan was subsequently gazetted under EMCA (1999) in 2004 through legal Notice No.108 and legal supplement No.39. However, the plan implementation was not effected due to concerns raised.

The prime objective of that plan was to manage human activities around the lake in a sustainable way and ensure the conservation of the lake ecosystem and associated biodiversity.

The main weaknesses in the 2004 Lake Naivasha Management Plan were;

a) The plan was prepared with the intention to manage the water resources of the lake with marginal consideration for the other parts of the basin.
b) The plan did not clearly define sustainable levels for water abstractions in the lake.
c) The Lake Naivasha Management Implementation Committee (LNMIC) lacked sufficient legitimacy and plan implementation capacity.
d) The LNMIC lacked support of all the stakeholders within the basin.

A number of sub-catchment management initiatives have emerged in the basin in the recent past as highlighted below;

i. Naivasha Basin Water Resource Users Associations Sub-Catchment Management Plans (SCMP), 2011
ii. Lake Naivasha Basin Water Allocation Plan 2011 - 2014
iii. North Kinangop (Mutarakwa) participatory Forest management plan (2009-2014)
iv. Geta Participatory Forest Management Plan (2009-2014)
v. Aberdare Kiburu (South Kinangop) Participatory Forest Management Plan (2010-2015)
vi. Eburru Forest Participatory Management Plan (2008 -2012)

The Geta, North and South (Aberdare Kiburu) Kinangop, Eburru Community Forest Associations (CFAs) have signed management agreements with the Kenya Forest Service (KFS) that guides the communities in the co-management of the forests.

**Management Options**

Land within the Lake Naivasha basin is legally owned by Government, local authorities and individuals and this in some instances limits the scope of conservation regimes that can be applied to the whole basin. There are a number of legal options that can be proposed. However with regard to the lake (a Ramsar site) and its riparian areas, the legal option that could be used to manage it would be make it a Protected Natural Environment that promotes the preservation of ecosystems processes and biodiversity. If it could be managed as a National Reserve, the lakes and the riparian areas would exclude human settlement and allow controlled exploitation of natural resources including water accessibility.

The net consequence of this arrangement would entail the eviction of illegal settlements, developments and limit access to resources. Furthermore, the land tenure system favouring this designation, would be under a regulatory authority.

However, since this is not the current scenario, the management program here has been grouped into nine management sectors as follows:

1. Water resources
2. Agriculture and Irrigation
3. Forestry
4. Livestock development
5. Fisheries development
6. Wildlife management
7. Tourism development
8. Energy production
9. Urban development

In the development of the management programmes, care has been taken to ensure that there are explicit and logical links between the vision statement (which sets out the overall goal of the programme), management objectives, and the

management strategies to achieve the objectives. Each management programme is discussed in further detail in the following sections.

## MANAGEMENT PROGRAMMES AND IMPLEMENTATION STRATEGY

### 1) Water Resources Management

***Issues***

The key issues associated with water resources management include;

- Excess water abstraction
- Siltation of water bodies
- Eutrophication
- Pollution
- Changes in surface and ground water hydrology
- Loss of biodiversity and vegetation cover
- Alteration of drainage patterns
- Desiccation of soils and vegetation

***Goals***

The overall goals of the management are to:

a) Ensure sustainable management and use of water resources within the basin while promoting equitable sharing of water resources
b) Ensure the conservation of the catchment areas to improve on the water quantity and quality

***Objectives***

i) To enhance implementation of existing regulations to protect the rights of all users,
ii) To promote water use efficiency that is hydrologically and economically beneficial to domestic, agricultural, and industrial water users and the environment.
iii) To identify funding sources to implement water conservation programmes that help to enhance water resources
iv) To mitigate and adapt to effects of climate change on water resources

**Implementation Strategy: Water Resource Management**

| Management Action and Activities | | Persons / Institutions Responsible | Time Frame | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | YEAR 1 (2012/4) | | | | YEAR 2 (2014/8) | | | | YEAR 3 (2018/22) | | | |
| ***1.1 Adopt and implement management strategies for surface water resources*** | | | | | | | | | | | | | | |
| 1.1.1 | Regulate water use to improve efficiency | • WRMA & WRUAs, NAIVAWASS | X | X | X | X | X | X | X | X | X | X | X | |
| 1.1.2 | Implement the Lake Naivasha Basin water allocation plan | • WRMA & WRUAs, WATER CO. | X | X | X | X | X | X | X | X | X | X | X | X |
| 1.1.3 | Regulate water abstraction | • WRMA, WRUAs, CAAC, CSOs | X | X | X | X | X | X | X | X | X | X | X | X |
| 1.1.4 | Develop codes of conduct for water users | • WRUAs & WRMA, WSB, WRB, CSOs | X | X | X | X | | | | | | | | |
| 1.1.5 | Construction of dams/dykes/weirs | • Community, Relevant Govt. Ministries, NGOs, Dev. Partners, NEMA, WRMA, WRUA | | | | | | | | | X | X | X | X |
| ***1.2 Adopt and implement management strategies for ground water resources*** | | | | | | | | | | | | | | |
| 1.2.1 | Regulate drilling of boreholes and borehole water use | • NEMA, MoEW&NR, WRMA & WRUAs, CAAC | X | X | X | X | X | X | X | X | X | X | X | X |

| | | | YEAR 1 (2012/4) | | | | YEAR 2 (2014/8) | | | | YEAR 3 (2018/22) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.2.2 | Promote ground water recharge through afforestation | • KENGEN, WRUA, WRMA, NEMA, MoEW&NR , KFS, CFAs MoAL&F | X | X | X | X | X | X | X | X | X | X | X | X |
| 1.2.3 | Map out ground water conservation areas | • WMRA, WRUAs & Relevant research inst., NEMA | X | X | X | X | | | | | | | | |
| 1.2.4 | Undertake a basin hydrological survey to determine quantity and quality of ground water resources | • WRMA, Relevant research Inst. | X | X | X | X | | | | | | | | |
| 1.2.5 | Promote Protection of gazetted Lake Naivasha basin ground water conservation areas | • MoEW&NR WRMA, NEMA, WRUAs, MoLH&UD, KWS, Land Owners | | | | | X | X | X | X | | | | |
| ***1.3 Implement and enforce regulations for protecting water resources and their catchments*** | | | | | | | | | | | | | | |
| 1.3.1 | Enforce protection of headwaters and other water resources | • KFS, CFAs, WRMA, WRUAs, KWS, CA, NEMA, CAAC | X | X | X | X | X | X | X | X | X | X | X | X |
| 1.3.2 | Enforce regulations on new and existing water abstractions points (surface and ground water) | • WRMA, WRUAs, CAAC, CA | X | X | X | X | X | X | X | X | X | X | X | X |
| ***1.4 Monitor water abstraction and use*** | | | | | | | | | | | | | | |
| 1.4.1 | Enhance water abstraction monitoring system | • WRMA, WRUAs, Research institutions | X | X | X | X | | | | | | | | |
| 1.4.2 | Support the development of an abstraction and water socio-economic survey to determine abstraction levels and demand | • WRUAs, NGOs, WRMA. Research Institutions, KWS, CA | | | | | X | X | X | X | | | | |
| 1.4.3 | Standardize water monitoring | • WRMA,WRUAs, NGOs | X | X | X | X | X | X | X | X | X | X | X | X |
| 1.4.4 | Water budget estimation | • MOEW&NR, WRMA, WRUAs, Research Inst. | | | | | X | X | X | X | | | | |
| 1.4.5 | Promote water harvesting | • Community, NGOs, WRUAs, WRMA | X | X | X | X | X | X | X | X | X | X | X | X |
| 1.4.6 | Awareness creation on wise use of water, monitoring and compliance | • WRUAs, CBOs/NGOs, WRMA, CFAs, KFS | X | X | X | X | X | X | X | X | X | X | X | X |

| | | | YEAR 1 (2012/4) | YEAR 2 (2014/8) | YEAR 3 (2018/22) |
|---|---|---|---|---|---|
| ***1.5 Monitor water quantity and quality in lake, rivers and reservoirs*** | | | | | |
| 1.5.1 | Harmonize and standardize water levels, flows monitoring & data management program | • WRMA, KMFRI, FD, LNRA, WRUAs, research Institutions, KENGEN, LNGG, NARWACSO, IMARISHA | X X X X | | |
| 1.5.2 | Standardize water quality monitoring protocols & parameters | • M.C.N, WRMA, KMFRI, FD, NEMA , MoH, WSPs, KWS, WRUAs, Research Inst., IMARISHA | X X X X | | |
| 1.5.3 | Installation of monitoring gauges and management of the gauges | • WRMA, NGOs, WRUAs | X X X X X X X X | | |
| 1.5.4 | Training of monitors/data collectors/inspectors | • WRMA, KMFRI, WRUAs, NGOs | X X X X X X X X X X X X | | |
| 1.5.5 | Promote proper treatment of effluents to meet set standards | • WRMA, NEMA, MoH, Private sector, WRUA. Other County Govt, KMFRI, Research Inst., | X X X X X X X X X X X X | | |
| | | Water Companies, NGOs/CBOs | X X X X X X X X X X X X | | |
| 1.5.6 | Monitor water quality indicators (biological and physical-chemical indicators) | • KMFRI, FD, KWS, WRMA, WRUAs, Research Inst. | X X X X X X X X X X X X | | |
| ***1.6 Protect, regulate and monitor surface and ground water pollution*** | | | | | |
| 1.6.1<br>1.6.2. | Data collection (monthly/quarterly)<br>Map out potential hot spots | • WRUA,WRMA KMFRI, Universities, County Govt.<br>• County Govt,WRMA, WRUA | X X X X X X X X X X X X | | |
| 1.6.3 | Control waste water discharge/ solid waste disposal | • County Govt, NEMA, Private sector, MoH | X X X X | | |
| 1.6.4 | Wastewater treatment | • WRMA, CG, WRUA, Water Service Providers, Fish Farmers, BMU | X X X X X X X X X X | | |
| 1.6.5 | Control pesticides and fertilizers use | • MoAL&F, PCPB, KEPHIS | X X X X X X X X X X X X | | |
| 1.6.6 | Afforestation to reduce erosion and storm flow | • KFS, WRUAS, Community, NGOs, KENGEN, IMARISHA, KWS, MoE | X X X X X X X X X X X X | | |
| 1.6.7 | Promote best farming practices | • MoAL&F, Farmers, WRUA, Sectoral Associations | X X X X X X X X X X X X | | |
| 1.6.8 | Conserve and protect the riparian land vegetation/buffer zones along lake shores and rivers | • MoLH&UD, CBOs,NGOs, LNRA, WRUAS, MoAL&F , NEMA, KWS, Local Authorities, WRMA, IMARISHA, LNGG | X X X X X X X X X X X X | | |

| | | | YEAR 1 (2012/4) | | | | YEAR 2 (2014/8) | | | | YEAR 3 (2018/22) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.6.9 | Promote best land use practices | • MoAL&F, NEMA, WRUAs, IMARISHA, MoLH&UD, WRMA, County Govt, CBOs/NGOs/CSOs | X | X | X | X | X | X | X | X | X | X | X | X |
| 1.6.10 | Rehabilitation of catchments areas | • Community, WRUAs, CBOs/CSOs/ NGOs, CFAs, KFS, WRMA, WSB, KWS. MoWE&NR | X | X | X | X | X | X | X | X | X | X | X | X |
| ***1.7 Rehabilitate degraded riparian areas to enhance buffering capacity*** | | | | | | | | | | | | | | |
| 1.7.1 | Restoration of degraded riparian areas | • CA, MoAL&F., WRMA KWS, KFS, LNGG, LNRA | X | X | X | X | X | X | X | X | X | X | X | X |
| 1.7.2 | Demarcation of riparian areas | • NEMA, WRMA, CA, MoAL&F, LNRA, WRUAs, KWS, LNGG | X | X | X | X | | | | | | | | |
| 1.7.3 | Gazettement of riparian land as conservation area | • MoEW&NR MoAL&F, WRMA, Local Authorities | | | | | X | X | X | X | | | | |
| 1.7.3 | Enforcement of Laws relevant to riparian lands | • MOEW&NR, WRMA, NEMA, KWS, MoAL&F | X | X | X | X | X | X | X | X | X | X | X | X |
| 1.7.4 | Advocacy for the conservation of riparian areas | • MoAL&F, CSOs, NGOs | X | X | X | X | X | X | X | X | X | X | X | X |
| 1.7.6 | Repossess grabbed or encroached riparian areas | • CA, Judiciary, NEMA, WRUA, KAC&EC, MoAL&F, KWS | | | | | | | | | X | X | X | X |
| ***1.8 Promote and support incentives to conserve riparian vegetation*** | | | | | | | | | | | | | | |
| 1.8.1 | Sensitization and Awareness programs | • WRUAs, KWS, LNGG, WRUA, MoAL&F, WRMA, NWC, NMC, LNRA, IMARISHA , County Govt | X | X | X | X | X | X | X | X | X | X | X | X |
| 1.8.2 | Promote sustainable use of riparian products | • Dev. Partners, IMARISHA, KWS, LNGG, WRUA, MoAL&F, WRMA, NWC, NMC, LNRA | X | X | X | X | | | | | | | | |
| 1.8.3 | Promote IGAs to reduce pressure on riparian areas | • MoEW&NR, KWS, LNGG, WRUA, MoAL&F, WRMA, NWC, NMC, LNRA, IMARISHA | X | X | X | X | X | X | X | X | X | X | X | X |
| 1.8.4 | Provide incentives such as PES for farmers who set aside riparian land for conservation | • MoEW&NRKWS, LNGG, WRUA, MoAL&F, WRMA, NWC, NMC, LNRA, IMARISHA | | | | X | X | X | X | | | | | |
| 1.8.5 | Encourage community participation in the management of riparian areas | • MoEW&NR., KWS, LNGG, WRUA, MoAL&F, WRMA, NWC, NMC, LNRA, IMARISHA | | | | X | X | X | X | X | X | X | X | X |

| | | | YEAR 1 (2012/4) | YEAR 2 (2014/8) | YEAR 3 (2018/22) |
|---|---|---|---|---|---|
| ***1.9 Upscale riparian zone rehabilitation programmes in the LNB*** | | | | | |
| 1.9.1 | Replace exotic riparian vegetation with native vegetation | • WRUAs, Land Owners, IMARISHA, WRMA | | X X X X X X X X | |
| 1.9.2 | Demarcate riparian boundaries | • GoK, Land Owners, WRUAs, WRMA | X X X X | | |
| 1.9.3 | Promote soil and water conservation measures | • WRUAs, MoAL&F, MoEW&NR | X X X X X X X X X X X X | | |

**2) Agriculture and Irrigation**

***Issues***

The key issues associated with agriculture and irrigation include:

- Soil erosion
- Deforestation
- Pollution of soils and water
- Changes in hydrology
- Loss of vegetation cover and biodiversity
- Destruction of wildlife habitats
- Eutrophication
- Water use conflicts
- Increased run-off, siltation of water courses and water bodies

***Goal***

To develop strategies and management guidelines that promote sustainable agriculture while safeguarding environmental goods and services.

***Objectives***

i). Develop an Irrigation Master Plan for the basin
ii). Enhance sustainable agricultural practices that promote environmental conservation and food security
iii). Enhance water availability for small and large scale irrigation by adopting water harvesting and storage technologies
iv). Promote crop diversification and appropriate technologies to increase resilience to climate variation
v). To mitigate and adopt climate change effects on agriculture and vice versa

**Implementation Strategy: Irrigation and Agriculture Management**

| Management Action and Activities | | Persons / Institutions Responsible | Time Frame | | |
|---|---|---|---|---|---|
| | | | YEAR 1 (2012/4) | YEAR 2 (2014/8) | YEAR 3 (2018/22) |
| ***2.1 Ensure adequate supplies of irrigation water for agricultural production*** | | | | | |
| 2.1.1 | Maintain and improve water quality & quantity for use in irrigation | • WRMA, WRUAs, Farmers, National water Cooperation & Pipeline, MOEW&NR, MoAL&F, WWF, RECONCILE, County Govt , NEMA | X X X X X X X X X X X X | | |
| 2.1.2 | Protection and Improvement of catchment areas to ensure water supply | • WRMA, WRUAs , MoAL&F, WWF, KFS, CFAs, NEMA | X X X X X X X X X X X X | | |

| | | | YEAR 1 (2012/4) | | | | YEAR 2 (2014/8) | | | | YEAR 3 (2018/22) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.1.3 | Training communities in agricultural production | • MoAL&F, , MoAL&F, MoEW&NR, KARI, WWF, WORLD VISION, CDN, SHDI, NAWACOMP | X | X | X | X | X | X | X | X | X | X | X | X |
| 2.1.4 | Construction of water reservoirs, dams, pans, boreholes, de-silting of dams | • National Water Co. & Pipeline, World Vision, MoAL&F, MOEW&NR, Farmers, Davis & Shirtliff, CDN, WWF | X | X | X | X | X | X | X | X | | | | |
| 2.1.5 | Promote efficient irrigation technologies | • MoAL&F, MOEW&NR, KARI, HORT IPRO, AMIRAN, | X | X | X | X | | | | | | | | |
| 2.1.6 | Undertake baseline water quality and quantity assessments | • WRMA, MOEW&NR, WRUA, WWF, MoAL&F, LNGG, LNRA, NEMA | X | X | X | X | | | | | | | | |
| 2.1.7 | Install water meters at all abstraction points throughout the catchment | • WRMA, WRUAs, NGO | X | X | X | X | | | | | | | | |
| 2.1.8 | Develop a code of conduct for water users | • WRMA, WRUAs, NGO | X | X | X | X | X | X | | | | | | |
| 2.1.9 | Monitoring and evaluation of water abstraction | • WRMA, WRUAS, MOEW&NR | X | X | X | X | X | X | X | X | X | X | X | X |
| 2.1.10 | Promote construction of wetlands for waste water treatment | • NEMA, KWS, LNGG, MoAL&F, WWF, WRUAS | X | X | X | X | X | X | X | X | | | | |
| 2.1.11 | Promote recycling of waste water | • LNGG, NEMA, L. Naivasha Tour Operators Group, LNRA, COOPERNIC | X | X | X | X | X | X | X | X | | | | |
| ***2.2 Promote sustainable small - scale household irrigation technologies in the catchment*** | | | | | | | | | | | | | | |
| 2.2.1 | Promote small scale water efficient irrigation technologies | • FARMERS, MoAL&F, WRUAs, WWF, World Vision, SHDI, MOEW&NR, KARI, | X | X | X | X | X | X | X | X | | | | |
| 2.2.1 | Promote water storage facilities | • WWF, MoEW&NR, MoAL&F, World Vision | X | X | X | X | X | X | X | X | | | | |
| 2.2.2 | Develop guidelines for efficient irrigation systems | • MoAL&F, MoEW&NR, NIB | X | X | | | | | | | | | | |
| 2.2.3 | Water recycling at small scale level | • MoAL&F, MoEW&NR, Communities, WRMA, WRUAs | X | X | X | X | | | | | | | | |
| 2.2.4 | Promote mulching in agricultural farm lands | • MoAL&F, Farmers | X | X | X | X | | | | | | | | |
| 2.2.5 | Promote environmental friendly green houses | • Amiran, MoAL&F, Public Health, NEMA, KEBS,KEPHIS | X | X | X | X | X | X | X | X | X | X | X | X |
| 2.2.6 | Promote efficient irrigation systems | • MoAL&F, MoEW&NR, NIB | X | X | X | X | X | X | X | X | X | X | X | X |
| 2.2.7 | Formation of cooperatives & linking farmers to micro-finance institutions | • MoI&E, AFC, NCPB, Banks | X | X | X | X | X | X | X | X | | | | |

| | | | YEAR 1 (2012/4) | YEAR 2 (2014/8) | YEAR 3 (2018/22) |
|---|---|---|---|---|---|
| ***2.3 Develop an Irrigation master plan for the basin*** | | | | | |
| 2.3.1 | Map/geo-reference suitable areas for irrigation | • MoEW&NR, WRMA, WRUAs, MoLH&UD, MoD&P, NEMA, NMC, LNGG, CSOs, Donors, MoAL&F, DRSIS | X X X X | | |
| 2.3.2 | Undertake land use planning & zonation | • MoEW&NR, WRMA, WRUAs, MoLH&UD, MoD&P, WWF, MoAL&F | X X X X | | |
| 2.3.3 | Undertake environmental impact assessments & audits | • MoAL&F, NEMA, Communities | X X X X | X X X X | X X X X |
| ***2.4 Promote technologies for dry land farming*** | | | | | |
| 2.4.1 | Promote efficient water use technologies and conservation | • MoAL&F, MoEW&NR, WRMA, WRUA, KARI | X X X X | X X X X | |
| 2.4.2 | Reclamation & restoration of degraded land | • MoEW&NR, MoAL&F, KFS, WRMA | X X X X | X X X X | X X X X |
| 2.4.3 | Promote drought tolerant and appropriate crops varieties | • MoAL&F, Seed Growers, KARI | X X X X | X X X X | X X X X |
| 2.4.4 | Promote crops rotation | • MoAL&F, Kenya Seed, MoAL&F | X X X X | X X X X | X X X X |
| 2.4.5 | Promote soil conservation technologies including agro-forestry | • MoAL&F , WRMA, Farmers , KEFRI, ICRAF | X X X X | X X X X | X X X X |
| ***2.5 Promote efficient use of farm inputs*** | | | | | |
| 2.5.1 | Strengthen Public Private Farmer linkages | • Farmers, MoAL&F, WRMA, PCPB, KEPHIS, NCPB, LNGG, WRUAS, LNRA, | X X X X | X X X X | X X X X |
| 2.5.2 | Provide extension services (capacity building on organic farming, proper use of chemicals and fertilizers) | • Farmers, MoAL&F, WRMA | X X X X | X X X X | X X X X |
| 2.5.4 | Enforce use of approved agricultural chemicals and fertilizers | • MoAL&F, KEPHIS, PCPB, NEMA | X X X X | X X X X | X X X X |
| ***2.6 Upscale the payment for environmental services program on the entire catchment*** | | | | | |
| 2.6.1 | Upscale soil and water conservation structures in the entire basin | • Dev. Partners, WWF, LNGG, CARE Kenya, WRUAs, LNRA, WRMA, MoAL&F | X X X X | X X X X | X X X X |

| | | | YEAR 1 (2012/4) | | | | YEAR 2 (2014/8) | | | | YEAR 3 (2018/22) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.6.2 | Capacity building for implementation of PES to farmers | • Communities, MoAL&F. LNRA, LNGG, WWF | X | X | X | X | X | X | X | X | X | X | X | X |
| 2.6.3 | Resource mobilization for incentives to farmers | • WWF, CARE Kenya, LNGG, WRMA, WRUAs | X | X | X | X | X | X | X | X | | | | |
| 2.6.4. | Improve marketing linkages of produce from farmers under PES program | • Investors, LNGG, MoAL&F, KFC, COOPERNIC | | | | | X | X | X | X | X | X | X | X |
| ***2.7 Develop an invasive species control strategy for the LNB*** | | | | | | | | | | | | | | |
| 2.7.1 | Identify the invasive species and their impacts on the environment and livelihoods | • KARI, KWS, WWF, KMFRI, KEFRI | X | X | X | X | X | X | X | X | | | | |
| 2.7.2 | Map out the areas affected by invasive species | • KWS, KARI, KEPHIS, WWF, KMFRI, KEFRI | X | X | X | X | | | | | | | | |
| 2.7.3 | Develop and implement an invasive species management strategy | • Fisheries, NEMA, KWS, MoAL&F, WRMA, KARI, KEFRI, KMFRI | X | X | X | X | X | X | X | X | X | X | X | X |
| ***2.8 Adopt best management practices appropriate to all land uses throughout the catchment*** | | | | | | | | | | | | | | |
| 2.8.1 | Enhance use of appropriate farming practices - soil conservation measures, agro-forestry, organic farming etc | • Farmers, MoAL&F., WRUAs, CFAs, KFS | X | X | X | X | X | X | X | X | X | X | X | X |
| 2.8.2 | Develop and implement land use plan/zonation in the catchment | • MoAL&F, KFS, KWS, MoLH&UD, WWF, MoEW&NR | X | X | X | X | X | X | X | X | | | | |
| 2.8.3 | Monitor and regulate on-farm practices within the horticultural sector | • NEMA, MoAL&F, KEPHIS, LNGG, HCDA | X | X | X | X | X | X | X | X | X | X | X | X |
| 2.8.4 | Advocacy on sustainable land use practices | • MoAL&F, Naivasha CSO Forum, WRUAs, NEMA, KFS | X | X | X | X | X | X | X | X | X | X | X | X |
| 2.8.5 | Develop best practices guidelines for key land use activities in the catchment | • MoAL&F , MoLH&UD, WWF, MoAL&F, KWS | X | X | X | X | | | | | | | | |
| 2.8.6 | Encourage use of alternative energy sources | • MoAL&F, MoEW&NR , WWF, World Vision, RECONCILE, NAWACOMP | X | X | X | X | X | X | X | X | X | X | X | X |

| | | YEAR 1 (2012/4) | YEAR 2 (2014/8) | YEAR 3 (2018/22) |
|---|---|---|---|---|
| ***2.9 Implement integrated catchment management principles*** | | | | |
| 2.9.1 Build capacity for integrated catchment management at community and institutional levels | • WWF, IMARISHA, KWS, MoEW&NR | X X X X X X X X X X X X | | |
| 2.9.2 Monitor the implementation of the integrated management principles | • WWF, IMARISHA, KWS, MoEW&NR | X X X X X X X X X X X X | | |
| ***2.10 Protect and reclaim encroached riparian areas*** | | | | |
| 2.10.1 Enforcement of existing laws and regulations | • NEMA, AGRI., WRUAs, CFAs, Community, KWS, KFS | X X X X X X X X X X X X | | |
| 2.10.2 Sensitization of community on riparian land protection | • DEV. PARTNERS, WRUAs, CFAs, Media | X X X X X X X X X X X X | | |
| 2.10.3 Rehabilitation of degraded riparian areas | • NEMA, MoAL&F, WRUAs, CFAs, Community, KWS, KFS | X X X X X X X X X X X X | | |

**3) Forestry Development**

***Issues***

The key issues associated with forestry development include;

- Deforestation including illegal logging
- Overgrazing
- Forest fires
- Planting of unsuitable tree species
- Encroachment of forest ecosystems
- Lack of alternative sources of energy
- Charcoal burning
- Inadequate enforcement of forest laws and regulations

***Goal***

The overall goal of the forestry programme is to conserve and manage gazetted and on-farm forestry resources within the basin

***Objectives***

(i) To increase forest cover for enhanced ecosystem service provision within the basin.

(ii) To mitigate and adapt to effects of climate change on forest ecosystems.

**Implementation Strategy: Forestry Development**

| Management Action and Activities | Persons / Institutions Responsible | Time Frame | | |
|---|---|---|---|---|
| | | YEAR 1 (2012/4) | YEAR 2 (2014/8) | YEAR 3 (2018/22) |
| ***3.1 Build capacity on agro-forestry practices*** | | | | |
| 3.1.1 Enhance extension services to farmers | • KFS, MoAL&F | X X X X X X X X X X X X | | |

| | | | YEAR 1 (2012/4) | | | | YEAR 2 (2014/8) | | | | YEAR 3 (2018/22) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.1.2 | Training on agro forestry skills | • KFS, MoAL&F | X | X | X | X | | | | | | | | |
| 3.1.3 | Promote the appropriate agro-forestry species and diversity | • KEFRI, KFS | X | X | X | X | X | X | X | X | X | X | X | X |
| ***3.2 Promote on-farm forestry*** | | | | | | | | | | | | | | |
| 3.2.1 | Encourage the establishment of woodlots to supply domestic energy needs | • KFS, CFAs, Farmers, WRUAs | X | X | X | X | X | X | X | X | X | X | X | X |
| 3.2.2 | Establish community tree nurseries for afforestation programmes | • Community KFS, CFAs, Farmers, KEFRI, WRUAs | X | X | X | X | | | | | | | | |
| 3.2.3 | Promote alternative energy sources e.g. solar, wind and biogas | • MoEW&NR, KFS, Community, Universities, KARI, MoAL&F | X | X | X | X | X | X | X | X | X | X | X | X |
| 3.2.4 | Promote IGAs e.g. ecotourism, bee keeping, butterfly farming, aquaculture | • MoAL&F, MoEAC&T, KFS, SME Institutions | X | X | X | X | X | X | X | X | X | X | X | X |
| ***3.2 Strengthen the management of State Forests*** | | | | | | | | | | | | | | |
| 3.3.1 | Strengthen the capacity of the Kenya Forest Service to carry out their mandate | • Maisha Bora, KFS, WWF, NWC, Save the Mau Trust, LNGG | X | X | X | X | | | | | | | | |
| 3.3.2 | Strengthen the capacity of the CFAs, to implement Forest management plans | • CFAs, IMARISHA, KFS , Dev. Partners | X | X | X | X | X | X | X | X | | | | |
| 3.3.2 | Step up rehabilitation of degraded sites | • KFS, WWF, NWC, Save the Mau, CFAs, TRUST, LNGG, Self Help Africa, World Vision | X | X | X | X | X | X | X | X | X | X | X | X |
| 3.3.3 | Enhance the capacity of Government officials, NGOs, CFAS, local communities and entrepreneurs to tap a range of forestry incentive schemes initiatives e.g. REDD +, Green Climate Fund and Carbon Trading | • KFS/UNDP, KFWG, WWF, Save the Mau Trust | X | X | X | X | X | X | X | X | X | X | X | X |

**4) Livestock Development**

***Issues***

The key issues associated with livestock development include;

- Loss of vegetation cover
- Soil erosion
- Pollution of water sources
- Spread of livestock diseases
- Poor livestock breeds
- Overstocking beyond carrying capacity
- Pastoral conflicts
- Land fragmentation

***Goal***

The overall goal of the livestock programme is to enhance sustainable livestock production and reduce impacts of livestock on environment within the basin

***Objectives***

i). To improve livestock production through promotion of advanced livestock breeds and apportionment of the required daily nutrient uptake for different zones in the basin.

ii). To strengthen market linkages for livestock and livestock products.

iii). To promote proper use and management of livestock chemicals.

iv). To mitigate and adapt to effects to climate change on livestock production and vice versa.

**Implementation Strategy: Livestock Development**

| Management Action and Activities | | Persons / Institutions Responsible | Time Frame | | |
|---|---|---|---|---|---|
| | | | YEAR 1 (2012/4) | YEAR 2 (2014/8) | YEAR 3 (2018/22) |
| ***4.1 Improved selection of livestock breeds for different zones in the basin*** | | | | | |
| 4.1.1 | Community education on livestock management | • MoAL&F, CSOs, Farmers, Ranchers, Pastoralists, 4K Club, KARI, KENGEN | X X X X X X X X X X X X | | |
| 4.1.2 | Exchange visits to other areas | • MoAL&F, NGOs, CBOs Farmers, KARI | X X X X | | |
| 4.1.3 | Enhance livestock extension services to local farmers | • MoAL&F, Farmers, companies involved in livestock products, KARI | X X X X X X X X X X X X | | |
| 4.1.4 | Selection of high yield disease resistant breeds | • MoAL&F, Farmers, Pastoralists, KARI, NGOs, CBOs | X X X X X X X X X X X X | | |
| ***4.2 Promotion of markets for livestock products*** | | | | | |
| 4.2.1 | Undertake livestock supply and market survey | • MoAL&F, CSOs, Farmers, Ranchers, Pastoralists, Local councils, KMC, Export and slaughter houses | X X X X X X X X X X X X | | |
| 4.2.2 | Enhance coordination amongst value chain actors | • MoAL&F, Farmers, NGOs, CBOs, Public Health, KCC | X X X X X X X X X X X X | | |
| 4.2.3 | Promote value addition | • MoAL&F, Pastoralists, Kenya Livestock Traders Org., Private Companies in Dairy and Beef, KARI, NGOs, CBOs | X X X X X X X X X X X X | | |

| | | | YEAR 1 (2012/4) | | | | YEAR 2 (2014/8) | | | | YEAR 3 (2018/22) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4.2.4 | Encourage cooperative society/movement approach | • MoAL&F, Kenya Livestock Traders Org, NGOs, CBOs, MoI&E | X | X | X | X | X | X | X | X | X | X | X | X |
| 4.2.5 | Enforcement of livestock marketing/movement laws | • MoAL&F, County Govt. | X | X | X | X | X | X | X | X | X | X | X | X |
| 4.2.6 | Support marketing infrastructure development | • Local Council, Pastoralists, MoT&I | X | X | X | X | X | X | X | X | X | X | X | X |
| ***4.3 Building capacities for communities to practice sustainable livestock production*** | | | | | | | | | | | | | | |
| 4.3.1 | Promoting participatory research and linkages with farmers | • MoAL&F, CSOs, Farmers, Ranchers, Pastoralists, KARI, Private Sector | X | X | X | X | X | X | X | X | X | X | X | X |
| 4.3.2 | Capacity building on livestock and pasture management | • MoAL&F, , Dev. Partners | X | X | X | X | X | X | X | X | X | X | X | X |
| 4.3.3 | Sensitization and adoption of improved technologies in livestock production (Zero grazing, paddock, AI services) | • Livestock owners , MoAL&F, KARI, MoAL&F, Private Sector | X | X | X | X | X | X | X | X | X | X | X | X |
| 4.3.4 | Promote information sharing amongst sectoral players | • MoAL&F, CSOs, Farmers, Ranchers, Pastoralists, KARI, Private Sector | X | X | X | X | X | X | X | X | X | X | X | X |
| 4.3.5 | Educating the communities on the dangers of cross border movements to avoid transfer of diseases | • Pastoralists, Veterinary Dept., MoAL&F, NGOs, CBOs, MoAL&F and Private Sector | X | X | X | X | X | X | X | X | X | X | X | X |
| ***4.4 Enhancing pasture and water supply for livestock production*** | | | | | | | | | | | | | | |
| 4.4.1 | Promote paddocks for pasture regeneration | • MoAL&F, CSOs, Farmers, Ranchers, Pastoralists | X | | X | | X | | X | | X | | X | |
| 4.4.2 | Promote land consolidation | • Community Land Boards, CBS, County Land boards, Land Adjudication Settlement Officers, land and settlement Boards | X | X | X | X | X | X | X | X | X | X | X | X |
| 4.4.3 | Promote optimal stocking rates within the carrying capacity | • Pastoralists, Farmers, MoAL&F, Veterinary Dept | X | | | | X | | | | X | | | |
| 4.4.4 | Rehabilitation and servicing of boreholes, wells & springs for water supply | • MoEW&NR, WRUA, WRMA, Private Sector, NGOs, CBOs | X | X | X | X | X | X | X | X | X | X | X | X |

| | | | YEAR 1 (2012/4) | | | | YEAR 2 (2014/8) | | | | YEAR 3 (2018/22) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4.4.5 | Establish and facilitate conflict resolution mechanisms | • WRUAs, Community Leaders, Land Control Board, District Adjudication Officers, local Government , NGOs, CA | X | X | X | X | X | X | X | X | X | X | X | X |
| 4.4.6 | Enforce livestock management laws | • MoAL&F, CA. | X | X | X | X | X | X | X | X | X | X | X | X |
| 4.4.7 | Promote processing, conservation, storage and use of feeds for livestock during the dry season | • MoAL&F | | X | X | | | X | X | | | X | X | |
| ***4.5 Regulate direct access, grazing and watering of livestock in riparian zones and forests*** | | | | | | | | | | | | | | |
| 4.5.1 | Strengthen the resource user's institutions | • WRUAs, CFAs, organized CBOs, WRMA, Line ministries | X | | | X | | | X | | | | X | |
| 4.5.2 | Providing water for livestock at designated points | • WRUA, Private sector, pastoralists, local community, Development partners | | | X | | | | X | | | | | |
| 4.5.3 | Identify and manage corridors to be used in access to the water resources to minimize direct grazing on the riparian areas | • MoAL&F, MoEW&NR, NEMA, WRUAS, other regulating bodies, KWS , Fisheries, community, County government, Private Sector | | X | | | | X | | | | X | | |
| 4.5.4 | Identify and manage access routes to the forest grazing zones | • MoAL&F, CFAs, KFS, KWS, NEMA | X | X | | X | | X | | | | X | | |
| 4.5.5 | Development of alternative water sources (e.g. water pans, water harvesting, and boreholes) | • MoAL&F, MoEW&NR, WRMA, NGOs, CBOs, Private sector | | | X | | | X | | | | X | | |
| ***4.6 Promote environmental sound use of livestock chemicals*** | | | | | | | | | | | | | | |
| 4.6.1 | Training and educating of livestock owners on proper siting & use of chemicals in livestock health control | • MoAL&F, NGOs, CBOs, Private sector, local communities, MoH | X | X | X | X | X | X | X | X | X | X | X | X |

**5) Fisheries Development**

***Issues***

The key issues associated with fisheries development include;

- Overfishing
- Poor fishing methods
- Declining fisheries
- Illegal fishing/poaching
- Encroachment of fish habitats
- Inadequate law enforcement
- Invasive species
- Poor marketing
- Inadequate public participation in Fisheries management

- Low level of adoption of fish farming techniques/aquaculture
- Inadequate capacity (financial, human and Infrastructure) in fisheries management

### *Goal*

The overall goal of the fishery management programme is to develop a sustainable fisheries management strategy for the Lake Naivasha basin comprising of both capture and culture fisheries.

### *Objectives*

I). Design and develop sustainable fisheries management strategies

ii). Promote aquaculture to increase fish production as an alternative source of livelihood

iii). To enhance the institutional capacity in fisheries management

iv). To mitigate and adapt to the effects of climate change on fisheries development

**Implementation Strategy: Fisheries Development**

| Management Action and Activities | | Persons / Institutions Responsible | Time Frame | | |
|---|---|---|---|---|---|
| | | | YEAR 1 (2012/4) | YEAR 2 (2014/8) | YEAR 3 (2018/22) |
| ***5.1 Designing appropriate fisheries management strategies*** | | | | | |
| 5.1.1 | Survey and establishing regulations to protect fish breeding areas and landing sites | • FD, KMFRI, BMUs, KWS | X X X X | | |
| 5.1.2 | Gazettement of existing fish landing sites and establishing additional fish landing grounds | • MoAL&F, BMUs, MoLH&UD | | X X X X | |
| 5.1.3 | Support the restoration of degraded fish breeding sites and associated habitat | • BMU, FD, KMFRI, KWS, WRUAs, NGOs, WRMA, CBOs | X X X X | X X X X | X X X X |
| 5.1.4 | Promote stakeholders participation in fisheries Co- management | • FD, BMU, KWS, WRMA, Stakeholders | X X X X | X X X X | X X X X |
| 5.1.5 | Improve the monitoring tools and strategies | • FD, KMFRI, WRMA | X X X X | | |
| 5.1.6 | Promote fisheries research to improve knowledge on fishery resources, including the ecology of fisheries and fish habitats | • FD, Research Institutions (KWS, KARI, KMFRI, Universities), Fishermen | X X X X | X X X X | X X X X |
| 5.1.7 | Protection of fish habitats | • MoAL&F, FD, BMUs, KWS, KMFRI, WRMA, CA, LNGG, LNRA | X X X X | X X X X | X X X X |
| 5.1.8 | Strengthen the capacities of the fisheries institutions | • MoAL&F, DEV. PARTNERS, NGOS | X X X X | X X X X | X X X |
| 5.1.9 | Review sectoral code of conduct | • FD, BMU, NGOs, Private Sector | X X X X | | |

| | | | YEAR 1 (2012/4) | | | | YEAR 2 (2014/8) | | | | YEAR 3 (2018/22) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***5.2 Monitoring and collecting data for sustainable fisheries management*** | | | | | | | | | | | | | | |
| 5.2.1 | Standardize monitoring and data collection protocols | • FD, KMFRI, BMUS, Fish Farmers and Traders, Fishermen | X | X | X | X | X | X | X | X | X | X | X | X |
| 5.2.2 | Train data collectors and analysts | • FD, KMFRI, BMU, Fish Farmers and Traders, Fishermen | X | X | X | X | | | | | | | | |
| 5.2.3 | Establish data collection centres | • FD, KMFRI, BMU, Fish Farmers and Traders, Fishermen | X | X | X | X | | | | | | | | |
| 5.2.4 | Develop data base and information dissemination system | • FD, KMFRI, FD, KMFRI, BMU, WRUAs | X | X | X | X | X | X | X | X | X | X | X | X |
| ***5.3 Enforcement of fishing regulations within the basin*** | | | | | | | | | | | | | | |
| 5.3.1 | Control of illegal fishing through increased monitoring and control surveillance | • BMU, FD, KWS, CA | X | X | X | X | X | X | X | X | X | X | X | X |
| 5.3.2 | Regulating number of fishers and fishing gear for sustainability | • FD, BMU, KWS, KMFRI | X | | | | X | | | | X | | | |
| 5.3.3 | Awareness creation to enhance compliance | • FD, BMU, KWS, KMFRI, CA, WRUAs, NGOs | X | X | X | X | X | X | X | X | X | X | X | X |
| ***5.4 Capacity building of players within the fisheries sector*** | | | | | | | | | | | | | | |
| 5.4.1 | Training of fish farmers, fishermen and traders | • MoAL&F, BMU, NGOs, Dev. Partners | X | X | X | X | X | X | X | X | X | X | X | X |
| 5.4.2 | Support acquisition of appropriate gear | • MoAL&F, BMU, NGOs | X | X | X | X | X | X | X | X | X | X | X | X |
| 5.4.3 | Promote the development of markets and value chains (service providers, value addition, markets and infrastructure) | • FD, NGOs, Dev. Partners, County Govt, GoK Agencies | X | X | X | X | X | X | X | X | X | X | X | X |
| 5.4.4 | Support mobilization of financial resources to enhance fisheries activities | • SACCOs, Banks, Development Partners, GoK Agencies, Private Sector Partnerships | X | X | X | X | X | X | X | X | X | X | X | X |
| 5.4.5 | Enhance awareness creation on fisheries best practices | • FD, BMU, NGOs, Public Health, County Govt. | X | X | X | X | X | X | X | X | X | X | X | X |

| | | | YEAR 1 (2012/4) | YEAR 2 (2014/8) | YEAR 3 (2018/22) |
|---|---|---|---|---|---|
| ***5.5 Promote aquaculture to increase fish production*** | | | | | |
| 5.5.1 | Train farmers on aquaculture practices | • FD, KMFRI, MoAL&F, NGOs, Dev. partners, WRMA, WRUAs | X X X X | X X X X | X X X X |
| 5.5.2 | Promote research on aquaculture within the basin | • KMFRI, FD, Research Inst.(KMFRI & Universities), Dev. Partners | X X X X | X X X X | X X X X |
| 5.5.3 | Promote extension services among fish farmers | • FD, NGOs, MoAL&F, Dev. Partners | X X X X | X X X X | X X X X |
| 5.5.4 | Establish market linkages | • FD, NGOs, MoAL&F, Dev. Partners, MoI&ED | X X X X | X X X X | X X X X |
| ***5.5 Promote aquaculture to increase fish production*** | | | | | |
| 5.5.1 | Train farmers on aquaculture practices | • FD, KMFRI, MoAL&F, NGOs, Dev. partners, WRMA, WRUAs | X X X X | X X X X | X X X X |
| 5.5.2 | Promote research on aquaculture within the basin | • KMFRI, FD, Research Inst.(KMFRI & Universities), Dev. Partners | X X X X | X X X X | X X X X |
| 5.5.3 | Promote extension services among fish farmers | • FD, NGOs, MoAL&F, Dev. Partners | X X X X | X X X X | X X X X |
| 5.5.4 | Establish market linkages | • FD, NGOs, MoAL&F, Dev. Partners, MoI&ED | X X X X | X X X X | X X X X |
| ***5.6 Promote equitable access to fisheries resources*** | | | | | |
| 5.6.1 | Advocate for improved access to the lake | • CA, FD, BMUs, CSOs, MoAL&F, Private Sector, WRUAs, IMARISHA, WRMA | X X X X | | |
| 5.6.2 | Mainstreaming gender and disadvantaged groups in fisheries management | • FD, BMU, NGOs, Dev. Partners, MoD&P | X X X X | X X X X | X X X X |

### 6) Wildlife Conservation and Management

***Issues***

The key issues associated with wildlife conservation and management include:

- Human wildlife conflicts
- Over population of certain wildlife species in the riparian land
- Land fragmentation
- Poaching
- Encroachment and disconnect of wildlife corridors and dispersal areas
- Inadequate law enforcement
- Weak wildlife policies (in terms of penalties, compensations and incentives)

***Goal***

To conserve and manage wildlife and their habitats, at optimal and harmonious levels, in order to yield sustainable benefits.

***Objectives***

i). To enhance community participation in wildlife management while promoting wildlife related economic opportunities

ii). To maintain numerically viable and ecologically functional populations

iii). Secure land/habitat for wildlife

**Implementation Strategy: Wildlife Conservation and Management**

| Management Action and Activities | | Persons / Institutions Responsible | Time Frame | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | YEAR 1 (2012/4) | | | YEAR 2 (2014/8) | | | | YEAR 3 (2018/22) | | | | |
| ***6.1 Promote community wildlife conservation practices and enterprises*** | | | | | | | | | | | | | | |
| 6.1.1 | Promote game farming and wildlife sanctuaries | • KWS, Communities, NGOs, CBOs, Land Owners | X | X | X | X | X | X | X | X | X | X | X | X |
| 6.1.2 | Promote benefit sharing mechanisms (incentives) from conservation areas | • MOEW&NR, KWS, NGOs, CBOs, Private Sector, Communities | X | X | X | X | X | X | X | X | X | X | X | X |
| 6.1.3 | Promote sustainable community based ecotourism | • MOEW&NR, KTB, KWS, NGOs, CBOs & Private Sector, Communities | X | X | X | X | X | X | X | X | X | X | X | X |
| 6.1.4 | Build the capacity of communities in wildlife conservation | • MOEW&NR, KWS, NGOs, CBOs & Private Sector, Conservation Education and Training Centres, Communities | X | X | X | X | X | X | X | X | X | X | X | X |
| 6.1.5 | Promote in-reach and outreach programs for school groups in conservation areas within the basin | • MOEW&NR, MoES&T, KWS, KFS, NGOs , CBOs ,Land Owners, Private Sector, Communities, Learning Institutions | X | X | X | X | X | X | X | X | X | X | X | X |
| ***6.2 Control degradation of wildlife habitats and corridors*** | | | | | | | | | | | | | | |
| 6.2.1 | Undertake habitats carrying capacities surveys | • MoEW&NR, MoLH&UD, KWS, NEMA, NGOs, CBOs, Private Sector, Communities | X | X | X | X | | | | | | | | |
| 6.2.2 | Secure wildlife corridors | • MoEW&NR, MoLH&UD, KWS, NEMA, NGOs, CBOs, Private Sector , Communities | X | X | X | X | X | X | X | X | | | | |
| 6.2.3 | Creation of buffer zones | • MoEW&NR, MoLH&UD, KWS, KFS, NEMA, NGOs , CBOs , Private Sector, Local Communities | X | X | X | X | X | X | X | X | | | | |
| 6.2.4 | Control habitat carrying capacity | • MoEW&NR, MoLH&UD, MoAL&F, KWS, NEMA, NGOs, CBOs, Private Sector, Communities | X | X | X | X | X | X | X | X | X | X | X | X |

| | | | YEAR 1 (2012/4) | YEAR 2 (2014/8) | YEAR 3 (2018/22) |
|---|---|---|---|---|---|
| ***6.3 Conserve wildlife habitats in the wetlands and catchment areas*** | | | | | |
| 6.3.1 | Increase patrols and enforcement | • KWS, NEMA, KFS , NGOs , CBOs, Private Sanctuaries, Communities | X X X X | X X X X | X X X X |
| 6.3.2 | Demarcate & secure the riparian zones & other critical wildlife habitats | • MoEW&NR, MoLH&UD, County Government , KWS, NEMA , NGOs, CBOs ,Land Owners , Communities | X X X X | X X X X | |
| 6.3.3 | Develop and implement strategy for conserving and managing the areas | • Dev. Partners, KWS, NWC, COLANGO | | X X X X | X X X X |
| 6.3.4 | Promote sustainable livelihood activities by communities | • MoEW&NR, MoLH&UD, KWS, KFS, NEMA, NGOs, CBOs , Private Sector, Communities | X X X X | X X X X | X X X X |
| 6.3.5 | Control of invasive alien species | • MoEW&NR, MoAL&F , KWS , NEMA , NGOs, CBOs, Private Sector, KFS, KEFRI, Research Institutions | X X X X | X X X X | X X X X |
| 6.3.6 | Empower local communities to enhance surveillance and law enforcement | • MoEW&NR, MoAL&F, , WRMA , KWS , NEMA, NGOs, CBOs, Private Sector, KFS | X X X X | X X X X | |
| ***6.4 Protect endangered, vulnerable and rare fauna and flora*** | | | | | |
| 6.4.1 | Protection and management of habitats for endangered, vulnerable and rare fauna and flora | • KWS, NEMA, KFS, WRMA, Community | X X X X | X X X X | X X X X |
| ***6.5 Support and promote wildlife conservation in large private and group ranches*** | | | | | |
| 6.5.1 | Promote wildlife user rights (incentives) | • MoEW&NR, MoAL&F, KWS, KFS, NEMA, NGOs, CBOs, Private Sector | | X X X X | X X X X |
| ***6.6 Monitor wildlife populations*** | | | | | |
| 6.6.1 | Conduct regular resource inventory e.g. game census and water fowl counts | • KWS, NMK, DRSRS, Nature Kenya, NGOs, CBOs, Land Owners, Research Institutions | X X X X | X X X X | X X X X |
| 6.6.2 | Promote participatory GIS based resource mapping for the basin | • KWS , NMK, DRSRS, NGOs, CBOs, Land Owners, Research Institutions | X X X X | | |

| | | | YEAR 1 (2012/4) | | | | YEAR 2 (2014/8) | | | | YEAR 3 (2018/22) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6.6.3 | Involve local communities in resource inventory | • KWS, NMK, NGOs, CBOs, Land Owners, Research Institutions | X | X | X | X | X | X | X | X | X | X | X | X |
| 6.6.4 | Establish an information management system (Data Base & Resource Centres) | • KWS, NMK, DRSRS, NGOs, CBOs, Land Owners, Research Institutions | X | X | X | X | | | | | | | | |
| ***6.7 Eradicate poaching and illegal possession of wildlife products*** | | | | | | | | | | | | | | |
| 6.7.1 | Promote and support education and awareness on the values of wildlife | • KWS, MoEW&NR, MOES&T, NMK, DRSRS, NGOs, CBOs, Land Owners, Research Institutions & Education Centres | X | X | X | X | X | X | X | X | X | X | X | X |
| 6.7.2 | Create a strong anti-poaching and intelligence network among wildlife keepers and community to reduce poaching | • MoEW&NR, KWS, NGO, CBOs, Communities, Landowners | X | X | X | X | X | X | X | X | | | | |
| ***6.8 Reduce Human Wildlife Conflict*** | | | | | | | | | | | | | | |
| 6.8.1 | Strengthen KWS and community relations in HWC reporting and PAC | • MoEW&NR, KWS, NGOs CBOs, Land Owners, Communities | X | X | X | X | X | X | X | X | X | X | X | X |
| 6.8.2 | Employ community wildlife scouts | • MoEW&NR, KWS, NGOs CBOs, Land Owners , Communities , Training Institutions | X | X | X | X | | | | | | | | |
| 6.8.3 | Facilitate timely compensation | • MoEW&NR, KWS , Private Sector | X | X | X | X | X | X | X | X | X | X | X | X |

**7) Tourism Development**

***Issues***

The key issues associated with tourism development include:

- Concentration of tourism activities around Lake Naivasha (impact)
- Inadequate communication and marketing capacity of tourism products by local communities
- Inadequate tourism products in the middle and upper catchment except for the Aberdare National Park and forests
- Lack of a strong tourism stakeholder forum for the Lake Naivasha basin
- Inadequate tourism infrastructure in the middle and upper catchment

***Goal***

The goal of the tourism programme is to promote sustainable tourism within the basin.

***Objectives***

i). To develop and diversify tourism products ( such as cultural and agri-tourism) coupled with a marketing strategy for the basin

ii). To establish a strong tourism stakeholder forum to advocate for tourism issues within the basin

**Implementation Strategy: Tourism Development**

| Management Action and Activities | | Persons / Institutions Responsible | Time Frame | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | YEAR 1 (2012/4) | | | | YEAR 2 (2014/8) | | | | YEAR 3 (2018/22) | | | |
| ***7.1 Promote and improve tourist infrastructure in the catchments (middle and upper)*** | | | | | | | | | | | | | | |
| 7.1.1 | Improve tourist road network and circuits | • MoLH&UD,MOT&I, and County Government, KWS, MoEAC&T, KHA & KURA, Private Sector | X | X | X | X | X | X | X | X | X | X | X | X |
| 7.1.2 | Establish camping, picnic sites and associated infrastructure (nature trails, canopy walks and board walks) | • KWS, CBOS, NGOS, MoEAC&T,(CFAs, WRUAs), Private Investors, Land owners, Communities | X | X | X | X | | | | | | | | |
| 7.1.3 | Develop eco-lodges in the vicinity of forests (Eburru, Mau, Kinangop & Aberdare) | • KWS, KTB, KFS, CBOs, NGOS, Private Investors, Communities etc. | X | X | X | X | X | X | X | X | | | | |
| ***7.2 Establish a tourism stakeholders' forum*** | | | | | | | | | | | | | | |
| 7.2.1 | Undertake stakeholders consultative and sensitization meetings | • KWS, MoEAC&T, NGO's, CBOs, Private Sector, and Communities | X | | | | | | | | | | | |
| 7.2.2 | Operationalization of the forum | • KWS, NGOs, CBOs, Private Sector, AG's Office, and Communities | X | X | X | | | | | | | | | |
| 7.2.3 | Capacity building of stakeholders | • MoEAC&T, KWS, CBOs, NGOs, Private Sector | X | X | X | X | X | X | X | X | X | X | X | X |
| 7.2.4 | Promote and support local tourism investments in the catchment | • KWS, KFS, KTB, NGOs, CBOs, Private Sector and communities, LNB Tourism Forum | X | X | X | X | X | X | X | X | X | X | X | X |
| ***7.3 Develop cultural tourism*** | | | | | | | | | | | | | | |
| 7.3.1 | Promoting cultural and heritage tourism products | • MoEAC&T, Ministry of Sports, Culture and the Arts, KTB, KWS, NGOs, CBOs and Communities, LNB Tourism Forum | X | X | X | X | X | X | X | X | X | X | X | X |
| ***7.4 Develop a marketing strategy for tourism in the catchment*** | | | | | | | | | | | | | | |
| 7.4.1 | Develop tourism marketing strategy guidelines | • MoEAC&T, KTB, KWS, County Government, Land Owners, NGOs, CBOs, Private Sector | X | X | X | X | | | | | | | | |

| | | | YEAR 1 (2012/4) | | | | YEAR 2 (2014/8) | | | | YEAR 3 (2018/22) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.4.2 | Establish website & other appropriate information materials for marketing | • MoEAC&T, KTB, County Government , KWS, KFS, Land Owners, NGOs, CBOs, Private Sector | X | X | X | X | X | X | X | X | X | X | X | X |
| 7.4.3 | Identify target tourist sources, their needs and aspirations | • MoEAC&T, KTB, KWS, KFS, NGOs, CBOs, Ministry of Information, Media, Local Investors | X | X | X | X | X | X | X | X | | | | |
| 7.4.4 | Conduct an analysis of tourism value chain to determine contacts and actors | • MoEAC&T, KTB, KWS, KFS, NGOs, CBOs, Local Investors, Communities | X | X | X | X | | | | | | | | |
| 7.4.5 | Capacity building on marketing strategies | • MoEAC&T, KWS, KTB, County Government, Land Owners, NGOs, CBOs, Private Sector, Communities | X | X | X | X | X | X | X | X | X | X | X | X |
| 7.4.6 | Conduct stakeholders meetings to adopt the tourism strategy guidelines | • MoEAC&T, KWS, KTB, County Government, Land Owners, NGOs, CBOs, Private Sector | X | X | X | X | | | | | | | | |

**8) Energy Production**

***Issues***

The key issues associated with energy production include:

- Impact of geothermal power stations
- Water abstraction
- Environmental pollution (air, water, noise, odour)
- Alteration of environment
- Excessive use of biomass fuel (fuel wood and charcoal)
- Low adoption of renewable energy e.g. solar, wind and biogas energy

***Goal***

To promote sustainable production and use of renewable energy (geothermal, wind, bio-gas, solar) within the Lake Naivasha basin

***Objectives***

i). To promote greater focus on clean energy through adoption of diversified renewable energy sources and technologies

ii). Reduce the impacts of energy production in the Naivasha basin especially on water resources, biodiversity and atmosphere

**Implementation Strategy: Energy Production**

| Management Action and Activities | | Persons / Institutions Responsible | Time Frame | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | YEAR 1 (2012/4) | | | | YEAR 2 (2014/8) | | | | YEAR 3 (2018/22) | | | |
| ***8.1 Promote alternative renewable energy technologies at household level*** | | | | | | | | | | | | | | |
| 8.1.1 | Identify appropriate renewable energy technologies for the area | • MoE&P, GiZ, IMARISHA, CFAs, CSOs, WWF | X | X | X | X | X | X | X | X | X | X | X | X |

| | | | YEAR 1 (2012/4) | YEAR 2 (2014/8) | YEAR 3 (2018/22) |
|---|---|---|---|---|---|
| 8.1.2 | Undertake household energy needs survey | • MoE&P, GiZ, IMARISHA, CFAs, CSOs, WWF | X X X X | X X X X | X X X X |
| 8.1.3 | Undertake capacity building on renewable energy | • MoE&P, GiZ, IMARISHA, CFAs, CSOs, WWF | X X X X | X X X X | X X X X |
| 8.1.4 | Support transfer of viable renewable energy technologies | • MoE&P, GiZ, IMARISHA, CFAs, CSOs, WWF | X X X X | X X X X | X X X X |
| ***8.2 Promote alternative renewable energy technologies at Industrial level*** | | | | | |
| 8.2.1 | Promote large scale Green Energy production | • KenGen, GDC , MoE&P, Private companies | X X X X | X X X X | X X X X |
| 8.2.2 | Promote large scale biogas production and use within the large scale farms | • LNGG, IMARISHA | X X X X | X X X X | X X X X |

**9) Urban Development**

***Issues***

The key issues associated with urban development include:

- Increased production of liquid and solid wastes
- Poor wastewater and sewage management
- Urban floods due to poor drainage
- Unplanned settlements/informal settlement
- Poor infrastructure for social and economic development ( housing and roads)
- Increased human population
- Increased pressure and competition for resources (environment, social amenities)
- Increased demand for water resources, declining supply and poor management
- Limited exploitation of alternative sources of energy

***Goal***

To ensure sustainable urban development within the Lake Naivasha basin.

***Objectives***

i). To develop and implement sound urban planning for the urban centres

ii). To develop and implement a comprehensive integrated waste management plan

iii). To improve water supply and distribution

iv). To improve and provide appropriate infrastructure (roads, housing and markets)

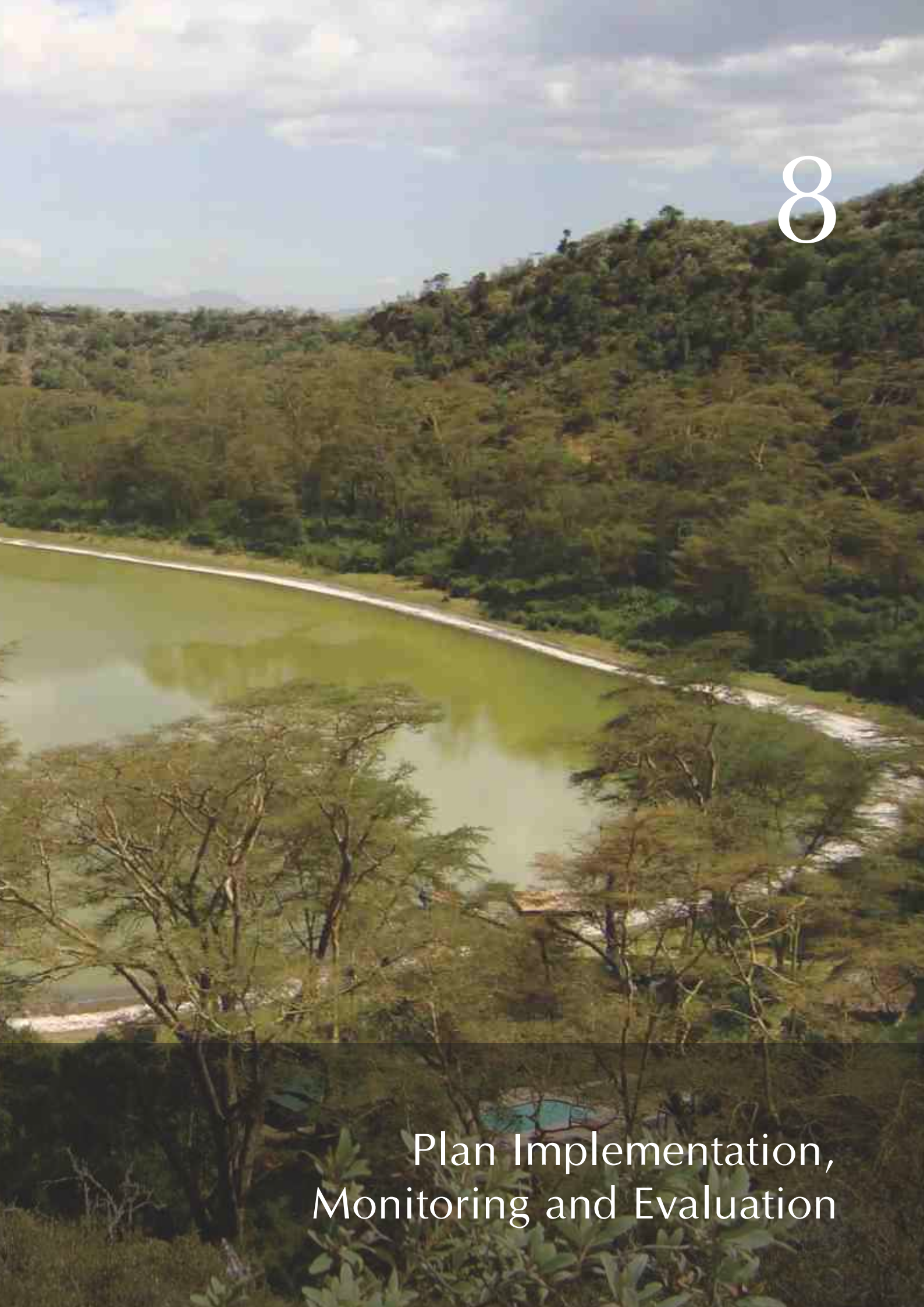
**Implementation Strategy: Urban Development**

| Management Action and Activities | | Persons / Institutions Responsible | Time Frame YEAR 1 (2012/4) | YEAR 2 (2014/8) | YEAR 3 (2018/22) |
|---|---|---|---|---|---|
| ***9.1 Develop and implement sound urban planning for the urban centres*** | | | | | |
| 9.1.1 | Review the physical plan /zoning by-laws through stakeholder participation | • Town Physical Planners, County Govt., All Counties (Market & Rural Centres) | X X X X | | |

| | | | YEAR 1 (2012/4) | | | | YEAR 2 (2014/8) | | | | YEAR 3 (2018/22) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9.1.2 | Enhance the capacity of the planning office to implement the physical plan | • Town Physical Planners, County Govt., All Counties (Market & Rural Centres) | X | X | X | X | X | X | X | X | X | X | X | X |
| 9.1.3 | Ensure compliance and enforcement of zoning by-laws | • County Govt., CEC | X | X | X | X | X | X | X | X | X | X | X | X |
| 9.1.4 | Promote public participation in urban plans implementation | • CED, County Govt. | X | X | X | X | X | X | X | X | X | X | X | X |
| ***9.2 Develop and implement a comprehensive integrated waste management plan in all urban centres*** | | | | | | | | | | | | | | |
| 9.2.1 | Designate and secure dumpsites | • County Govt, NEMA, & Private Companies | X | X | X | X | | | | | | | | |
| 9.2.2 | Establish well maintained treatment sewage systems | • NEMA, County Govt, Water Service Providers | X | X | X | X | | | | | | | | |
| 9.2.3 | Put up litter bins around the urban centres for solid waste | • Municipal Council of Naivasha, other Corporate Bodies | X | X | X | X | | | | | | | | |
| 9.2.4 | Establish private sector solid waste management (e.g. youths, CBOs, Individuals) | • County Govt, MoD&P | X | X | X | X | | | | | | | | |
| 9.2.5 | Enhance capacity of County Govt. in waste management | • NEMA, County Govt. | X | X | X | X | X | X | X | X | X | X | X | X |
| 9.2.6 | Promote clean-up campaigns | • CSOs, Schools, County Govt, Business Community | X | X | X | X | X | X | X | X | X | X | X | X |
| 9.2.7 | Install incinerators for hazardous wastes | • County Govt, MoH | X | X | X | X | | | | | | | | |
| 9.2.8 | Enhance the capacity of entrepreneurs to start waste management businesses e.g. recycling, composting and, incineration | • MoES&T, MoEW&NR, County Govt. | X | X | X | X | X | X | X | X | X | X | X | X |
| 9.2.9 | Ensure compliance and enforcement of waste management regulations | • NEMA, County Govt., MoH | X | X | X | X | X | X | X | X | X | X | X | X |
| ***9.3 Promote urban forestry*** | | | | | | | | | | | | | | |
| 9.3.1 | Awareness creation on urban forestry | • KFS, NMC, School, Business Communit | X | X | X | X | X | X | X | X | X | X | X | X |
| 9.3.2 | Develop and initiate urban forestry programme | • KFS, County Govt, School, Business Community | X | X | X | X | X | X | X | X | X | X | X | X |

| | | | YEAR 1 (2012/4) | | | | YEAR 2 (2014/8) | | | | YEAR 3 (2018/22) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9.3.3 | Enhance enforcement of by-laws on livestock in urban areas | • County Govt. | X | X | X | X | X | X | X | X | X | X | X | X |
| 9.3.4 | Review environmental by-Laws | • County Govt. | X | X | X | X | | | | | | | | |
| ***9.4 Develop an urban recreation and conservation parks plan for all urban centres*** | | | | | | | | | | | | | | |
| 9.4.1 | Establish and maintain public parks | • County Govt., KFS, Public Works | X | X | X | X | X | X | X | X | X | X | X | X |
| 9.4.2 | Gazettement of public parks | • County Govt, KFS, MoLH&UD, MoLH&UD | X | X | X | X | | | | | | | | |
| ***9.5 Enforcement of EMCA regulations in urban development*** | | | | | | | | | | | | | | |
| 9.5.1 | Subject the IMP to strategic environmental assessment | • Naivasha CSO Forum, NEMA | X | X | X | X | | | | | | | | |
| 9.5.2 | Create awareness on EMCA regulations including EIA and EA procedures | • NEMA, County Govt, Proponents, CSOs, Env. Experts, Lead Agencies | X | X | X | X | X | X | X | X | X | X | X | X |
| 9.5.3 | Ensure compliance and enforcement of EMCA regulations | • NEMA, MoLH&UD, MoH | X | X | X | X | X | X | X | X | X | X | X | X |
| 9.5.4 | Capacity building of the District Environment Committees | • NEMA, County Govt., CSOs, Business Community, Lead agencies | X | X | X | X | X | X | X | X | X | X | X | X |
| 9.5.5 | Develop State of Environment Report for the Lake Naivasha Basin | • NEMA, County Govt., CSOs, Business community, Lead agencies | X | X | X | X | | | | | | | | |
| ***9.6 Ensure proper design and installation of urban drainage to minimize the risk of urban flood disasters*** | | | | | | | | | | | | | | |
| 9.6.1 | Develop drainage system plans and review with time | • County Govt. , Physical Planning Office, Urban Property Owners | X | X | X | X | | | | | | | | |
| 9.6.2 | Construct well planned drainage systems | • County Govt. , Physical Planning Office, Urban Property Owners | X | X | X | X | X | X | X | X | | | | |
| 9.6.3 | Encourage roof water catchment in the urban centres | • County Govt. , Physical Planning Office, Urban Property Owners | X | X | X | X | X | X | X | X | X | X | X | X |
| 9.6.4 | Establish constructed wetlands/pans | • County Govt. , Physical Planning Office, Urban Property Owners | X | X | X | X | X | X | X | X | | | | |
| 9.6.5 | Promote water harvesting in the L. Naivasha catchment | • County Govt. , Physical Planning Office, Urban Property Owners | X | X | X | X | X | X | X | X | X | X | X | X |

| | | | YEAR 1 (2012/4) | | | | YEAR 2 (2014/8) | | | | YEAR 3 (2018/22) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***9.7 Build capacity for urban disaster management*** | | | | | | | | | | | | | | |
| 9.7.1 | Enhance capacity of the Districts and local disaster management committees | • CA. & Line Ministries, NEMA, Private sector, County Disaster Management Committee | X | X | X | X | X | X | X | X | X | X | X | X |
| 9.7.2 | Develop a disaster management strategic plan | • CA. & Line Ministries, NEMA, Private sector, County Disaster Management Committee | X | X | X | X | | | | | | | | |
| 9.7.3 | Develop a resource mobilization strategy | • County Disaster Management Committee | X | X | X | X | | | | | | | | |
| 9.7.3 | Centralize registry of available resources Inventory | • County Disaster Management Committee, CA | X | X | X | X | | | | | | | | |
| 9.7.4 | Public education and awareness on disaster management | • County Disaster Management Committee, CSO's, CBOs, Business Community | X | X | X | X | X | X | X | X | X | X | X | X |



# 8

# Plan Implementation, Monitoring and Evaluation

The IMP implementation will be undertaken by agencies based on the sector plans in this management plan. The Imarisha-Naivasha Board will provide a coordinating role in this management plan while the implementation committee oversees successful execution of the plan.

**Monitoring and Evaluation (M&E)**

Monitoring and evaluation of the management plan will be a continuous activity following adaptive management approaches. The M&E component essentially provides a basis for correction, adjustments and improvements to the proposed goals, targeted activities and assessment of the achievements attained. The guiding principle for the whole process will target maintenance of multi-functionality values of the ecosystems of the basin including the integration of development agenda / investments with conservation and finally ensuring full involvement of all basin-dependent stakeholders. During this stage, problems encountered in implementation of planned activities are identified and strategies to address them outlined. Notwithstanding, a reflection of the past is made in a bid to making the future successful.

**Method of Monitoring and Evaluation**

A monitoring and evaluation plan will be designed and reviewed regularly for the purpose of this management plan. Monitoring will be continuous throughout the plan period. A logical framework will be institutionalized to guide monitoring and evaluation. Monitoring indicators will be clearly stated in the implementation/action plans. Evaluation will be undertaken every two years in order to assess the progress and achievements in the implementation of the plan activities. The evaluation will also help to address the constraints encountered during the implementation of the plan.

Issues to be monitored and evaluated include:

i). The extent of acceptance of the management plan among the stakeholders
ii). The response to education and awareness initiatives
iii). Implementation of activities by synthesizing progress reports, work plans, and stakeholder involvement and participation
iv). Impacts of management prescriptions
v). Environmental status of the lake and its catchment through the use of biological, physical, social and economic indicators.
vi). Budget allocations, expenditure and accounting procedures

Monitoring and evaluation indicators will be identified, quantified, qualified and verified for the different management activities to assess the progress and achievements of the set targets in the management plan.

**Responsibilities**

The implementing agencies will be responsible for the monitoring and evaluation of their activities. It should be noted that for each action and activities in the management plan, responsibilities have been assigned to particular institutions or stakeholders.

**Resources mobilization**

Substantial funds will be required for the implementation of the activities proposed in the plan. Imarisha-Naivasha Board will take the lead role in mobilizing resources for the implementation of activities in the plan. However, each implementing institution will be responsible for mobilizing resources to implement their specific activities.

**Sustainability**

During the management plan implementation period the capacity and governance of the participating institutions will be enhanced to ensure sustainability. The implementation of the plan will be based on the existing institutional structures.

**Review of the IMP**

This will be carried out at mid-term and at the end

of the plan period to incorporate emerging issues, revise targets, implementation strategies and timeframes, future direction and community perspective on the IMP. During this review:

- trends and threats will be assessed against the objectives of the IMP strategies
- existing action plans and other management plans and strategies relevant to the IMP will be identified and assessed for their effectiveness, relevance, and impact on resources management
- gaps in IMP and strategies will be identified and addressed
- IMP strategies will be analyzed taking cognizance of the relevant historical, social, cultural, political and economic contexts in which they apply
- consultation with stakeholders will be undertaken to ensure support for implementation of adjusted plan's strategies
- issues identified will be resolved taking into consideration the views of stakeholders

**Disputes**

In the events of disputes concerning this plan, the Ministry responsible for environmental issues will provide the dispute resolution framework.

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# Appendices

**APPENDIX I**

**List of Tables**



**APPENDIX II**

**List of Figures**

# Technical Team Profiles

## Prof. George Otiang'a-Owiti

Prof. George Otiang'a-Owiti is a seasoned leader with wide range of experience having served in various leadership positions at the University of Nairobi successfully for over 30 years. He subsequently moved to be at the helm of the Kenya Wildlife Service Training Institute as the Principal since 2001 and steered its growth in terms of programs development, trainee enrollment and overall revenue generation. He is an astute scholar as evidenced by the over 35 publications to his name. He has been a DANIDA and JICA expert at the Sokoine University of Agriculture in Morogoro, Tanzania and the University of Zambia in Lusaka, Zambia respectively. His research and academic prowess saw him clinch the prestigious Senior Fulbright Fellowship in 1995/96 and has been a member of various consultancies. Besides research, he is very passionate about teaching and mentoring his staff and trainees through supervision and evaluation.

Prof. Owiti has chaired the Eastern and Southern Africa Sub-Regional Training Board for UNEP/GEF AEWA Flyways Projects-Wings over Wetlands Project from 2007-2009. He sits in the Board of the College of African Wildlife Management at Mweka in Tanzania. He has been a Board member and an Evaluator for the Wetlands and Poverty Reduction Program for Wetlands International Africa Program between 2006 and 2009.

Professionally, he is a Veterinarian and a Reproductive Morphologist with both a B.Vet. Med. and MSc from University of Nairobi, and a PhD from University of California-Davis USA. In the last 13 years, he has veered away from the topics dealt with in his theses and dug into the fields of Ecosystem Health and Natural Resources Management. He was the Lead Facilitator in the development of this Management Plan.

## Roselyn Agumba Onyuro

Ms Onyuro is a trainer with vast experience in issues of natural resource management. She has trained various groups ranging from local communities to practitioners in wetlands management from within and without Kenya. With her background in education she takes pride in imparting knowledge and sharing experiences with a view to changing attitudes, behavior and building capacities in prudent natural resource use and management. She was instrumental in the review and development of the Diploma in Fisheries and Aquatic Sciences curriculum and the Craft Certificate in Aquaculture respectively at Kenya Wildlife Service Training Institute (KWSTI). She has a total of 19 years working experience as a trainer.

Ms Onyuro is a Hubert Humphrey fellow, a professional development fellowship program which she undertook at the University of California, Davis in 2012-2013. From this she gained experience and knowledge in Wetlands and Lake Ecosystems management from a global perspective.

She holds a Bachelor of Science degree in Education from Egerton University College and a Masters of Philosophy degree in Zoology-Ecology, from Moi University College. She has also evolved into an administrator over the years and is articulating this at KWSTI where she is the Registrar.

## Mbogo Kamau

Mr. Mbogo Kamau is currently working with Imarisha Naivasha as Technical Officer, Environment and Natural Resources Management. He has worked in the Naivasha Basin for over ten years with different institutions and in different capacities, promoting sustainable natural resources management and community livelihoods improvements. Among his diverse activities and involvement in the basin, he was instrumental in the implementation of the Naivasha Watershed Conservation and Management Project, funded by Community Development Trust Fund, which was geared towards environmental improvement through landscape restoration and ecosystem protection, sustainable natural resources utilization and development of alternative livelihoods support systems. He has extensively been involved in capacity building and awareness creation on environmental best practices and management within the basin.

Over the years he has developed a keen interest into Ecosystems structure and functioning, human influences and other forcing functions, and how these factors affect ecosystems stability, resources management and sustainability.

Mr. Mbogo has vast experience in integrated watersheds management, working with multi- disciplinary teams and in multi-sectoral partnerships. He has a Bachelor of Science degree and a Master of Science in hydrobiology degree, both from the University of Nairobi. He has also undertaken other additional professional trainings to advance his skills in Natural resources management. He has been very personate in advocating for processes that ensure strategic and participatory natural resources and watersheds management.

## Eva Chepkorir Malel

Mrs. Eva Chepkorir Malel is a trainer by profession in the field of Natural Resource Management currently working at KWS training Institute, Naivasha as a lecturer. She also coordinates certificate and short courses at the Institute. She has been involved in the development of curriculum for certificate and diploma programmes at the institute as an editor and a course panel member. She has facilitated seminars and workshops at national and regional levels. Before joining the institute, she worked with resource dependent communities and communities based organizations within Naivasha and Nakuru region. She mobilised communities for capacity building in natural resource laws, policy advocacy and to implement projects. The projects sought to enhance their livelihoods and participation in natural resource management.

Eva has keen interest in building capacity for individuals, communities and all stakeholders on natural resource management so that they can effectively participate in the management of environment and natural resources, to identify their problems, prioritize and identify solutions to the problems by developing a management strategy and to engage in policy making process.

She has a Bachelor of Science degree (Honours) in Natural Resource Management from Egerton University.


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