



**REPUBLIC OF KENYA**

**MINISTRY OF ENVIRONMENT AND MINERAL RESOURCES**

**NATIONAL ENVIRONMENT MANAGEMENT  
AUTHORITY**

**MWINGI DISTRICT**



**MWINGI DISTRICT  
ENVIRONMENT ACTION PLAN  
2009-2013**

## **EXECUTIVE SUMMARY**

Economic growth and environment are closely intertwined in Kenya. Environmental Action Planning is a tool that aims at enhancing the integration of environment into development planning. Mwingi District is not an exception and has to contend with these challenges with some being unique to the District. Challenges experienced in the District include poverty that has led to the over-use and destruction of environment. Continued reliance on trees for fuel and wetlands for farming and its resources has led to deforestation and wetland encroachment. Annual flooding continues to destroy lives, property and frustrate farming activities.

The DEAP highlights priority themes and activities for the District towards achieving sustainable development. The report is divided into section one and has eight chapters. Section one gives the challenges of sustainable development and also describes the rationale for and preparatory process of the DEAP.

Chapter one gives the introduction and presents the district's main profile covering the physical features, demographic, agro-ecological zones, and main environmental issues.

Chapter two describes the District's Environment and Natural resources of Land, Water, Biodiversity (forest, wildlife, and Dry lands biodiversity), wetlands and agriculture, livestock and fisheries. For each resource, major environmental issues, challenges and proposed interventions are identified.

Chapter four detail human settlements and infrastructures in Mwingi District covering situation analysis, challenges and proposed interventions. Environmental challenges addressed include; waste management, sanitation, pollution, diseases, land use, demand for water, energy, materials for construction, land policy and legislation, biodiversity loss and land tenure.

Chapter four addresses environmental aspects in trade, industry and services sectors. The key issues under this chapter are high pollution levels from industrial activities and weak enforcement of relevant legislations.

Chapter five discusses environmental hazards and disasters. The major hazards covered include; drought and famine (famine seasons have local names for instance in 1985 it was called "Nikwa

ngwete” to mean you have money but unable to buy food because the commodity is not in the market.

Environmental information, networking and technology are discussed in chapter six. It emerges that environmental information and networking technology have continued to receive scanty attention. In order to achieve sustainable environmental management, it is necessary to focus on raising awareness and enhancing public participation at all levels.

Governance, Policy and Legal Framework as well as Institutional arrangements are discussed in chapter Seven. The key issues addressed include; harmonization of environmental legislations and institutional mandates, incorporation of indigenous knowledge in environmental management. Chapter eight is the implementation Matrix.

## **FOREWORD**

The 1992 Earth Summit held in Rio de Janeiro came up with various recommendations, among them Agenda 21, a Global Environmental Action Plan. The theme of the Summit focused on how nations could attain sustainable development. The Government of Kenya embraced this idea by developing the first National Environment Action Plan (NEAP) in 1994.

Since independence, Kenya has continued to demonstrate her commitment to environmental management through various initiatives, among them the National Development Plans of 1974 and the National Environment Action Plan of 1994. Further, there have been a number of sectoral policies on environment in fields such as Agriculture, Livestock, Water, Energy, Food, Land, Wildlife, Forest, Industry, Trade, Arid Lands, Disaster Management and the Draft Sessional Paper No. 6 of 1999 on Environment and Development.

The Environmental Management and Coordination Act (EMCA, 1999) provides for the integration of environmental concerns in national policies, plans, programmes and projects. In this regard, EMCA 1999 provides for the formulation of National, Provincial and District Environment Action Plans every five years. Environmental Action Planning is a tool that aims at integrating environmental concerns into development planning. This EAP process was participatory, involving various stakeholders from institutions and sectors, including the public, private, NGOs and local communities at District, Provincial and National levels. These consultative meetings provided the basis for formulation of the PEAP and finally the National Environment Action Plan Framework.

The DEAP report addresses environmental issues from various sectors in an integrated manner and their significance in development planning. It proposes a strategy for achieving sustainable development in line with Kenya's quest to meet the Millennium Development Goals (MDGs) Vision 2030 and Medium Term Plan (MTP). The report has brought out a number of proposed interventions, legal and institutional framework to be incorporated into sectoral development plans and programmes. Its implementation will be monitored through the Annual State of the Environment Reporting. I wish to underscore that the 2009-2013 DEAP report is a broad-based strategy that will enable the district attain sustainable development as envisaged in Vision 2030.

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## **ACKNOWLEDGEMENT**

I acknowledge with great appreciation the completion of the first Mwingi District Action Plan report for 2009-2013. The report, which identified and documented environmental challenges in the District, is a milestone in sustainable socio-economic development for our District. This is in fulfillment of requirements under Environmental Management and Coordination Act of 1999.

I take this opportunity to thank all who contributed towards the successful preparation of this important document. The report will act as a reference material and source of inspiration for all Kenyans of good will for environmental conservation. It will form a basis for any environmental interventions in the District in the future. All the persons who took part in its production should feel appreciated.

First, I wish to thank all members of the District Environment Action Plan Committee who tirelessly collected information and prepared write-ups, which formed part of the report. Their commitment to this process succeeded in producing this document. I wish also to thank the District Environment Officer (Mrs Patricia Mumbi) who was given the task of coordinating the exercise by collecting the write-ups, compiling the document and presenting it to the committee and to the National Environment Action Plan Committee. She kept the committee informed of the progress and required support to enable compilation of the report.

The support from Director General of NEMA cannot be underestimated through provision of resources for enabling the exercise completed smoothly. Although the funds were not adequate, the little fund that was availed enabled the preparation of the report. The Director, department of research and planning of NEMA is recognized for giving the necessary technical information, which the committee needed for the execution of their work through training and provision of written material for the purpose.

A word of gratitude is also passed on to the Director of Environment Eastern Province for continuous technical support given to entire DEAP committee which, enabled timely completion of the District Environment Action Plan whose contents formed part of the Provincial Environment Action Plan Eastern.

The NEMA board of management should be appreciated for allocating and voting for funds for the preparation of the Action Plan for Mwingi District Action Plan among others

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# TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY .....</b>	<b>i</b>
<b>FOREWORD.....</b>	<b>iii</b>
<b>ACKNOWLEDGEMENT.....</b>	<b>iv</b>
<b>TABLE OF CONTENTS .....</b>	<b>vi</b>
<b>LIST OF TABLES.....</b>	<b>ix</b>
<b>ACRONYMS.....</b>	<b>x</b>
<b>CHAPTER ONE.....</b>	<b>1</b>
1.0 Introduction .....	1
1.1 Preamble .....	1
1.1.1 E.M.C.A (1999) Provision on Environmental Planning.....	2
1.2 The environmental action planning process .....	2
1.3 District profile.....	3
1.3.1 Geographical Location, Size and Administrative Units .....	3
1.3.2 Administrative.....	3
1.3.3 Topography .....	3
1.3.4 Climate.....	3
1.3.5 Population Size and Distribution.....	4
<b>CHAPTER TWO .....</b>	<b>7</b>
2.0 Environment and natural resources .....	7
2.1 Soils and land use .....	7
2.1.1 Soils.....	7
2.2 Land and Land Use Changes .....	8
2.3 Water resources .....	10

2.4 Biodiversity conservation .....	11
2.5 Forestry and wild life.....	12
2.5.1 Forestry .....	12
2.5.2 Wildlife Resources .....	22
2.6. Agriculture, livestock and fisheries .....	23
2.6.1 Agriculture .....	23
2.6.2 Livestock .....	24
2.6.3 Fisheries .....	26
<b>CHAPTER THREE.....</b>	<b>29</b>
3.0 Human settlements and infrastructure .....	29
3.1 Human settlements .....	29
3.2 Population density by division .....	32
3.3 Human and environmental health .....	33
<b>CHAPTER FOUR.....</b>	<b>38</b>
4.0 Industry, trade and services .....	38
4.1 Industrial sector .....	38
4.2 Trade sector .....	38
4.3 Services sector .....	40
4.4 Tourism.....	41
4.5 Mining and quarrying .....	41
4.6 Quarrying and Sand harvesting .....	42
4.7 Quarrying.....	44
<b>CHAPTER FIVE.....</b>	<b>46</b>
5.0 Enviromental harzards and disasters .....	46
5.1. Overview .....	46



<b>CHAPTER SIX.....</b>	<b>49</b>
6.0 environment education, information and technology .....	49
6.1 status of environmental education .....	49
6.1.2 Non- formal Environmental Programs .....	50
6.1.3 Public Awareness and Participation .....	50
6.2 Environmental Information and Communication Technology .....	52
6.2.1 Types and sources of environmental information .....	52
6.2.2 Information and Data Types in the district.....	53
6.2.3 Status of environmental information management systems.....	54
<b>CHAPTER SEVEN.....</b>	<b>56</b>
7.0 Status of environmental governance and institutional frameworks.....	56
7.1 Overview.....	56
7.2 EMCA Structures for Environmental Management .....	56
7.3 Other Players in Environmental Governance .....	58
<b>CHAPTER EIGHT.....</b>	<b>61</b>
8.0 Implementation strategy .....	61
8.1 Overview .....	61

## LIST OF TABLES

TABLE 1: POPULATION DENSITIES PER LOCATION IN MWINGI DISTRICT .....	5
TABLE 2: DISTRIBUTION, USE AND DEGRADATION STATUS OF THE MAJOR SOIL TYPES .....	7
TABLE 3 .....	8
TABLE 4: PRIORITY ISSUES AND INTERVENTIONS.....	9
TABLE 5: MWINGI DISTRICT LAND USE .....	14
TABLE 6: DESCRIPTION ON LAND CLEARANCE.....	15
DIVISION AND ADJUDICATION OF TRUST LAND IS ON-GOING. TABLE 5 GIVES AN ESTIMATION OF REMAINING TRUST LAND, AND TABLE 5 GIVES MORE DETAILS ON THAT ESTIMATION, PER DIVISION. GAZETTED AREAS OCCUPY ABOUT 23,500 HA, AND THE NORTH KITUI RESERVE 74,500 HA. TABLE 7: FOREST AREA BY LEGAL STATUS.....	
TABLE 8 .....	16
TABLE 9: FOREST UNDER KENYA FORESTRY SERVICE (KFS) .....	17
TABLE 10: FORESTS UNDER TRUST LAND, PER DIVISION.....	18
TABLE 11: FOREST INDUSTRIES IN MWINGI DISTRICT.....	21
TABLE 12: VARIOUS SOURCES OF FUEL AS AN APPROXIMATE PERCENTAGE OF TOTAL POPULATION .....	27
TABLE 13: POPULATION PROJECTIONS.....	30
TABLE 14: POPULATION DENSITY BY DIVISION.....	32
TABLE 15 .....	33
TABLE 16: WATER AND SANITATION .....	34
TABLE 17 .....	35
TABLE 18 .....	43
TABLE 19 .....	50
TABLE 20: STATUS OF ENVIRONMENTAL AWARENESS AND PARTICIPATION IN THE DISTRICT.....	51
TABLE 21: INFORMATION AND DATA.....	53
TABLE 22: LEGISLATION THAT IMPACT ON HUMAN HEALTH AND ENVIRONMENT QUALITY .....	58
TABLE 23: IMPLEMENTATION MATRIX .....	65

## **ACRONYMS**

CBO -Committee Based Organization

DDO -District Development Office

DDP - District Development Plan

DEAP -District Environment Action Plan

DEO -District Environment Officers

EMCA Environment Management Coordination Act, No. 8 of 1999

EMS -Environmental Management System

ERSW & EC - Economic Recovery Strategy for Wealth and Employment Creation

GDP -Gross Domestic Product

GIS -Geographical Information System

MDGs -Millennium Development Goals

MEAs -Multilateral Environmental Agreements

NBI -Nile Basin Initiative

NDPs -National Development Plans

NEAP -National Environment Action Plan

NEAPC National Environmental Action Plan Committee

NEMA- National Environmental Management Authority

NEPAD -New partnership for Africa Development

NGOS -Non-Governmental Organizations

PDE -Provincial Directors of Environment

PEAP -Provincial Environment Action Plan

PRSP -Poverty Reduction Strategy Papers

SEA -Strategic Environment Assessment

TAC -Technical Advisory Committee

UNCED United Nations Conference on Environment and Development

UNDP -United Nations Development Programme

WAC (ICRAF)-World Agro Forestry Centre

WKIEMP Western Kenya Integrated Environment Management Project

WSSD -World Summit on Sustainable Development

# CHAPTER ONE

## 1.0 Introduction

### 1.1 Preamble

The United Nations Conference on Environment and Development (UNCED) commonly known as the Earth Summit held in Rio de Janeiro in 1992 aimed at improving the global environment, while ensuring that economic and social concerns are integrated into development planning. The Conference underscored the need to plan for sustainable socio-economic development by integrating environmental concerns into development through adopting and preparing appropriate policies, plans, programmes and projects. The Conference agreed on the guiding principles and a global plan of action (Global Environmental Action Plan) for sustainable development commonly called Agenda 21.

Sustainable development is commonly defined as “development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs”. Development is also said to be sustainable if it meets ecological, economic and equity needs. The process of attaining sustainable development calls for the integration of environmental considerations at all levels of decision making in development planning and implementation of programmes and projects.

The theme of the Summit was on how nations could attain the sustainable development objective. The Government of Kenya embraced this noble idea when it developed the first National Environment Action Plan (NEAP) in 1994. The country also prepared the National Development Plan (1994-97) that ensured that there was not only a chapter on Environment and Natural Resources but also that environmental concerns were integrated in all the chapters of the Development Plan. Environmental Planning was thereafter well anchored in the Environment Management and Coordination Act (EMCA, 1999). (EMCA, 1999) provides for the integration of environmental concerns in national policies, plans, programmes and projects. In this regard, EMCA provides for the formulation of National, Provincial and District Environment Action Plans every five years.

### **1.1.1 E.M.C.A (1999) Provision on Environmental Planning**

The EMCA provides that every District Environment Committee shall every five years prepare a District Environment action plan in respect of the district for which it's appointed and shall submit such plan to the chairman of the provincial environment action plan committee for incorporation into provincial environment action plan as proposed under section 39.

## **1.2 The environmental action planning process**

### **DEAP Methodology**

The process started by holding regional workshops, which the DEAP Secretariat was appointed by the Director General in 2004. That comprised of a District Water Officer, District Development Officer (DDO) and District Environment Officer (DEO) to attend an induction course on the DEAP methodology. The District Environment Committee (DEC) members gazetted in 2003 were further requested to form a District Environment Action Planning Committee (Technical Committee comprising lead agencies and representatives from other stakeholders), chaired by the DDO and the DEO is the secretary. Once the draft DEAP is prepared, the DEC approves and submits to the Provincial Environment Committee for inclusion in the Provincial Environment Action Plan.

### **Objectives of District Environment Action Plans**

The objectives of District Environment Action Planning include the following:

- To determine the major environmental issues and challenges facing the districts
- To identify environmental management opportunities
- To create synergy and harmony in environmental planning
- To integrate environmental concerns into social, economic planning and development of the district
- To formulate appropriate environmental management strategies specific to the district

## **Scope**

The preparation of the Mwingi DEAP has been realigned with Vision 2030, Midterm Plan 2008-2012 as directed by the government. The current DEAP covers the period of 2009-2013 and as per EMCA shall be revised after every five years. The DEAP will be monitored by the annual preparation of the State of Environment Reports. The environmental indicators that have been developed in the implementation matrix will be monitored by the respective lead agencies on an annual basis and incorporated in the annual State of Environment Report. The National Steering Committee and the National Environment Action Planning Committee have approved the indicators.

## **1.3 District profile**

### **1.3.1 Geographical Location, Size and Administrative Units**

#### **1.3.2 Administrative**

Mwingi district was carved from Kitui district in 1992 and is part of the larger Ukambani region. The district is bordering Kitui district to the south, Mbeere and Machakos districts to the west, Tharaka district to the north-west and Tana River district to the east.

#### **1.3.3 Topography**

The district covers an area of 10,030 square kilometres. The topography of the district can be divided into hilly rugged uplands and lowlands. The general landscape is flat with a plain that gently rolls down towards the east and northeast where altitudes are as low as 400 meters. The few hills rise as inselbergs in the plains rising to an altitude of 1,747 meters above sea level. These isolated hills usually affect communication within the district and other neighbouring district.

#### **1.3.4 Climate**

The climate of Mwingi district is hot and dry for the greater part of the year. The district falls under two climatic zones: semi arid and arid. Most of the district is classified as arid. Temperatures are high throughout the year. The districts mean annual temperatures range between 26 degrees centigrade and 34 degrees centigrade. The minimum mean annual temperatures in the district vary between 14 and 22 degrees centigrade. The mean annual potential evaporation in central eastern and north-eastern the range is from 2200 to 2400mm. The bulk of the district falls within 2000 to 2200mm range.

The district has two rainy seasons with two peaks in March and May being the long rains and October to December being the short rains. The rest of the year is dry. The rainfall ranges from 800mm to 1400mm in most years. Rainfall is highly unpredictable from year to year.

The drainage system of Mwingi district is controlled by the Tana River catchments. The seasonal rivers within the district flow in a general north, north-west direction and drain into Tana River.

### **1.3.5 Population Size and Distribution**

Mwingi District is a homogeneous district inhabited mainly by Kambas. The district has a projects population of 330,110 for the year 2003 as per 1999 population census and is projected to rise to 337,081 in 2008, with a growth rate of 2.4%. It has an average population density of 30 persons per km<sup>2</sup>. More than 95% of this is rural based while 5% is the urban population of which, Mwingi town has 4% while the rest is distributed in other trading centre. Migwani is the most densely populated division (1010 persons per km<sup>2</sup>), followed by Central, Kyuso, Mui, Nuu, Mumoni, Tseikuru, Nguni, and finally Ngomeni, being the least populated (7 persons per km<sup>2</sup>). Table 1.1 shows the population projections per location.

Central Division registered the highest population, which stood at 83,687 in 1999 and is projected to increase to 103,864 by the year 2008. The high population can be attributed to urban status where Mwingi town is situated, as well as higher potential for agriculture, central division has a population density of 69 persons per km<sup>2</sup> and is projected to increase to 86 people per km<sup>2</sup> by the year 2008.

Ngomeni division has the least population of 10,712 and is projected to increase to 13,294 by the year 2008. The low population can be attributed to low and unreliable rainfall for cultivation. Ngomeni division is predominantly a livestock zone with a population density of 7 persons per km<sup>2</sup>. The district shows a very high prevalence of poverty, which is estimated at 80% with the poor residing in the driest division in the district namely: Tseikuru, Kyuso, Ngomeni, Nguni, and Nuu divisions. Migwani, Central, and Mui have least poverty prevalence.



**TABLE 1: POPULATION DENSITIES PER LOCATION IN MWINGI DISTRICT**

DIVISION	LOCATION	POPULATION	DENSITY (PERSONS PER SQ. KM.)
Central	Mwingi	34,751	75
	Mumbuni	14,202	
	Kiomo	16,893	
	Endui	7,140	
	Waita	11,846	
	Kanzanzu	6,097	
	TOTAL	90,929	
Migwani	Migwani	19,455	108
	Nguutani	17,715	
	Thitani	14,273	
	Kyomo	10,391	
	TOTAL	61,934	
Kyuso	Kyuso	10,419	108
	Kimangao	11,364	
	Mivukoni	8,266	
	Kamuwongo	7,186	
	TOTAL	37,235	
Mumoni	Tharaka	5,450	108
	Kanthungu	5,408	
	Kakuyu	19,318	

	Katse	6,903	
	Mutanda	3,778	
	TOTAL	40,857	
Nuu	Nuu	8,288	17
	Wingemi	8,916	
	Mutyangombe	5,774	
	TOTAL	22,978	
Mui	Mui	9,684	45
	Kalitini	7,062	
	TOTAL	16,746	
Tseikuru	Tseikuru	9,775	19
	Musavani	8,334	
	Masyungwa	7,605	
	TOTAL	25,714	
Nguni	Nguni	10,286	13
	Ukasi	11,895	
	TOTAL	22,181	
Ngomeni	Ngomeni	6,165	7
	Mitamisiyi	5,471	
	TOTAL	11,636	
MWINGI DISTRICT	TOTAL	330,110	

*Source District statistics office 2007*

## CHAPTER TWO

### 2.0 Environment and natural resources

#### 2.1 Soils and land use

##### 2.1.1 Soils

The District mainly covered by basement system rocks, which weather into soils of variable depth and texture and are rich in ferromagnesian minerals with a deep red color. Soils developed on gneisses rich in quartz have a lighter orange color and sandy loam to sandy clay loam textures. A characteristic of soils developed on basement complex (Luvisols, Acrisols, and Arenosols) is the tendency to form surface capping which makes them very susceptible to soil erosion. Rocks from parts of Nuu and Ngomeni volcanoes cover parts of western and northern parts of the district. Soils developed on these rocks are of variable depth and have stony surfaces. There are small pockets of black cotton soils (vertisols) in the district. The soil fertility ranges from low to moderate with low organic matter content.

**TABLE 2: DISTRIBUTION, USE AND DEGRADATION STATUS OF THE MAJOR SOIL TYPES**

Type of soils	Characteristics	Potential use	Current use	Degradation Hazards	Proposed Intervention
<b>Sandy clay loams (Ferrisols)</b>	-Shallow to deep -well drained	Crop production	Crop production	Medium-high erodibility	Soil Conservation
<b>Black cotton soil (vertisols)</b>	-Deep -Poorly drained -Difficult to work on when too dry or too wet.	Crop production	Crop production	Prone to gully formation	Soil Conservation
<b>Sandy loams</b>	-Shallow -Susceptible to surface capping -Low fertility	Grazing Crop production	Grazing Crop production	High erodibility	-Soil Conservation -Application of organic manure

*Source: District agriculture office 2007*

TABLE 3

In General	Hilly Steep Areas	Undulating and Flat Plains (Lowlands areas)
Sordity	Soil erosion	Soil compaction
Poor drainage	Low soil fertility	Water logging
Soil moisture content and low soil fertility	Low soil moisture content	Gulley erosion Sheet erosion

*Source: District Agriculture office, 2007*

## 2.2 Land and Land Use Changes

### Land Types and status of land use.

Increase in population has led to more intensive cultivation and also opening up of agricultural land in more fragile areas L5 and L6. It is estimated that 20% of farmers practice Shifting cultivation-while 80% practice Mixed farming-

### Emerging enterprises in the district includes:

- Production of horticultural crops in the irrigation schemes,
- Growing of mangoes and vegetables
- Emerging livestock systems include guinea-fowls rearing and production of silk worm.

### Impacts of land use changes

Land related issues include:

- Destruction of vegetation covers as a result of slash and burn method of opening up new land
- Decline in crop yields
- Increased land degradation/soil erosion
- Persistence of drought occurrence.
- Increased use of farm chemicals (fertilizers, pesticides) leading to increased water pollution.

**TABLE 4: PRIORITY ISSUES AND INTERVENTIONS**

Key environmental issues	Proposed Intervention	Responsible Institution
Regular drought	Set early warning systems	
overgrazing	Controlled grazing	Livestock production department
Soil erosion/land degradation	Rangeland rehabilitation Soil conservation	-Livestock production department. Agriculture
Riverbank erosion	Provision of proper watering points along the rivers Riverbank protection	- Livestock production department. Agriculture and Water dept.

## 2.3 Water resources

The drainage system of Mwingi district is controlled by the Tana River catchments. The seasonal rivers within the district flow in a general north, north-west direction and drain into Tana River.

The district has a few permanent streams, which flow from Mumoni and Nuu hills (five permanent springs being tapped now and some more still untapped). These run for a few kilometres and disappear, leaving dry beds. The Nuu hill complex has most springs in the district. Other hill complexes like Endui also have permanent springs, and are in danger of drying up if present trends of land clearing on the hill slopes continue. River Tana is the only permanent river, which divides Mwingi district with Mbeere, Tharaka and Nyambene district. There are several seasonal rivers, which flow during the rainy seasons.

Boreholes and wells in many cases produce saline water, all the more so in the lower and drier areas towards the north and the east of the district. Some under used sources of water are the slow moving flows of seasonal rivers, Nthunguthu and Katse. Kithyoko and Tyaa rivers are more saline.

### Key Environmental issues.

- Difficult access and ownership of water sources,
- poor management of water sources,
- low quality and salinity,
- encroachment into water catchment areas,
- Uncontrolled sand harvesting leading to declining water levels.

### Proposed interventions

- Rehabilitate existing water infrastructure (38 boreholes and De-silt 152 earth dams)
- Develop new water sources (Construct 38 New. earth dams Construct 38 New. Sand storage. Sink 516 shallow wells Develop 4 No. springs)
- Extend Mwingi-Kiambere, Maasinga Kitui distribution lines
- Construct a water canal from River Tana
- Enforce the Law on ownership of water sources

- Capacity building of water users on Operation and maintenance of water sources
- Protect water sources ,
- Rehabilitate water catchment areas,
- Enhancement of the Community Environmental health education

## 2.4 Biodiversity conservation

### Biodiversity data and information

The district has a rich diversity of plants and animal species most of the tree and shrub species are concentrated on hilltops especially Muumoni and Nuu hills. and along the river beds Some of the indigenous species such as *Ficus spp*, and *Melia volkensii* are being wiped-out in search for timber. Those that fall on private lands are threatened due to harvesting for timber and charcoal production. Hill top cultivation is also a threat to conservation of biological biodiversity.

### Key Environmental Issues.

- Unsustainable sand harvesting.
- soil erosion
- overgrazing
- Shifting cultivation/slash and burn method of land preparation which results in a lot of burning of vegetation
- Forest fires
- Overexploitation of some plants for charcoal/timber/basketry/weaving

## Proposed Interventions

- Educate communities on the dangers of shifting cultivation.
- Raise awareness on water and soil conservation
- Raise awareness on the importance of biological diversity
- Formation of community based conservation groups to protect and conserve the hilltops

## 2.5 Forestry and wild life

### 2.5.1 Forestry

Four hills namely Mumoni, Gaikuyu, Nuu and Imba were gazetted by the colonial government. Trust land and State land areas were also defined. The rest of the district is covered under forestry extension as far as forestry activities are concerned. Since most of the forest reserves are protected the bulk of work of the forest department in the district is in forest extension. The main focus has been to promote growing of tree seedlings, planting and caring of the same, conservation of the existing tree vegetation and promotion of the use of non-wood tree products.

Over the years, several bilateral projects and NGOs have assisted the Department: The World Food Programme/project was started in Mwingi in January 1997 and ended in June 1999. The objectives were, to assist forest department in reducing backlogs in replanting of harvested areas and silvicultural operations, to facilitate extension forestry in semi-arid areas for the benefit of agro-pastoralists and small-scale farmers involved in self-help activities, promote forestry among the rural poor as a source for employment,

Agricultural income activities and improvement of infrastructure in rural areas. This project worked with 16 women/self help groups in 1997 and the number of groups increased to 22 by June 1999 when the project ended. Number of seedlings produced was about 30,000 which were planted with about 45% survival.

**Kitui Integrated Development Program:** This was a bilateral program, which was sponsored by DANIDA and covered all government departments in Kitui/Mwingi. It started in 1993 and ended in 1995 and dealt mainly on extension services especially training the farmers on tree seedling production and farm forestry. They also assisted by providing vehicles and motorcycles to the department.



**Integrated Food Security Programme-Eastern (German Technical Cooperation GTZ):** This was a bilateral project in the Ministry of Agriculture in Mwingi and it assisted a few other departments like Forest Department. Mostly the areas covered were training of the farmers and extension agents on farm forestry and fruit tree propagation. The main objective of GTZ was improvement of food security in the district. It supported various self help groups with tree nursery inputs and scions for fruit trees.

**Action Aid Kenya:** This is an NGO, which operated in the northern part of the district (Tharaka) where they support various activities including one tree nursery and fruit tree seedling production. It also promoted conservation of the many hilltops found in the area, through awareness creation.

The Forest Department Extension Services have been on going in the district since the early 1970's and is involved in forestry activities in areas outside the government forests. The main activities include production of seedlings by farmers, groups or institutions and planting in the farms and public land.

### **Vegetation Types**

According to table 3, over half of Mwingi is occupied by pastures & woodlands that are not distinguishable from each other. About one third is dedicated to agriculture. This is only an approximation of the reality, as shifting cultivation is a dynamic process. Woodlands & pastures are mostly areas that are changing from trust land status towards freehold, and will be subject to agriculture in the future. Forests & Hills are gazetted areas, or set aside for forestry (some hills are plain rock outcrops).

TABLE 5: MWINGI DISTRICT LAND USE

Division	Total Area (ha)	Agriculture	Pasture & woodlands	Forests & Hills	National Parks & Reserves	Other
Central	117,800	65,400	47,300	4,000	-	1,100
Kyuso	80,100	48,060	31,258	480	-	303
Migwani	46,800	33,206	12,089	5	-	1,500
Mumooni	105,200	34,211	55,371	14,406	-	1,213
Ngomeni	162,000	42,750	77,950	18,603	22,350	347
Nguni	166,500	32,850	130,621	1,959	-	1,070
Nuu/Mui	171,000	34,200	119,600	16,450	-	750
Tseikuru	129,700	22,425	54,330	155	52,150	640
TOTAL (ha)	979,100	313,102	528,519	56,058	74,500	6,922
TOTAL (%)	100	32	54	6	8	1

Source: District Agriculture office, 2007

### Forest types

The vegetation usually consists of more than 10 meter tall trees with interlocking canopy cover of between 80% and 100%. The high forests occur on top of Mumoni hill which is above 1700 Masl. There exist plantations of exotic and indigenous species with few naturally occurring trees and shrubs. The plantations of exotic species are mainly *Cupressus lusitanica*, *pinus patula* and *eucalyptus tereticornis* among others. Cypress and pine do not do well because of drought and currently many are dying. Mumoni forest is dominated by scattered trees and shrubs on the lower slopes. The main species are *Acacia tortilis*, *A. mellifera*, *Balanites aegyptica*, *Terminalia brownie*, and a few *Melia volkensii*. On the upper elevations, small patches of rainforest are found,

dominated by *Cordia abyssinica*, *Croton megalocarpus*, *Albizia gummifera* and *Markhamia lutea*. Perennial grasses grow on the slopes.

Nuu hill has a steep terrain and is covered by shallow soils. The main tree species are *Acacia spp.*, *Balanites aegyptica*, *Terminalia brownie* and baobab. On upper slopes and along the water catchment courses, broad leaf species are found like *Ficus*, *Croton megalocarpus* and *Sterculia Africana*.

### Land Clearance

There are 4 categories of land clearance distinguished in a report on natural resources survey of Ukambani by consultants and DRSRS scientists as shown in table 4 below.

**TABLE 6: DESCRIPTION ON LAND CLEARANCE**

Land-use/Land-cover		Agro-ecological risk (AER) zones					
% land cleared	Land use type	Ex-tremely High	Very high	High	Moder-ately high	Moder-ately low	low
<10	Protection	I	II	III	IV	V	VI
10-50	Hunting/gathering	1	8		22	29	-
50-90	Grazing	2					6
>90	Mixed farming	3	11	18			
	Grazing	4					
	Mixed farming				27	34	
	Mixed farming	5	13				42

*Source: District Agriculture office, 2007*

**The four most important categories of land-use:**

**Less than 10%** cleared where the land use type is woodland protection as forest or park/reserve, hunting and gathering and grazing. This zone is extremely high agro-ecological risk zone and is unsuitable for settlement and farming, but the frontier of settlement has reached this zone and further expansion might be likely to cause irreversible destruction of the woodlands.

**Between 10-50%** cleared in which the land use type is mainly mixed farming and grazing. These two zones cover the majority areas of the district; they are also characterized by large farms in which shifting cultivation is still being practiced.

**Between 50-90%** cleared vegetation where mixed farming is the predominant land used.

**Over 90%** cleared where mixed farming is predominant of land use. Cover a relatively smaller part of the district and is found in the high potential parts of Migwani, Central and Kyuso Divisions.

### Forest Ownership

Division and adjudication of trust land is on-going. Table 5 gives an estimation of remaining trust land, and table 5 gives more details on that estimation, per division. Gazetted areas occupy about 23,500 ha, and the North Kitui Reserve 74,500 ha. Table 7: Forest area by legal status.

**TABLE 8**

Division	Gazetted	National Parks & reserves	Trust land
Central	-	-	4,000
Kyuso	-	-	480
Migwani	-	-	201
Mumooni	13,517	-	889
Ngomeni	-	22,350	303
Nguni	1,247	-	712
Nuu/Muui	8,826	-	10,242
Tseikuru	-	52,150	155

### Government Forests

In Mumoni hills there are some plantations (132 ha), but no silvicultural practice has ever been applied. Some stands are mature but there is little possibility for exploitation due to the absence of an access road. Other gazetted hills benefit from guards, as Nuu hill, but no other management is being practiced. Mu-taitho and Kyui hills in Nuu and Mui division are currently in the process of gazettment.

**TABLE 9: FOREST UNDER KENYA FORESTRY SERVICE (KFS)**

Name	Area (ha)	Division
Maai	515.00	Nguni
Imba/Chakuyu	732.00	Nguni
Mumoni	10,422.90	Mumoni
Gaikuyu	3,075.60	Mumoni
Nuu	3,532.90	Nuu
TOTAL	18,278.40	

*Source: District forestry office Mwingi 2007*

### Trust land Forests

Kea Hill in Migwani division has 201.3 ha, of which most have been cleared and only 2 ha of tree cover on its top are left. The hill should be completely replanted, managed as a catchment area and proposed for gazettment. Nuu Hill is half gazetted, and half owned by the County Council. Table 7 below documents area coverage of forest under trust land ownership in the district per division.

TABLE 10: FORESTS UNDER TRUST LAND, PER DIVISION

Division	Name	Area (ha)	Remarks
L Central	Kiormo rock	600	
	Endui	2,400	
	Mbaika-Enziu	1,000	
Sub-total		4,000	
2 Kyuso	Ngai	100	Rocky
	Twimyua	50	Vegetated & rocky
	Ngeyani	70	Vegetated
	Ngaai	100	Under cultivation & vegetation
	Kasyathyu	80	Vegetated
	Kyuso	50	Rocky
	Kimangao	30	Rocky
Sub-total		480	
3.Migwani	Kea hill	201	15 ha planted 98,5 ha natural forest
4.Mumoni	Kagundu	204	encroachment, future water, grazing
	Kamuwongo	275	same
	Kyuga	340	same
	Itinda rock	70	rocky
Sub-total		889	
5 Ngomeni	Maabila	100	Vegetated, insecure
	Ngomeni rock	200	

Sub-total		300	
6 Nguni	Ndiamumo	52	Some try to possess it, densely vegetated, catchment of Enziu river  Very rocky  Catchment of Enziu river, grazing  Same
	Munga	86	
	Mathiakani	217	
	Kamuthengi	263	
	Kianguli	94	
Sub-total		712	
7 Nuu	Mulatya	166	
	Kanungu	130	
	Tumbole/Kasasi	727	
	Mukogu, Mu-taitho	3,000	
	Kaai	38	
	Evia	86	
	Kamue	6,000	
	Wemanzi, Mutukya, Kyui		
Sub-total		10,242	
8 Tseikuru	Kangalai	20	
	Tseikuru	25	
	Tsirietumo	100	

	Kithitya	10	
Sub-total		155	
Grand total		16,979	

### State lands

The eastern side of the district is state lands, of which the northern part became the Mwingi North National Reserve (74,500 ha), in 1979. Sosoma Cooperative Society was allocated another 126,000 ha in 1991, in the southern part of the district to act as a ranch. The remainder is a wide strip, between the two mentioned areas.

### Free Hold

Land adjudication is most advanced in Migwani and Central divisions and free hold lands are common. Except for the two divisions, tree planting in the district is not well developed, on account of a still abundant presence of natural tree vegetation, and because of planting problems related to drought, goats and termites.

Trees planting in Migwani, in farms is done in form of agro forestry, boundary marking; contour planting. This is also the division where there is shortage of wood fuel, as only half of the families might be able to produce a minimum of 2m<sup>3</sup> of fuel wood a year, while consumption is at least 3m<sup>3</sup>. Pole production is minimal and very deficient.

In dry divisions, like Nguni, where shifting cultivation is practiced on a large scale, people slowly take up planting. Otherwise, they have exempted from feeling naturally growing trees like *Acacia tortilis*, *A. mellifera* and *Tamarindus indica*. An important use for natural woodlots maintained on farms, is grazing. Management of *Melia volkensii* is practiced traditionally through pruning and pollarding. Multiplication is mostly through wildlings.

### Forest Industry and Markets

There are no major forest industries in the district, like sawmills. There are only small-scale workshops in each trading/commercial centre, as detailed in table 8. Each employing 3-4 people on average. Some jua



kali exists in Mwingi town and other centres (21 journey workshops in Migwani division), and a little wood carving.

**TABLE 11: FOREST INDUSTRIES IN MWINGI DISTRICT**

Division	Number of workshops
Central	10
Kyuso	12
Migwani	5
Mumoni	4
Ngomeni	3
Nguni	3
Nuu/Muui	2
Tseikuru	1
TOTAL	40

*Source: DFO Mwingi 2007*

Pit sawing is done on a small scale in natural woodlands in Nguni. Most of the wood in joinery workshops comes from outside the district, a part from some *Mellea volkensii* which is pit sawn

Basketry is based on sisal and baobab fibres. Bricks are produced on a domestic basis, when need arises. Wood used to fire the kiln is from *Delonix elata*, *Acacia tortilis*, and *Balanites aegyptiaca*. Three cubic meters of wood are needed to produce 5,000 bricks.

Tree products frequently sold are: pods from *Acacia tortilis* (Ksh 40-90/bag), honey (from *Acacia* and other species), fruits from baobab (Ksh 60/bag in Nguni), tamarind pods (Ksh 15/kg in Nguni) and others (*Vitex doniana*). Fodder, mostly pods from *A. tortilis*, appears to be a growing market, with the bulk sold to Mombasa and Garissa.

### **Key environmental issues**

- Encroachment into the forest reserves
- Deforestation
- Loss of biodiversity
- Low levels of awareness on modern agro-forestry practices
- Forest fires

### **Proposed interventions**

- Re-afforestation
- Raise awareness on modern agro-forestry practices
- Delineation of forest boundaries.
- Creation of fire breaks within the forest and acquire modern fire fighting equipment.

## **2.5.2 Wildlife Resources**

Wildlife: Strategic challenges

Wildlife/human conflicts, poaching for meat and trophies, disease transmission from wildlife to livestock, poor infrastructure and insecurity around tourism sites are the key strategic challenges in realizing potential in the district. The list below presents the problems affecting wildlife based livelihoods in the district.

### **Key Environmental Issues**

- Insufficiency in the implementation of the policy on community wildlife management;
- Human - wildlife conflicts on farmlands within the precincts of protected areas
- Loss of habitat due excessive removal of vegetation;
- Wildlife poaching;

## Proposed Interventions

- Encourage community participation in design and implementation of protected area management plans.
- Carry out rigorous problem animal Control to reduce human / wildlife conflicts
- Carry-out anti-poaching activities and prosecute offenders.
- Promote land uses that are compatible with wildlife conservation to reduce conflicts
- Establish community conservation areas/ sanctuaries for tourism
- Community awareness and education programs for both communities and schools on proper use and conservation of environmental resources.

## 2.6. Agriculture, livestock and fisheries

### 2.6 1 Agriculture

Mwingi district is categorized as an ASAL district within 6 agro-ecological zones, namely UM 3-4, UM4, LM4, 4M5, IL5 and IL6. Mixed crop and livestock production is the mainstay of the community, with the balance between the two production systems being determined by the agro-ecological potential.

Subsistence production is the main activity. Food crops grown include maize, sorghum, millet, beans, cow-peas, green grams, and pigeon and dolichos lablab. Cash crops include cotton, sunflower and some coffee (sold as mbuni); green grams are normally grown for commercial purposes.

Access to markets is fair except that poor infrastructure hinders the availability of market information and takes its toll on transportation means (roads network)

### Key environmental issues

- Encroachment of river banks
- Soil erosion
- Water contamination from pesticides

### **Proposed interventions**

- Promote soil and water conservation measures such as fanya juu's retention ditches, diversion, unploughed strips and trash lines.
- Riverbank protection should be emphasized
- Encourage integrated pest management practices

### **2.6.2 Livestock**

The Kamba traditionally are a pastoralist community but this is slowly changing with more people relying on agro-pastoralism. Livestock rearing nonetheless remains an important production system in the district. Key livestock species are cattle and goats.

### **Strategic challenges**

The following are the strategic constraints in the sustainable management of livestock in the district.

#### **Diseases and pests**

Diseases and pests are another challenge. The district has limited access to veterinary services both private and government in part due to poor physical infrastructure which makes communication difficult. The private sector providers of these services are largely uninterested in the district as demand for their services tends to be low and the supporting infrastructure poor. Emphasis has to be laid on traditional knowledge and building the capacity of Community Based Animal Health Workers (CBAHWs) to fill lacuna.

#### **Poor physical and industrial infrastructure**

Though Mwingi town is the frontier district to the north eastern part of Kenya, it has not been able to take full advantage of this strategic location due to poor energy, telecommunication and road infrastructure. This has dampened the capacity for value addition in the district for livestock-based products. Mwingi thus remains primarily a market for live animals.

#### **Insecurity and conflict**

Conflict and insecurity, especially along the Tana River border is rife and this has negatively impacted on the ability of the district to grow its livestock sector.

### **Cultural attitude to cattle**

Cattle are given a lot of social value thus down playing their commercial value. Commercial orientation with regard to livestock is thus limited in the households. The effect is that household livelihood security can be jeopardized even when the family has livestock.

### **Strategic opportunities and potential impact**

Mwingi's key strength in the livestock marketing sector lies in its strategic location at the frontier of the vast livestock rich north east of Kenya. It is also close to Nairobi, the country's largest consumer market of livestock and livestock products. With appropriate infrastructure, the capacity for value addition is real. And the impact would be to support a viable and sustainable livelihood option based on a product that is easily available in the district and beyond – livestock.

The destruction of vegetation cover has led to a vegetation succession that cannot effectively and firmly hold the soil and has encouraged the emergence of other species which are inferior both in terms of palatability and effective material for soil cover, hence decrease in biodiversity. Socio-economically, livestock plays an important role as they act as source of ready cash to pay school fees and meet family food requirements especially during famine and grain shortage. This also applies to goats; however, goats are known to be environmentally destructive and should be confined to reduce destruction.

### **Key environmental issues**

- Low productivity and inadequate control of livestock diseases,
- Lack of water for animal use
- Poor livestock husbandry
- Overgrazing;
- Soil and gully erosion.
- loss of Biodiversity

## Proposed Interventions

- Promote use of improved animal breeds.
- Strengthen disease control measures.
- Construct and rehabilitate cattle dips.
- Develop dams and borehole for domestic and animal use.
- Promote appropriate livestock management systems
- Rehabilitation of degraded sites.

### 2.6.3 Fisheries

Fishing is a commercial activity in Kiambere Dam while Katooni on the Mwingi side is used as a fish landing beach. The fishing vessels used here are mainly bar-paddled wooden boats. "Foot Fishermen" are scattered along the shores of the dam and along the Tana River (River line fishery). The fishing gears used include gills nets, traditional traps (ukoono) rod and line.

Although the district produces a substantial amount of fish, the bulk of it is sold outside the district and only a small %age is consumed in the district. This is because of the eating habits of the local people. To improve the fishing industry in the district fishing methods and marketing systems should be improved. This will increase fish landing in the district.

It should be noted that the development of aquaculture in the district is hindered by the absence of permanent water, lack of transport to cover the vast district and shortage of fisheries extension officers.

#### Key environmental issues:

- Soil erosion/ land degradation
- Poor use of modern agricultural technology,
- Encroachment into water catchment areas

**Proposed Interventions:**

- Promote use of appropriate technology;
- Promote low cost agricultural inputs; facilitate access to credit;
- Capacity building for proper storage facilities at farm level.
- Improve access to markets by improving infrastructure.

**Types and status of Energy Sources**

The main types of energy in the district are:

- Fuel wood- mainly in form of firewood in rural areas while in urban canters, charcoal dominates.
- Petroleum products-kerosene, liquefied petroleum gas (LPG), motor gasoline, diesel oil and fuel oil.
- Electricity- only a small part of the district is connected to the national grid.
- Alternative sources of energy- large but untapped.

**Status of Energy Sources**

The table below gives the status of the various sources of fuel as an approximate percentage of total population

**TABLE 12: VARIOUS SOURCES OF FUEL AS AN APPROXIMATE PERCENTAGE OF TOTAL POPULATION**

Source of Energy	% of Households with Access
Fuel wood	100%
Petroleum products (mainly kerosene for lighting)	95%
Solar	2%
Electricity	2%

**Trends in Energy Production, Consumption Costs and Projections.**

As the population increases in the district, demand for the various sources of energy is set to rise. However due to the high cost of conventional sources of energy including electricity and petroleum products, pressure is going to increase wood fuel and the alternative sources of energy. There will therefore be need to ensure that adequate supplies of wood are available to satisfy demand through sustained yields, while at the same time conserving the environment. This can be done through encouraging use of improved cooking stoves and intensified social (farm) forestry practices, currently being promoted by the departments of agriculture, forestry, and ICIPE.

**Key Environmental Issues**

- Deforestation mainly as a result of charcoal burning
- Spillage of fuel and used motor oils from garages and fuel depots
- Gaseous emissions from the combustion of energy fuels

**Proposed interventions.**

- Reduce tax on solar equipment and accessories to affordable levels
- Create awareness on solar and wind as sources of energy – pilot units in public institutions



## CHAPTER THREE

### 3.0 Human settlements and infrastructure

#### 3.1 Human settlements

Mwingi District is a homogeneous district inhabited mainly by Kambas. The district has a projects population of 330,110 for the year 2003 as per 1999 population census and is projected to rise to 337,081 in 2008; with a growth rate of 2.4%. It has an average population density of 30 persons per km<sup>2</sup>. More than 95% of this is rural based while 5% is the urban population of which, Mwingi town has 4% while the rest is distributed in other trading centre. Migwani is the most densely populated division (1010 persons per km<sup>2</sup>), followed by Central, Kyuso, Mui, Nuu, Mumoni, Tseikuru, Nguni, and finally Ngomeni, being the least populated (7 persons per km<sup>2</sup>). Table 3.1 shows the population projections per location.

Central Division registered the highest population, which stood at 83,687 in 1999 and is projected to increase to 103,864 by the year 2008. The high population can be attributed to urban status where Mwingi town is situated, as well as higher potential for agriculture, central division has a population density of 69 persons per km<sup>2</sup> and is projected to increase to 86 people per km<sup>2</sup> by the year 2008.

Ngomeni division has the least population of 10,712 and is projected to increase to 13,294 by the year 2008. The low population can be attributed to low and unreliable rainfall for cultivation. Ngomeni division is predominantly a livestock zone with a population density of 7 persons per km<sup>2</sup>. The district shows a very high prevalence of poverty, which is estimated at 80% with the poor residing in the driest division in the district namely: Tseikuru, Kyuso, Ngomeni, Nguni, and Nuu divisions. Migwani, Central, and Mui have least poverty prevalence.

## Population and settlement

The 1999 Kenya Population and Housing Census estimated the population of Mwingi district to be 303,828 persons, with an average density of 30 people per square kilometre. With a growth rate of 2.4 percent, this is projected to 377,081 people by 2008. The Akamba people are the dominant ethnic group.

**TABLE 13: POPULATION PROJECTIONS**

<b>DIVISION</b>	<b>LOCATION</b>	<b>POPULATION</b>
Central	Mwingi	34,751
	Mumbuni	14,202
	Kiomo	16,893
	Endui	7,140
	Waita	11,846
	Kanzanzu	6,097
	<b>TOTAL</b>	90,929
Migwani	Migwani	19,455
	Nguutani	17,715
	Thitani	14,273
	Kyomo	10,391
	<b>TOTAL</b>	61,934
Kyuso	Kyuso	10,419
	Kimangao	11,364
	Mivukoni	8,266

	Kamuwongo	7,186
	<b>TOTAL</b>	<b>37,235</b>
Mumoni	Tharaka	5,450
	Kanthungu	5,408
	Kakuyu	19,318
	Katse	6,903
	Mutanda	3,778
	TOTAL	40,857
Nuu	Nuu	8,288
	Wingemi	8,916
	Mutyangombe	5,774
	TOTAL	22,978
Mui	Mui	9,684
	Kalitini	7,062
	TOTAL	16,746
Tseikuru	Tseikuru	9,775
	Musavani	8,334
	Masyungwa	7,605
	TOTAL	25,714
Nguni	Nguni	10,286
	Ukasi	11,895
	TOTAL	22,181

Ngomeni	Ngomeni	6,165
	Mitamisiyi	5,471
	TOTAL	11,636
<b>MWINGI DISTRICT</b>	<b>TOTAL</b>	<b>330,110</b>

Source *District Statistics office 2007*

### 3.2 Population density by division

TABLE 14: POPULATION DENSITY BY DIVISION

Division	Density: (Persons per sq. km)
Central	75
Migwani	108
Kyuso	46
Mumoni	38
Tseikuru	19
Nguni	13
Ngomeni	7
Nuu	17
Mui	45

### 3.3 Human and environmental health

TABLE 15

key issues	1990			1993	1996	1999	2002	2004
Population size	252025			282020	316990	303828	328073	33723
Population growth intercensal growth rate – Eastern province	1969 - 1979	1979-1989	1989-1999					
	3.5	3.3	2.1					
Population density	26			29	32	31	33	34
Poverty incidence 2004 (Mwingi north) (Mwingi south) (Mwingi district)	No. of poor 95816 82927 181106			% of individual below poverty line 62.6 61.1 63	Poverty ranking national 143 133	% contribution to provinces poor 3.9 3.4		
Migrations	N.B Between 1969 & 1999 migration patterns remained almost the same. Implying that the push band the pull factors in the district remained the same.			1979 0.2%	1989 0.3%	1999 1		

## Water and Sanitation

Difficult access and uncertain ownership of water sources,, poor management of water sources, low quality and salinity encroachment into water catchment areas, uncontrolled sand harvesting leading to declining water levels and high water tariffs in Mwingi town are the major problems in provision of water in the district.

**TABLE 16: WATER AND SANITATION**

Source of Water	Number of households	% Population
Ponds	7,917	11.6
Dams	388	0.6
Lake	593	0.9
Streams/Rivers	25,503	37.3
Springs	2,135	3.1
Wells	7,242	10.6
Boreholes	12,489	18.6
Piped water	11,624	17.0
Jabias/tanks	480	0.7
Total	68,321	100

*Source: 1999 National Population Census Vol.2*

According to the district water office there are 5 gazetted water schemes and 11 private schemes as shown in table 3. It is also recorded that there are over 600 shallow wells, 32 protected springs, 26 boreholes, 126 small earth dams/pans and over 1,000 roof catchments that are managed by the individual communities, though some of them may no longer be functioning.

### 3.4 Infrastructure

#### Key environmental issues

- Poor roads
- Insufficient water supply

#### Proposed Intervention

- Roads: upgrade and carry out proper maintenance of roads to improve accessibility to markets.
- Communication: expand communication facilities to ensure improved access to market information.
- Rural water supply: improve water facilities to improve access to clean water facilities; promote construction of V.I.P latrines among the population.

### 3.5 ENERGY SUPPLY

TABLE 17

STRATEGIC INITIATIVES	ESTIMATED INVESTMENT RE-SOURCES (10 YEARS) IN KSHS	KEY EXTERNAL AGENCIES
Adequate compensation in case of relocation	250,000,000	Community, NEMA, DSDO, DFO (Forest), ALRMP OOP, NGO's, Private Sector  DCO (Coop), Ministry of Lands, Ministry of Mines and Geology  Local Government
Find ways and means of the immediate Community to benefits from the minerals.		
Participatory environmental impact assessment to be done before exploitation		
Rehabilitation and conservation the environment while mining and after mining		

Community empowerment on their right regarding mineral resources resident in their locality		
Map mineral resources resident in the district		
Total	250,000,000	

District stands to deplete its sources of energy due to deforestation, opening up of new land for cultivation or crop production and unfavourable weather patterns that do not favour regeneration.

### **Types and Status of Energy Sources**

#### **Fossil Fuel:**

The district has no known reserves of fossil fuels and therefore relies on imported fuel to meet its demand. Petrol is mostly used by the transport sector and for industrial purposes. Kerosene is used for domestic purposes. The district does not have coal deposits. Fossil fuel contributes in a big way to air pollution levels generated from the district. This is mostly from the industries operating within the district.

#### **Solar Energy:**

Currently the use of solar energy is still very low but the district has potential for this energy if harnessed well. Its use is only limited to those with solar panels. No feasibility study has been done on its sustainability though there is plenty of sun light that is constant throughout the year.

### **Key Environmental Issues**

- Air pollution
- Inadequate energy supply
- Preference of respiratory diseases
- Deforestation
- High cost of introducing efficient and cost effective technologies; and for utilizing potential sources of energy



- Low consumer awareness of available technologies and the potential economic benefits

**Proposed interventions**

- Promote use of renewable sources of energy
- Rural electrification has to be intensified
- Promote use of environmentally friendly technologies in
- Conduct inspections on industrial air emissions analysis
- Promote use of efficient energy saving technologies
- Enhance community sensitization campaigns on respiratory track diseases

## CHAPTER FOUR

### 4.0 Industry, trade and services

#### 4.1 Industrial sector

The industrial sector in the district poorly developed with only one food-processing factory that Kitui mil-lers and Mwingi honey industries. The two factories produce and process maize flour and honey respective-ly.

##### Key Environmental Issues

- Noises and Gaseous emissions
- Solid waste
- Health and safety concerns for the workers

##### Proposed intervention

- Need for the factory to carry out annual audits
- Provide workers with protective clothing

#### 4.2 Trade sector

The types of trade within the district are mainly:

- Wholesale and retail
- Supermarkets outlets
- Open air markets
- Hardware stores
- Livestock trade
- Agricultural produce
- Lumbering /Timber production
- Fabrication/Garages

- Sand/murram harvesting
- Quarrying

### **Key Environmental Issues**

- Prevalence of environmental related diseases
- Air pollution.
- Digestive and respiratory diseases
- Water pollution
- Inadequate enforcement of existing legislations
- Land degradation
- Poor waste management
- Cases of counterfeit and sub standard goods

### **Proposed interventions measures**

- Adopting cleaner production technologies
- Environmental Monitoring to ensure compliance
- Enforcing water quality and waste management regulations 2006
- Conducting research on alternative use of wastes and/or better methods of waste disposal
- Adequate sensitization and awareness on environmental issues, EMCA and need for compliance
- Offer incentives, rewards, sanctions and recognition to the best technology in use
- Establishing appropriate sites and ensuring proper waste disposal.
- Carry out restoration of borrow pits.

### 4.3 Services sector

There are few entrepreneurs who have invested in the service industry (Garages, chemists, printing computer bureaus, saloons, boutiques, bookshops, tailoring and businesses)

However, there is still an opportunity in the service industry for a district that is growing fast even to invest in enterprises that can offer various consultancy services

- Hospitality-there are a no classified hotels in the district .The few eating-places available generate little waste that they able to dispose safely.
- Telecommunication-there is network coverage for Safaricom, Zain and Telecom wireless.
- Banking and Insurance- There are two banks offering Banking service in the District (Kenya commercial bank and Post bank)

#### Key environmental issues

- Pollution of water sources by wastes from industries
- Accumulation of wastes from industry, trade, and services provision
- Inadequate enforcement of relevant laws

#### Proposed Interventions

- Enforce regulations regarding liquid and solid waste disposal
- Training and awareness creation on safe use and disposal of chemicals
- Engaging Cleaner Development Mechanisms (CDM) in industrial processes

## **4.4 Tourism**

### **Type of tourism and attractions**

The district has a number of tourist attraction site and worth noting is that they have not been developed at all, mainly due the poor road network, and inadequate finances.

Some of tourist attraction areas include,

- Areas bordering Meru National Park, kola national reserve.
- Muumoni hills scenery.
- Ngomeni rock catchments
- Nuu springs

If these attractions are developed for eco-tourism, the district can earn a lot of foreign exchange.

## **4.5 Mining and quarrying**

### **Mineral Resources and status of exploitation**

Inorganic substances, which, are naturally occurring in the earth crust with a definite chemical composition and have distinctive physical properties or molecular structure are known as mineral. A few exceptions are liquid or amorphous in nature. When appear in large volume in a given area, it can be profitably exploited. It is then referred to as a mineral resource.

The metamorphic and intrusive rocks in the area weather down giving good quality sand and gravel, which can potentially be exploited for the building industry. The magmatites and gneisses can also be used as dimension stone. The phonolites and basalts can also be used in gravel making and in some cases where tuffs occur, as building stone.

### **Key environmental issues in mining sector**

- Landslides and rock falls due to over banking or steep slopes and deposition of loose materials as mine wastes.
- Effects on the water table

- Hazard to wild and domestic animals and humans as they can fall in the open mines with or without water
- Deforestation leading to loss of vegetative cover
- Displacement of people
- Pollution of water resources and environment in general
- Destruction of geological, paleontological data as well as loss of aesthetic beauty of the countryside
- Noise pollution from machinery and explosives

#### **Proposed intervention**

- Filling of gaping holes
- Land back filling and tree planting
- Install mufflers in their machines
- Sprinkling of water during dry periods

## **4.6 Quarrying and Sand harvesting**

Though the potential for quarrying is huge this largely remains unexploited and is only done on very limited scale, mainly murrum for road repair. As such, there has not been a serious environmental concern as result of quarrying

#### **Sand harvesting**

Sand harvesting is concentrated on seasonal rivers found in all divisions in the district. The district supplies building sand to the neighboring districts and major towns of Nairobi and Thika. The level of exploitation is high and the environmental impacts are as alarming and hence need to curb the trend.

TABLE 18

No.	Source Of sand	Method of sand harvesting	Geographical Location/name of site	Size/ site of Ha	Quantity '0000'Tonsextracted annual)	Regulatory agency	Environmental impacts
	Seasonal river	Manual scooping	kyanundu	4	12	County council	River bank erosion
	Seasonal river	Manual scooping	kivou	3	15	County council	River bank erosion
	Seasonal river	Manual scooping	kanginga	2	1	County council	River bank erosion
	Seasonal river	Manual scooping	mwanja	3	15	County council	River bank erosion
	Seasonal river	Manual scooping	Nguutani	3	15	County council	River bank erosion
	Seasonal river	Manual scooping	kithyoko	3	15	County council	River bank erosion

The table above shows the Status of sand harvesting in the district.

#### Key Environmental Issues.

- Erosion of river banks - -
- Water pollution
- -Weak enforcement Law

#### Proposed Intervention

- Rehabilitation of the river bank
- Organize the sand harvesters to form an association for ease of regulation
- Regulate sand harvesting to ensure harvesting is only done on designated areas
- Rehabilitation of disused sand harvesting sites.
- Enforcement of relevant legislations and regulations

- Involvement of the community participation in environmental conservation
- Protective gears
- Fencing the site
- Afforestation

## **4.7 Quarrying**

Quarrying is a common activity in the district and it has had a profound impact on the environment. Key issues associated with quarrying are given below.

### **Key Environment Issues**

- Destruction of ecosystems and habitat due to excavation
- Discharge of pollutants into the air
- Noise pollution
- Occupational health and safety concerns
- Un-rehabilitated quarries

### **Proposed Interventions**

- Backfilling of pits and afforestation
- Conduct EIAs and EAs on quarries.
- Continuous monitoring.

### **Sand harvesting.**

Sand harvesting is being carried out in gullies and small streams as accumulated deposits hence difficult to establish its potential.

### **Key Environmental Issues**

- Air Pollution
- Soil erosion



- Respiratory diseases
- River bank erosion
- Gully erosion
- Loss of aesthetic value
- Deforestation
- River/dam Siltation

**Proposed interventions**

- Soil erosion control measures
- Re-afforestation
- River bank protection
- De-siltation of rivers and dams

## CHAPTER FIVE

### 5.0 Environmental hazards and disasters

#### 5.1. Overview

Natural and human induced hazards pose a threat to human life, property and environment. Natural hazards include dry spells, soil erosion, drying-up of water sources, lightening and hailstorms, among others. Disasters occur when natural hazards interact with vulnerable people, property, and livelihoods causing varying damage depending on the level of vulnerability of the individual, group, property or livelihoods.

**Hazard:** A hazard is a potentially damaging physical event, human activity or phenomenon with a potential to cause loss of life or injury, property damage, social and economic disruption of life, environmental degradation among other effects.

**Disaster:** A disaster is a serious disruption of the functioning of the society causing widespread human, material or environmental damage and losses that exceed the ability of the affected community to cope using their own resources.

#### Status of Early Warning and Preparedness

Currently the task of assessing, planning and management of disasters within the district is vested on the District Disaster Management Committee whose membership includes the Provincial Administration and the relevant sectors, departments such as Works and Water.

#### The functions of the committee are listed below:

- Identification of alternative areas of settlements
- Coordinate relief supplies
- Promote flood control mechanisms

The approach adopted in the district is participatory whereby different sectors come together with the limited resources to address any disaster under the coordination of the Provincial administration.

The most common disasters in the district are:

## **Drought/famine**

In the past, the district has experienced increased frequencies of drought caused by poor management of water catchment areas, inappropriate soil conservation measure, deforestation and general land degradation. Continued lack of rainfall and deforestation, Poor cropping patterns, overgrazing, sand harvesting and poor and or lack of conservation techniques on the other hand, cause drought and famine.

## **Proposed interventions**

- Establish an efficient, early warning systems
- Diversification of income generating activities.
- Promote planting of drought resistant and early maturing crops.
- Exploit underground water.
- Encourage use of irrigation.
- Improvement of water harvesting techniques.
- On farm post harvesting food preservation.

## **Disease/pests outbreaks (Human/Livestock/crops)**

The most common animal disease is the New Castle, which attacks chicken. Its transmission has been attributed to movements especially during drought and famine seasons.

There was an outbreak of foot and mouth disease from September 2003 to April 2004. The Veterinary Office issued Quarantine, which helped in its control.

## **Impacts of El-nino Rains**

- Adverse effects on livestock
- Renders road networks impassable
- Interrupts learning in schools
- Disruption of household routine and social functions

- Adversely affect health and sanitation
- Cause Destruction to Property

**Key environmental issues**

- Soil erosion
- Outbreak of water borne diseases
- Destruction to flora and fauna
- Disruption of household routine and social functions
- Land degradation

**Proposed intervention**

- Tree planting upstream
- Early warning and monitoring system
- Pan/Dam construction
- Land use planning
- Community participation in flood control
- Construction of dykes

## **CHAPTER SIX**

### **6.0 environment education, information and technology**

There is both formal and non formal environmental education in the district. Formal education is mostly done in schools and through NGOs mainly engaged in agro-forestry activities with the communities under their training. Non formal type is mostly cultural and relates to flood control and activities that affect their livelihood such as food production and fishing

The types of environmental programmes in the district include;

- Eco -Schools
- Wildlife Clubs
- 4K Clubs
- Environmental Awareness and Management Project for Schools

### **6.1 status of environmental education**

Some of the environmental issues incorporated in the subjects taught in schools include Agro forestry, Soil conservation, Environmental conservation, Environmental Health, ecology among others. These help to create awareness on the part of students on the need for environmental conservation in general. The types of environmental programme are indicated in the table below:

TABLE 19

Type of Institution	Number of Schools	Types of Environmental Programmes	Challenges
Primary	5	Eco Schools Environmental Awareness and Management Project for 4K Clubs- Environmental Awareness and Management Project for Schools	Financial Limitation Packed curriculum
Secondary-	2	Environmental Awareness and Environmental Conservation for Schools-	Financial Limitation Packed curriculum
Tertiary	1	Environmental Awareness and Environmental Conservation Project for Schools	Financial Limitation Packed curriculum

### 6.1.2 Non- formal Environmental Programs

These are mainly carried out through Community Based environmental (CBOs) Farmer Field Schools (FFS), Women groups (WG) and Youth groups (YG). Some of the key players include key Government department and bilateral institutions Research organisation and Local and International NGO's including (Agriculture/livestock/water/forest) donors especially FAO, DASS, GAA, FARM AFRICA, ACTION AID, ABD, UNICEF, ICIPE and GREENBELT among others.

### 6.1.3 Public Awareness and Participation

Due to increasing awareness on environmental issues and an environmental law that provides for the establishment of relevant institution of Environment Management, the participation of the public is positive whenever an opportunity arises. This is supported by the fact that the district suffers from floods, long dry period, massive erosions and water pollution. These issues have generated an inbuilt need to address environmental issues affecting them.

Community based initiatives such as gully rehabilitation, afforestation, water scarcity, organized clean ups and tree planting activities amongst others are examples / activities where the public participates in Environmental Management.

**Key players** are NGOs ,Government departments such Kenya Forest Service, Ministry of Agriculture, Ministry of Public Health, Ministry of Livestock, NEMA; Local Authorities; Community Based Organisations (CBOs), Schools and Industries.

Public awareness and participation in the district is being coordinated by the NEMA office through the District Environment committee. To make the work of the committee more effective, divisional and location environmental committees have been established. Assistance in carrying out public awareness has been received from GOK departments NGOs and donors, notably JICA (through intensified social forestry project) and IFAD (through the Mt. Kenya East Pilot Project for Natural Resources Management-MKEPP)

**TABLE 20: STATUS OF ENVIRONMENTAL AWARENESS AND PARTICIPATION IN THE DISTRICT**

Pro-grams	Key players	sector	Environ-mental benefits	opportunities	challenges	interventions
ASP/DA SS	Agriculture Livestock Water Social ser- vices Forest NEMA	Natural resources	-Sustainable use of natural re- sources  Environmental conservation	Integration of natural re- sources con- servation ef- forts	Coordination of the various activities	
ICIPE (Farmer Field Schools)	F Agriculture Livestock Water Social ser-	Forestry	Increased planting of trees at farm level	Capacity build- ing at local level	-Drought  -Destruction of young trees by live- stock	-water harvest- ing

	vices Forest NEMA					
Arid Lands Resource Manage- ment project	Agriculture Livestock Water Social ser- vices Forest NEMA	Natural resources	Sustainable use of natural re- sources	Capacity build- ing at local level	Coordination of the various activities	

## 6.2 Environmental Information and Communication Technology

The broad challenge in harnessing environmental information and communication technology include inadequate resources and capacity for information collection, analysis, storage, and dissemination, inadequate awareness among environmental managers and the public; and lack of knowledge sharing networks at grass root level.

### 6.2.1 Types and sources of environmental information

The table13 below outlines the type of environmental data and information available in the district and the institutions where it can be accessed.



## 6.2.2 Information and Data Types in the district

**TABLE 21: INFORMATION AND DATA**

Sector	Type Information/ types	Form (GIS /maps /reports /electronical ly, books)	institutions	Access Condi- tions/policy	users	System Of updating
Agriculture, Livestock & fisheries	Soil conservation In the district	Reports	Ministry of Agric.	Free access	Planners Policy makers Students	Updated annually
	Rainfall data	Reports	Ministry of Agric.	Free access	Planners Policy makers Students	Monthly records
	Crop & livestock production trends	Reports	-Ministry of Agric. -Ministry of lives- tock	Free access	Planners Policy makers Students	Updated annually
	Drought early warn- ing system	-Reports Electronic reports	Drought man- agement office	Free access	Planners Policy makers Students	Monthly Updates
Water	Water resources in the district	Reports -Maps	District water office	Free access	-as above-	Updated annually
Lands	Adjudication status in the district	Reports -Maps	District lands adjudication office	Free access	-as above-	Updated annually
Forestry	Distribution of for- ests in the district	Reports maps	District forest office	Free access	-as above-	Updated annually

### **6.2.3 Status of environmental information management systems**

Adequacy of institutional skills in information management system

A number of institutions have acquired computers which are crucial in any information management system. However most of the technical staff in the departments is not trained in basic computer skills.

#### **Number of documentation centers, archives and libraries**

The district has one major library where information can be accessed.

NEMA office in the district has plan to start the district environmental information and documentation center but lack of funding is delaying the implementation

#### **Constraints/challenges in environmental information/data collection**

- Poor ICT infrastructure
- Lack of reliable power supply in the district
- Low institutional skills in information management
- Lack of documentation centres, archives and libraries
- inadequate funding

#### **Technologies**

Some of the technologies being promoted include:

- Bee keeping
- Silk worm production
- Energy saving devices
- Use of renewable sources of energy especially solar
- Water harvesting techniques
- Promotion of alternative income generating activities.

#### **Key environmental issues**

- Public participation is still low,
- Low Know-how on the part of environmental committees,
- Inadequate financial resources to mobilize the public and to implement projects at hand such as gully rehabilitation
- Inadequate knowledge on Environmental Management and its relevance.
- Poor Attitude towards new technologies.
- Low levels of awareness
- Inadequate capacity to implement Environmental programmes
- Insufficient Networking

**Proposed intervention**

- Intensify awareness creation and involve all sectors
- Train environmental committees on their role in environmental conservation
- Establish Public private partnerships on environmental programmes
- Capacity building on environmental management
- Promote public participation in project design implementation monitoring and evaluation

## **CHAPTER SEVEN**

### **7.0 Status of environmental governance and institutional frameworks**

#### **7.1 Overview**

##### **Status of Environmental Governance and Institutional Arrangement**

Environmental governance in Kenya is through various legislations, standards and regulations together with institutions that implement them. Before the enactment of EMCA in 1999 as an overarching framework law, environmental laws were scattered in various sectors and some were conflicting to each other. Environmental Management and Coordination Act (EMCA 1999) devolve administration of a number of environmental and natural resources management issues to communities. It recognizes community rights, benefit sharing, pastoral land tenure and equitable and sustainable access to land.

Environmental Management and Coordination Act addresses land use management issues including sustainable land use, land use planning, and ecosystems protection and management. The law identifies structures that oversee the equitable distribution of benefits and devolution of decision making on natural resources. Further EMCA empowers organised communities to formulate environmental actions and/or conservation and management plans, through NEAPC, PECs and DECs.

##### **7.2 EMCA Structures for Environmental Management**

Environmental governance in Kenya involves major players who are coordinated by National Environment Management Authority. There are also sectors of the government who have aspects of environmental management in their programmes and are referred to as lead agencies in the EMCA. Environmental Impact Assessment and Environmental Audit are tools used for planning for upcoming and existing projects respectively

##### **Some of the Lead Agencies in the district**

- Ministry of Water and Irrigation
- The Kenya Forest Service

- Water Resources Management Authority and related Companies and Boards
- Ministry of Works
- Ministry of Housing
- Ministry of Labour and Human Development
- Mines and Geology Department
- Ministry of Education, Science and Technology Development
- Ministry of Medical Services
- Ministry of Public Health and Sanitation
- Ministry of Energy
- Ministry of Agriculture
- Ministry of Local Government
- Kenya Wildlife Services
- Ministry of Livestock Development
- Ministry of Fisheries development

### 7.3 Other Players in Environmental Governance

- Public Complaints Committee
- National Environment Tribunal
- District and Provincial Environment Committees.

#### Status of environmental governance and institutional arrangements

Collaborating Government Departments.

Key collaborating departments in environmental conservation in the district include forest department, arid lands, and ministry of agriculture, ministry of livestock development and fisheries, ministry of water, provincial administration, county council and public health department.

#### Environmental NGOs/CBOs/Private sector organizations

These include, Genesis, world vision, the Green Belt Movement, action aid, farm Africa and several community based environmental conservation groups and churches.

#### Donor Organizations Active in the District

World bank-through Arid Lands Resource Management Project (ALRMP II) - promotes sustainable use of natural resources. ICIPE-Through farmer field schools, silkworm production, bee farming. NA-LEP/ABD/DASS promotes sustainable use of natural resources, agriculture as business, soil and water conservation and animal production.

## REGULATORY AND MANAGEMENT TOOLS

### TABLE 22: LEGISLATION THAT IMPACT ON HUMAN HEALTH AND ENVIRONMENT QUALITY

Title of legislation	Year of enactment	Aspects of environment addressed by the act	Implementing Agency(is)	Coordinating mechanisms	Areas on the overlaps and conflicts with EMCA
New forest act	2004	Forest conservation	Forest department		none
Water act	2002	-Management and conservation of water resources  Protection of water catchment areas	Water services board	Formation of water users associations and river user associations at community level	-
Public health act	-	Sanitation and hygiene	Department of public health	-	
Agriculture Act		-Soil Conservation  -River bank protection	Ministry of agriculture	-	-
Factories Act		Occupational health and safety	Ministry of labour	-	-

### Environmental Management Tools in the District

- Environmental impact assessment
- Environmental Audit
- Inspection of premises by public health
- Enforcement of regulations

- Prosecution of offenders.

Other Committee dealing with environmental issues at the district level include Physical Liaison Committee, Forest, Health and Environment Committee, District Agricultural Committee, DDC, District Executive Committee, District Health Board.



## **CHAPTER EIGHT**

### **8.0 Implementation strategy**

#### **8.1 Overview**

The District Environment Action Plan (D.E.A.P) Provincial Environment Action Plan (P.E.A.P) and National Action (N.E.A.P) preparation and implementation is guided by National priorities as contained in major policy documents including the ERSWEC, the National Development Plans and the district Development Plans. The objective of this Environmental Action Plans is to integrate environmental concerns in the development planning and implementation.

Environmental concerns are cross cutting in nature and their impacts are felt at the village, location, divisional and district level. Their integration in development process at all levels is essential hence the preparation of the District Environment Action Plans (DEAPS). The preparation and implementation is a statutory requirement under Section 38 of EMCA 1999.

#### **Stake holders' involvement**

The Implementation strategy of Environment Action Plan should involve many stake holders as possible. These include all government departments, agencies, state cooperation and any other organ of government as well as civil society organizations, private sector and individuals.

At the village, location and sub-location levels, environment management committees in conjunction with project management committees will carry out the programmes and also monitoring and evaluation. Project management committees will oversee the day-to-day implementation of the projects and the exercise will be continuous. At the divisional level, the divisional implementation team will be composed of the District Officer, divisional departmental heads and the relevant NGOs representatives. The implementation will be owned by the project management committee through the communities.

#### **Strength and weakness**

The district has the following strengths and weaknesses which will be encountered during the implementation of the district Environment Action Plan:

## **Strength**

Endowed with stakeholders who have capacities to undertake different projects which are related to Environment Management.

Indigenous knowledge systems that help community cope with and adapt to the environment.

Existing and functional district Environment committee which can give direction as per Environmental Management and co-ordination Act.

Relatively low levels of conflict which can allow good implementation of projects.

## **Weakness**

- Fragile ecosystem that is being pushed to the limit
- Marginalization due to poor past policies by Government.
- Cultural practices that render uptake of new ideas difficult such as land ownership by women.
- Weak human capital base due to low investment in education.

## **Opportunities and Challenges**

### **Opportunities**

- Increased government and development partner interest in Environmental Conservation activities.
- National and international internet environmental conservation issues.
- Low level of investments which can generate hazardous waste.
- Challenges
- Rapid population growth.
- Growing vulnerability to climatic shocks.
- Endemic poverty and depletion of vegetation cover.
- Low interest from the community and private sector to investment in environmental conservation activities.

### **Collaborative Mechanisms among Stake holders**

The major stake holders in the sector are the governments, NGO's, CBO's, Private sector and donors.

- The government through the lead agencies will provide technical support, capacity building and also provide enabling environment through appropriate regulatory policies.
- NGO's will provide capacity building and sensitized the communities and organized group on environmental awareness and community participation.
- Donor will provide funds to assist in implementation of community action plan (CAPs) while private sector will participate in advocacy for project which will be enhancing environmental conservation.

### **Resource Required**

The implementation of the Environmental Action Plan will require allocation of resources. This will call for resources capacity assessment among stake holders in order to avoid duplication while consolidating resources.

Community based resources (Local Authority Trust) Funds, Constituency Development Fund,, Government Budgetary allocations and funding from development partners operating within the district will form resource base for the implementation of the district Environment Action Plan (D.E.A.P)

### **Monitoring and Evaluation**

In order to ensure that implementation of the plan is undertaken by all stake holders. It is important to ensure monitoring and evaluation of district Environment Action Plan is developed from village level to the district level.

The monitoring and evaluation of the implementation of D.E.A.P will be carried out using the participatory approaches where project committee together with technical team will be involved

Monitoring will mainly be undertaken on continues basis through meetings and field visits. Reports will be prepared and reviewed. Evaluation will be undertaken periodically after the end of every financial year

The purpose of monitoring and evaluation of D.E.A.P is to ensure there are efficient and effective implementation as well as ensuring that environmental concerns have been addressed and integrated in development process. It will involve documentation of cross cutting issues.

There are a number of cross cutting issues which if documented would help to halt and reverse environmental degradation and reduce human vulnerability to the environmental excesses. These issues may result to action which includes:-

- Enhancement of coping mechanism/capacity of Mwingi population, with regard to adverse environmental change and reduction of environmental insecurity.
- Promotion of great public awareness and active public participation in environmental management.
- Implementation of environmental management tolls/system.
- Promotion of good environmental governance.

**Setting targets and monitoring indicators.**

To enhance of institutional capacity to coordinate monitor and supervise environmental Management.

TABLE 23: IMPLEMENTATION MATRIX

Division	Location	Issue Category	Problem Statement	Action No.	Actions Needed	Stakeholders	Time-frame 2009-2013
District Wide	District Wide	Air	Air pollution	1.	Control burning garbage	Min. of Public Health and Sanitation, Local Authorities	
				2	Promote recycling of waste	Local Authorities	
				3	Apply and enforce Public Health and Sanitation Act on disposal of dead animals	Min. of Public Health and Sanitation, Local Authorities	
				4.	Sensitize communities on waste management	Min. of Public Health and Sanitation, Local Authorities	
				5	Afforestation and Re-afforestation	KFS	
			High prevalence of T.B	6	Improve housing ventilation	Min. of Public Health and Sanitation, Local Authorities	
				7	Conduct air pollution monitoring	Min. of Public Health and Sanitation, Local Authorities	
Entire district		Climate & related environmental hazards	Frequent Drought /Famine	8.	Irrigate crops where possible	WRMA	

				9	Plant drought tolerant crops	Min. of Agriculture	
				10.	Plant early maturing crops	Min. of Agriculture	
			Frequent Drought /Famine	11.	Afforestation and Re-afforestation	KFS	
				12.	Promote storm water harvesting e.g construct water pans	WRMA	
				13.	Extension of Masin-ga water channel	Min. Public works Water and irrigation Min.	
				14.	Promote fish farming	Min. of Fisheries	
District Wide	District Wide	Climate & related environmental hazards	Flooding	15.	Enforce water harvesting in Athi river	WRMA	
				16.	Afforestation and Re-afforestation	KFS	
				17.	Initiate appropriate soil conservation measures	Min. of Agriculture	
				18.	Improve farming methods	Min. of Agriculture	
				19.	Peg river banks	Min. of Agriculture	
				20.	Regulate sand harvesting in the district	Min. of Agriculture	
				21.	Introduce new crops such as cotton	Min. of Agriculture	

		Crop Production & Soils	High rate of soil erosion	22.	Initiate appropriate soil conservation measures	Min. of Agriculture	
				23.	Afforestation and Re-afforestation	KFS	
				24.	Construct Check dams and sand dams	WRMA	
				25.	Construct proper drainage on roads	Min. of Roads	
				26.	Build gabions	Min. of Agriculture	
				27.	Plant cover crops	Min. of Agriculture	
				28.	Promote roof water catchment	Min. of Agriculture	
				29.	Promote use of mulching	Min. of Agriculture	
			Poor crop yields	30.	Promote use of certified seeds	Min. of Agriculture	
				31.	promote timely land preparation and planting	Min. of Agriculture	
				32.	Initiate appropriate soil conservation measures	Min. of Agriculture	
				33.	Plant early maturing crops	Min. of Agriculture	
District Wide	District Wide	Crop Production & Soils	Poor crop yields	34.	Enhance farmers Field schools for extension purpose	Min. of Agriculture	
				35.	Practice crop rotation	Min. of Agriculture	

				36.	Plant drought tolerant crops	Min. of Agriculture	
				37.	Promote use of farm yard manures	Min. of Agriculture	
				38.	Promote irrigation along developed water sources	Min. of Agriculture, WRMA	
				39.	Promote Agro-forestry	Min. of Agriculture	
				40.	Promote indigenous crops	Min. of Agriculture	
				41.	Sensitize communities to use certified seeds	Min. of Culture and social Services	
				42.	Conduct frequent soil sampling	Min. of Agriculture	
				43.	Encourage use of machine to prepare farmland /dry planting.	Min. of Agriculture	
				44.	Diversify crops	Min. of Agriculture	
		Energy	Shortage of wood fuel	45.	Promote planting of quick maturing trees	KFS	
				46.	Promote use of energy saving devices	Min. of Energy	
				47.	Promote use of alternative sources of energy e.g. biogas, solar	Min. of Energy	



		Environmental Education & Awareness	Low level of awareness on environmental education	48.	Educate the public through electronic and print media, drama and songs	Min. of Information	
District Wide	District Wide	Environmental Education & Awareness	Low level of awareness on environmental education	49.	Promote public participation in environmental plans, programmes and activities	Min. of Public Health and Sanitation, Local Authorities	
				50.	Sensitize communities/opinion leads to abandon cultural beliefs that inhibit environmental conservation	Min. of Culture and social Services	
				51.	Disseminate environmental information	Min. of Public Health and Sanitation, Local Authorities	
				52.	Integrate environmental issues in Schools & Adult/Public Institutions and literacy Centers	Min. Education	
				53.	Increased awareness on environmental laws through Barazas, seminars, workshops	Min. of Public Health and Sanitation, Local Authorities	
Masinga Division		Fish & Fisheries	Shortage of fish	54.	Apply and enforce fisheries act	Min. of Fisheries	
				55.	Promote manual removal of water hyacinth and put it into economical use	WRMA	

				56.	Promote fish farming	Min. Fisheries	
				57.	Afforestation and Re-afforestation	KFS	
				58.	Monitor and ban use of chemicals for fishing	Min. of Fisheries	
				59.	Rehabilitate and restore water catchment areas	WRMA, Min. Agriculture	
				60.	Apply and enforce Public Health and Sanitation Act to control pollution	Min. of Public Health and Sanitation, Local Authorities	
				61.	Promote use of recommended fishing gears and methods	Min. of Fisheries	
				62.	Construct ice plants/preservation	Min. Fisheries, min of Cooperatives	
				63.	Protect fish breeding grounds	Min. of Fisheries	
				64.	Promote use of solar to substitute the oil lamps for fishing	Min. of Fisheries	
				65.		Min. of Public Works	
			Resource use conflict between Machakos and Mbeere fishermen	66.	Establish an Masingha fishermen organization to address the conflicts	Min. of Fisheries	

				67.	Encourage inter governmental talks on River Nile	Min. of EAC	
				68.	Capacity build BMU on sustainable utilization of fish resources	Min. of Fisheries	
District Wide	District Wide	Forests & Trees	Deforestation	69.	Afforestation and Re-afforestation	KFS	
				70.	Promote agro forestry	KFS	
				71.	Conserve herbal medicinal plants	KFS	
				72.	Promote use of energy saving devices	Min. of Energy, Min. of Agriculture	
District Wide	District Wide	Forests & Trees	Deforestation	73.	Sensitize communities against traditional beliefs that hinder environmental conservation	Min. of Public Health and Sanitation, Local Authorities	
				74.	Promote community education and awareness on good forestry practices	KFS	
				75.	Plant drought tolerant crops	Min. of Agriculture	
				76.	Gazette existing forests		
				77.	Enforce the Forest Act	KFS	

				78.	Promote public awareness on the need to conserve and protect forests and catchments	KFS	
				79.	Establish tree nurseries	KFS	
				80.	Identify hilltops prone to soil erosion and rehabilitate them	KFS, Min. of Agriculture	
		Health	Prevalence of waterborne diseases	81.	Apply and enforce Public Health and Sanitation Act	Min. of Public Health and Sanitation, Local Authorities	
				82.	Promote treatment of drinking water	WRMA	
				83.	Protect water sources	WRMA, Min. Agriculture	
				84.	Apply and enforce waste management regulations	Min. of Public Health and Sanitation, Local Authorities	
				85.	Construct a proper drainage and sanitation facilities	Min. of Public Health and Sanitation, Local Authorities	
District Wide	District Wide	Health	Prevalence of waterborne diseases	86.	Construct latrines	Min. of Public Health and Sanitation, Local Authorities	

				87.	Create awareness on proper hygiene	Min. of Public Health and Sanitation, Local Authorities	
				88.	Promote use of treated mosquito nets	Min. of Public Health and Sanitation, Local Authorities	
			Aflatoxicosis		Create awareness on proper food storage	Min of Public Health and Agriculture	
		Industry & Other Business Activities		89.	Apply and enforce Water quality and Waste management regulations	Min. of Public Health and Sanitation, Local Authorities	
				90.	Enforce air control regulations	Min. of Public Health and Sanitation, Local Authorities	
				91.	Promote use of environmentally friendly sources of energy	Min. of Energy	
				92.	Promote use of cleaner production technologies	Min of Industry	
				93.	Recycle polythene materials	Local Authorities, Min of Industry	
				94.	Promote use of EFB	Min of Industry	

				95.	Protect springs	WRMA, Min. Agriculture	
		Livestock & Grazing	Low livestock productivity	96.	Control animal diseases	Min of Livestock	
				97.	Control tsetse through suppression, spraying and traps	Min. of Livestock	
District Wide	District Wide	Livestock & Grazing	Low livestock productivity	98.	Upgrading of indigenous cattle breeds/crossbreeding	Min. of Livestock	
				99.	Undertake research on Ticks control	Min. of Livestock	
				100	Train the communities diagnosis of animal disease and prevention methods	Min. of Livestock	
				101.	Train farmers on good animal husbandry	Min. of Livestock	
				102	Plant fodder crops/trees	Min. of Livestock	
				103	Construct water points	Min. of Livestock	
				104.	Make hay for use during the dry season	Min. of Livestock	
				105.	Reduce the stocking rate	Min. of Livestock	
				106	Promote zero grazing	Min. of Livestock	

		Mining & Quarrying	High incidences of malaria	107	Rehabilitate and restore mined areas	Mines and Geology Dept. Local Authorities	
			Open mining pits	108	Fence mining areas and pits	Mines and Geology Dept. Local Authorities	
		Settlements & Infrastructure	Diseases	109	Construct latrines	Local Authorities	
				110.	Apply and enforce waste management regulations	Min. of Public Health and Sanitation, Local Authorities	
District Wide	District Wide	Settlements & Infrastructure	Diseases	111	Promote community education on good hygiene and sanitation	Min. of Public Health and Sanitation, Local Authorities	
				112	Apply and enforce Public Health and Sanitation Act	Min. of Public Health and Sanitation, Local Authorities	
			Unplanned settlements	113	Improve existing roads	Local Authorities	
				114	Promote land use planning	Min of lands	
				115.	Prepare urban development plans	Min of Lands, local Authorities	
				116	Apply and enforce Physical Planning Act and Council Bylaws	Min. of Public Health and Sanitation, Local Authorities	

				117.	Construction of sewerage system	Min. of Public Health and Sanitation, Local Authorities	
				118	Construct pit latrines	Min. of Public Health and Sanitation, Local Authorities	
			Poor sanitation	119	Apply and enforce waste management regulations	Min. of Public Health and Sanitation, Local Authorities	
				120.	Designate waste disposal sites	Min. of Public Health and Sanitation, Local Authorities	
				121.	Apply and enforce Physical Planning Act and Council byelaws	Min. of Lands	
District Wide	District Wide	Water Resources	Inadequate clean drinking water	122.	Afforestation & Reforestation of water catchments including hill tops	WRMA, KFS	
				123	Treat drinking water	WRMA	
				124	Dig boreholes/shallow wells	WRMA	
				125.	Protect and conserve water sources	WRMA	
				126	Promote roof water catchments	WRMA	



				127.	Regulate river water abstractions	WRMA	
				128	Construct pit latrines	Local Authorities, Min of Public Health and Sanitation	
			Water pollution	129	Undertake Public education on good hygiene	Local Authorities, Min of Public Health and Sanitation	
				130	Construct latrines	Local Authorities, Min of Public Health and Sanitation	
				131.	Promote proper waste management	Local Authorities, Min of Public Health and Sanitation	
				132	Treat drinking water eg. Using chlorine	WRMA	
				133	Promote proper application of agro-chemicals	Min. of Agriculture	
District Wide	District Wide	Water Resources	Water pollution	134.	Undertake appropriate soil conservation measures	Min. of Agriculture	
				135.	Divert run offs far from the boreholes	Min. of Public Works, WRMA	

				136	Construct sewage systems	Local Authorities,	
				137	Designate waste disposal sites	Local Authorities, Min of Public Health and Sanitation	
				138	Protect water sources	WRMA	
			Drying of water sources	139.	Plant trees on the water catchment areas		
				140	Provide piped water	WRMA	
		Wetlands	Degradation of wetlands	141	Regulate the usage of wetlands resources	WRMA, Min. Agriculture	
				142	Educate communities on the importance of conserving wetlands	WRMA, Min. Agriculture	
				143.	Draw management plans for wetlands	WRMA, Min. Agriculture, Min of Lands	
				144.	Map and protect wetlands and other fish spawning areas	WRMA, Min. Agriculture, Min of Lands, Min of Fisheries	
		Wildlife, Biodiversity & Tourism	Human – wildlife conflict	145	Erect an electric fence around Masin-ga Dam	KWS	

				146	Establish wildlife buffer zones	KWS	
District Wide	District Wide	Wildlife, Bio-diversity & Tourism	Human – wildlife conflict	147	Strengthen District Compensation Committee	KWS	
				148	Sensitize communities to appreciate the importance of conserving wildlife	KWS	
				149.	Involve the communities in wildlife management	KWS	
			Loss of bio-diversity	150	Plant indigenous trees	KFS	
				152.	Preserve indigenous tree species	KFS	
				153.	Protect natural ecosystems	KFS, KWS	
			Untapped eco-tourism potential	154	Carry out an inventory of existing/potential tourism sites	Min. of Tourism	
				155	Apply and enforce EMCA	Min. of Tourism	
				156	Promote and market existing tourism activities	Min. of Tourism	
				157	Use media to promote local tourism	Min. of Tourism, Min of Information	

## **APPENDIX**

(Extract from EMCA)

### **PART IV OF THE ENVIRONMENTAL MANAGEMENT AND COORDINATION ACT (1999)**

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#### **ENVIRONMENTAL PLANNING (National Environment Action Plan Committee)**

There is established a committee of the Authority to be known as the National Environmental Action Plan Committee and which shall consist of:

The Permanent Secretary in the Ministry for the time being responsible for national economic planning and development who shall be the chairman;

The Permanent Secretaries in the Ministries responsible for the matters specified in the First Schedule or their duly nominated representatives;

Four representatives of the business community to be appointed by the Minister;

Representatives of each of the institutions specified in the Third Schedule;

Five representatives of non-governmental organisations nominated by the National Council of Non-Governmental Organizations;

Representatives of specialised research institutions that are engaged in environmental matters as may be determined by the Minister; and

**A Director of the authority who shall be the secretary.**

The National Environment Action Plan Committee shall, after every five years, prepare a national environment action plan for consideration and adoption by the National Assembly.

### **38. Provisions of the National Environment Action Plan**

#### **The national environment action plan shall: -**

Contain an analysis of the natural resources of Kenya with an indication as to any pattern of change in their distribution and quantity over time;

Contain an analytical profile of the various uses and value of the natural resources incorporating considerations of intergenerational equity;

Recommend appropriate legal and fiscal incentives that may be used to encourage the business community to incorporate environmental requirements into their planning and operational processes;

Recommend methods for building national awareness through environmental education on the importance of sustainable use of the environment and natural resources for national development;

Set out operational guidelines for the planning and management of the environment and natural resources;

Identify actual or likely problems as may affect the natural resources and the broader environment context in which they exist;

Identify and appraise trends in the development of urban and rural settlements, their impacts on the environment, and strategies for the amelioration of their negative impacts;

Propose guidelines for the integration of standards of environmental protection into development planning and management;

Identify and recommend policy and legislative approaches for preventing, controlling or mitigating specific as well as general adverse impacts on the environment;

Prioritise areas of environmental research and outline methods of using such research findings;

without prejudice to the foregoing, be reviewed and modified from time to time incorporate emerging knowledge and realities; and

Be binding on all persons and all government departments' agencies, state corporations or other organs of Government upon adoption by the National assembly.

### **39. Provincial Environment Action Plans**

Every Provincial Environmental Committee shall, every five years, prepare a provincial environment action plan in respect of the province for which it is appointed, incorporating the elements of the relevant district environment action plans prepared under section 40 and shall submit such plan to the chairman of the National Environment Action Plan Committee for incorporation into the national environment action plan.

### **40. District Environment Action Plans**

Every District Environmental Committee shall, every five years, prepare a district environment action plan in respect of the district for which it is appointed and shall submit such plan to the chairman of the Provincial Environment Action Plan committee for incorporation into the provincial environment action plan proposed under section 39

### **41. Contents of Provincial and District Environmental Action Plans.**

Every provincial environment action plan and every district environment action plan prepared under section 30 and 40 respectively shall contain provisions dealing with matters contained in section 38 (a), (b), (c), (d), (e), (f), (g), (h), (i), and (j) in relation to their respective province or district.

### **Reference Materials**

- Forest Manual, Mwingi District
- Mwingi District Development Plan 2002-2008 (Ministry of Finance and Planning)
- District State of Environment Report (SOE) 2004 and 2005
- Arid lands vision and strategy
- GoK, 2005. Ministry of Livestock and Fisheries Development, Department of Livestock Production
- Republic of Kenya (2002c). Kenya 1999 Population and Housing Census. Analytical Report on Labour Force. Vol ix.

- State of the Environment Report 2003, KENYA. A National Environment Management Authority – Kenya Publication
- State of the Environment Report 2003, Mwingi District.
- A National Environment Management Authority – Kenya Publication
- Environmental Management and Coordination ACT, 1999.
- The Environmental (Impact Assessment and Audit) Regulations, 2003, Legal Notice No. 101. Kenya Gazette Supplement No. 56 – 13th June 2003.