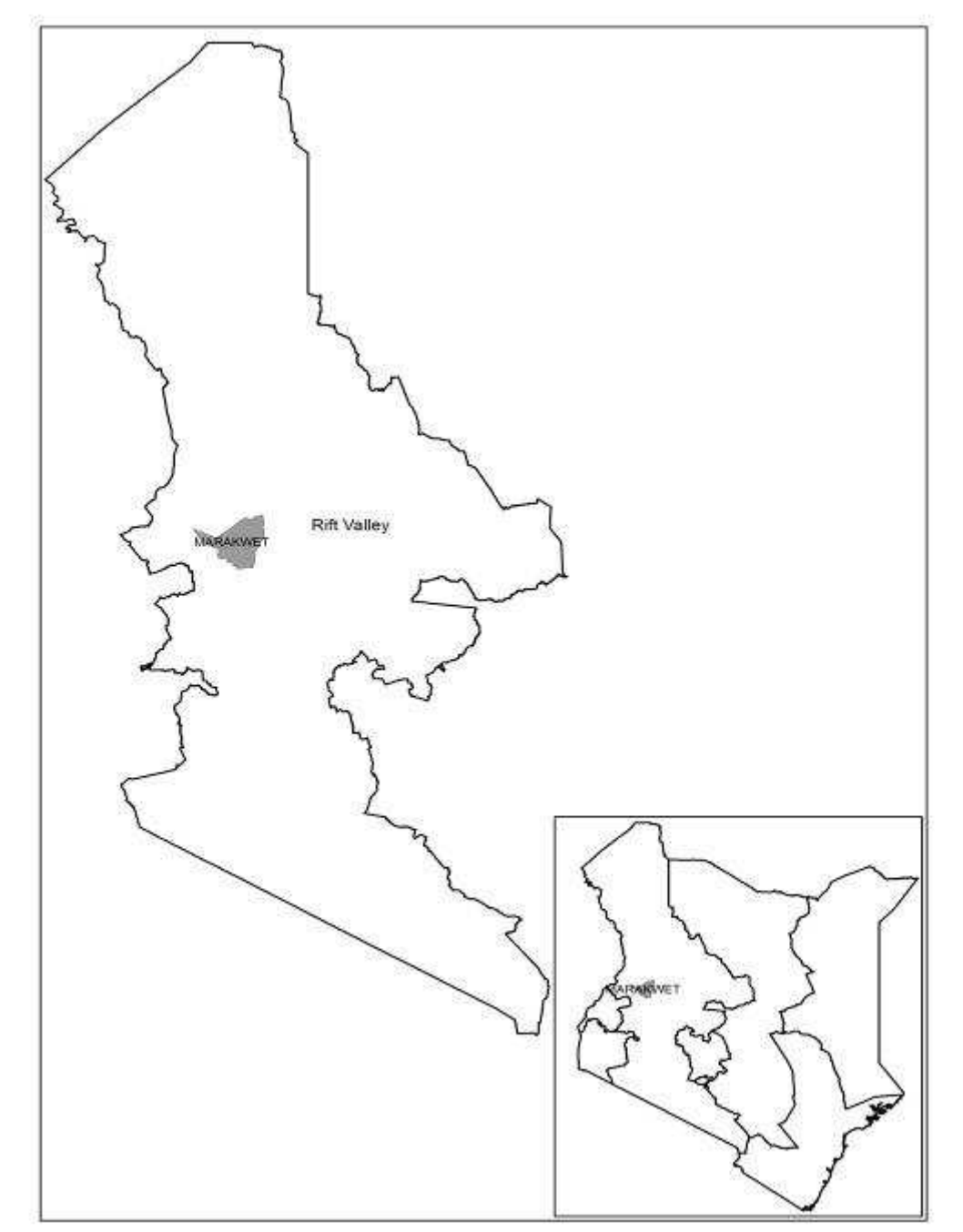
REPUBLIC OF KENYA
MINISTRY OF ENVIRONMENT AND MINERAL RESOURCES
NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY



MARAKWET
DISTRICT ENVIRONMENT ACTION PLAN
2009-2013

EXECUTIVE SUMMARY

The Environment Management Coordination Act (EMCA1999) provides for the formulation of the District Environment Action Plans every five years. This is the first District Environment Action Plan (DEAP) for Marakwet District. The drafting of the DEAP was undertaken through a participatory process both in the public, private and civil sectors. Further, this document has incorporated salient issues from the Divisions.

The DEAP highlights priority themes and activities for the District towards achieving sustainable development. The report is divided into eight chapters. Chapter one gives the challenges of sustainable development, describes the rationale and methodology, presents the District's profile covering the physical features, demographic, agro-ecological zones and main environmental issues.

Chapter two describes the Environment and Natural resources within the district. These include: Land, Water, Biodiversity (forest, wildlife, and Dry lands biodiversity), wetlands and agriculture, livestock and fisheries. Key environmental issues have been identified and interventions proposed.

Chapter three, details the Human settlements and infrastructure in Marakwet 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 and wetlands degradation, policy and legislation, biodiversity loss and land tenure.

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

Chapter five addresses environmental hazards and disasters. The major hazards covered include; drought and famine, human and livestock diseases, HIV/AIDS, wildfires and invasive species.

Environmental information, networking and technology are discussed in chapter six, and noted to have received less attention. The chapter highlights the need to raise awareness and enhance public participation in order to achieve sustainable environmental management.

Governance, Policy and Legal Framework as well as Institutional arrangements are set in chapter Seven. The key environmental issues addressed include; harmonization of environmental legislations and institutional mandates and incorporation of indigenous knowledge. 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. The process followed in preparing this DEAP was participatory, involving various stakeholders from institutions and sectors, including the public, private, NGOs and local communities at District and Provincial levels. These consultative meetings provided the basis also for formulation of the PEAP and finally the National Environment Action Plan.

The DEAP addresses environmental issues from various sectors in an integrated manner and discusses 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 2008-2012). The Plan 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 by the DEC and will be reflected in the State of the Environment Reports.

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.

Dr. Ayub Macharia (PhD)

DIRECTOR GENERAL,

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY

ACKNOWLEDGEMENT

On behalf of the National Environment Management Authority (NEMA), I would like to thank the Marakwet District Commissioner, who is also the chairman District Environment Committee (DEC) for spearheading the preparation process for this District Environment Action Plan (2009-2013). I also wish to thank most sincerely the District Environment Committee and the District Environmental Action Plan Technical Committee for their invaluable inputs and approval of this environmental action plan.

I acknowledge the insights and dedication to this process by the Provincial Director of Environment (Rift Valley) and the District Environment Officer.

Last but not least, I extend my gratitude to all those who contributed towards the finalization of this District Environmental Action Plan in one-way or another.

Dr. Kennedy I. Ondimu
DIRECTOR, DEPARTMENT OF ENVIRONMENTAL
PLANNING & RESEARCH CO-ORDINATION

TABLE OF CONTENTS

Contents

LIST OF TABLES

LIST OF PLATES

CHAPTER 1

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.

1.2 Challenges of environmental management

The people of Marakwet district fundamentally depend on the natural systems and natural resources for existence and development. Particular attention needs to be paid to the dynamics of the global system, the importance of watershed in micro-climates and the natural ecosystems. The capacity of natural vegetation including forests for maintaining system equilibrium, the importance of soil quality and agriculture in ensuring basic human security among others should also be considered. We have to use non- renewable resources efficiently and ensure the renewable resources are used sustainably.

Poverty hinders access to basic needs such as health care, nutrition and education. Currently, 46 percent of the Kenyan population lives below US$ 1 per day compared to 56 percent in 2006. Poverty often leads to over-use and destruction of the environment. In Marakwet district, 62.3% of the population lives under absolute poverty, (GoK, District Development Plan. 2002). The link between poverty and the environment calls for socio-economic development.

EMCA, 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.

1.3 DEAP Methodology

The process started with the appointment of the DEAP secretariat by the Director General NEMA in 2004. The secretariat comprised of a District Water Officer, District Development Officer (DDO) and District Environment Officer (DEO). They underwent an induction course on DEAP methodology.

The District Environment Committee (DEC) members gazetted in 2003 were requested to form a District Environment Action Planning Committee, comprising of lead agencies and representatives from the civil society, chaired by the DDO and the DEO is the secretary.

The District Environment Action Planning Committee spearheaded the preparation of the Marakwet DEAP. They requested for sectoral environment report from the lead agencies and compiled the DEAP. The Marakwet District Action Plan was further enriched through participatory planning approach in which consultation workshops at the district and location level added more information. Local communities consultations focused on the locations that rank the poorest in the poverty index (PI scale) in their respective districts.

The Marakwet District Action Plan therefore, derives its information from the Technical Planning Committee (TPC), Civil Society Consultation Workshops (CSCW), and the Review Technical Team from NEMA Headquarters.

Objectives of District Environment Action Plan

The objectives of District Environment Action Planning include the following:

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

1.4 DEAP Scope

The preparation of the Marakwet DEAP has been realigned with Vision 2030, Midterm Plan (MTP 2009-2013) as directed by the government. The current DEAP covers the period of 2009-2013 and as per EMCA shall be revised after five years. The DEAP will be monitored by the annual preparation of the State of Environment Report. 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 into the annual State of Environment Report. The National (SoE) Steering Committee and the National Environment Action Planning Committees have approved the indicators.

1.5 District profile

1.5.1 Geographical Location, size and administrative units

Marakwet district is one of the eighteen district forming Rift Valley Province. The district was created on 4th August 1994 and is bordered by West Pokot to the North, Trans-Nzoia to the West, Uasin Gishu to the Southwest, Keiyo to the south and Baringo to the east. It extends from Latitude 0^0 51' to 1^0 19' North and from Longitude 35^0 29' to 35% 43' East. The district covers a total area of 1,588 Km^2.

Table 1: District by division, location & sub-locations.

NO	DIVISIONS	AREA (KM^2)	LOCATION	SUB-LOCATION
1.	KAPCHEROP	438	8	24
2.	CHEBIEMIT	163	2	8
3.	TIRAP	186	5	15
4.	TUNYO	135	4	12
5.	KAPYEGO	325	2	6
6.	KAPSOWAR	124	3	7
7.	TOT	217	5	16
8.	**TOTAL**	**1,588**	**29**	88

Source: DDP, 2002

The district is divided into seven administrative divisions, twenty nine locations and eighty eight sub-locations Politically, It has two parliamentary constituencies namely:- Marakwet East and Marakwet West. Each constituency covers three administrative divisions and two constituencies share one division. It is further divided into twenty nine civic wards with one local authority, Marakwet county council.

1.5.2Administrative boundaries

Marakwet district is divided into three topographic zones, namely: - Highland Plateau, the Marakwet Escarpment and Kerio valley. The Highland Plateau rises gradually from an altitude of 2,800m above sea level on the Chebiemit Ridge to 3,350 M above sea level on the Cherangani Hills on the North.

The district has steep escarpments and flat Plateaus that comprise the narrow Elgeiyo escarpment, which varies between altitude 1,200M and 2,000M above sea level. Kerio Valley is 6.4 Km wide and 61.6 Km long and stretches from the south to the North of the district.

1.5.3 Physiographic and natural conditions

The escarpment forms the main water shed to many rivers. The Kerio catchment area lies to the east of this water shed and drains into Lake Turkana. The Western part of the escarpment forms part of the Lake Basin and drains into Lake Victoria. Many rivers drain into the fertile Kerio valley. These include, Kerio River, Embobut, Embomon, Arror, Enou and Maron. These rivers could be used to initiate Irrigation projects particularly horticulture. The floor of Kerio Valley has unconfirmed deposits of Minerals. Livestock production does well in Kerio Valley but cattle rustling which is rampant have a negative effect.

Natural forest cover in the district occupies about 43 per cent of the land. These forests comprise mainly of indigenous trees, which are important for environmental conservation and form good catchment for all rivers, which drain the district. Forest Conservation is an important prerequisite for securing water for domestic use and Irrigation. Proper management of these resources will therefore result in sustainable economic growth and poverty reduction in the district.

The altitude and the vegetation cover largely influence the rain in the district. The rainfall pattern is usually tri-model with the first rain season occurring in Mid-March, the Second in July/August while the third occurs in October/November. The highland zone lies between 2,000M-3,500m above sea level and get the highest rainfall ranging from 1000MM to 1300 MM per annum. The escarpment zone lying 1,500M-2,000M above sea level receives medium rainfall of 850 MM to 1000M per annum. The Kerio Valley zone lying 900M and 1,500M above sea level, receives the lowest rainfall of less than 850 MM per annum.

Throughout the district, high rainfall is accompanied by low evaporation while low rainfall is accompanied by high evaporation while low rainfall is accompanied by high evaporation. This implies that the moisture regime in rainfall areas is even more favorable to crop cultivation than would appear from the total amount of rainfall received. The reverse is true in low rainfall areas. For example, in the highland plateau where the rainfall is high and evaporation is low, there is potential for cultivation of crops like Maize, beans, wheat, tea, pyrethrum and vegetables. Sorghum does well under furrow Irrigation. Horticultural crops like citrus fruits and bananas are also grown. Although, cattle rustling discourage livestock farming in the Valley zone, there is high potential for livestock production.

The average temperature in the district is 240° c during the wet season with a maximum of 30° c in the hot season. February is the hottest month while July is the coldest month. The highland plateau area has the lowest temperature while the highest temperatures are recorded in the Kerio valley.

1.5.4 Population size and distribution

According to the 1999 population census, Marakwet district had a population of 140, 629. This represents a growth rate of 2.6 percent between 1999. The district population is projected to be 150,073 in 2002, 157,051 in 2004 and 172,004 in 2008.the table 2 shows the districts population projections

Table 2: population Projections by Age and Sex (1999-2008)

Age cohorts	**1999**		**2002**		**2004**		**2006**		**2008**	
	M	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**
0-4	12,415	12,008	13,362	12,921	14,034	13,568	14,739	14,247	15,479	14,960
5-9	11,155	10,923	11,996	11,745	12,592	12,327	13,217	12,937	13,873	13,578
10-14	10,423	10,348	11,203	11,122	11,755	11,669	12,343	12,254	12,942	12,847
15-19	8,318	8,195	8,925	8,792	9,354	9,214	9,806	9,656	10,274	10,119
20-24	5,567	6,868	5,954	7,538	6,228	7,703	6,513	8,062	6,812	8,445
25-29	4,430	4,884	4,730	5,219	4,941	5,451	5,161	5,702	5,392	5,958
30-34	2,966	3,219	3,157	5,428	3,291	3,571	3,431	3,726	3,576	3,889
35-39	2,891	3,124	3,076	3,326	3,207	3,469	3,342	3,614	3,481	3,771
40-44	2,226	2,320	2,364	2,461	2,461	2,561	2,561	2,676	2,666	2,781
45-49	1,935	2,214	2,053	2,351	2,135	2,447	2,221	2,547	2,310	2,651
50-54	1,706	1,689	1,808	1,790	1,879	1,863	1,954	1,931	2,031	2,010

55-59	1,284	1,334	1,358	1,411	1,409	1,465	1,463	1,521	1,518	1,579
60-64	953	1,223	1,005	1,293	1,042	1,341	1,080	1,392	1,119	1,444
65-69	882	988	930	1,043	963	1,081	998	1,120	1,034	1,161
70-74	664	783	699	825	723	854	747	884	773	915
75-79	496	440	521	461	538	476	555	492	574	507
80+	633	683	666	719	688	743	712	769	736	796
NS	124	318								
Total	**69,068**	**71,561**	**73,806**	**76,267**	**77,238**	**79,813**	**80,813**	**83,525**	**84,592**	**87,411**

Source district statistical office, Kapsowar, 2001

According to Table 2, the number of people aged (0-19) is estimated to be 90,066 in 2002 representing 60 per cent of the total population of the district. The same age cohort is estimated to be 94,513 and 104,072 in the years 2004 and 2008 respectively. It represents those who are yet to enroll in school, those in primary and secondary school. To cater for this population there is need for additional training facilities such as classrooms and youth vocational training to accommodate the growing population of youth. It is important that they are provided with the requisite training to enable them engage in gainful employment to fight poverty.

The population of those aged 75 years and above is projected to be 2,367, 2,445, and 2,613, in 2002, 2004, and 2008 respectively assuming that life expectancy doesn't change. This is an age cohort that is mainly dependent with the advent of HIV/AIDS on the economically active group, the impact of dependency is likely to be accelerated and the social safety nets are likely to be over stretched. Subsequently, the poverty situation will be compounded. This calls for concerted efforts to fight Aids and encourage individuals to save/invest for their retirement.

During the 1999 census, there were 30,824 female aged between 15-49 years. This is expected to rise to 33,325, 35,103, 36,977 and 38,951 in 2002, 2004, 2006, and 2008 respectively. This cohort is bound to impact on demand for natal and pre-natal service. There will be need for increased supply of these facilities and family planning service. This is also the age group, which is more susceptible to incidence of poverty as single mothers or as married mothers.

The total labour force (15-64) in the district in 1999 was 67,341, women accounted for 35,070 respectively 53.4 percent of the total district labour force. Male labour force over the same period was 32,271. The male to female ratio within the labour force was 100:108. Projections for 2002

indicates gross labour force of 34,430 and 37,433 males and females respectively and 39,182 males and 42,647 female by the end of the plan period. The female dominance in labour force may be explained by the low life expectancy for men and their migration to urban centers and other districts in search of employment and land. For effective management for sustainable growth and poverty reduction it will be important to mainstream gender into all projects and programmes in the district. Men should be sensitized to give women a go way in decision-making.

Out of the gross labour force of 67,341 people in 1999, 81.6 percent were literate. The number of dependants was 73,283 respectively a ratio of 100:109. It is instructive to remember that the high literacy level is an important latent force which can be utilized to exploit the existing agricultural potential of the district including Kerio Valley when the security situation improves.

In Marakwet district three types of poverty are easily discernable, namely food poverty, overall poverty and hard-core poverty. Food poor are those who are unable attain a calorie intake of 67,500 per month per adult equivalent. The food poverty line is estimated at Ksh 927 for rural areas. In Marakwet district, 47.57 per cent of the population areas in this category while 38.6 per cent of the households and 46.54 percent individuals fall under the same category. Nationally, the corresponding figures are 50.56 percent, 43.39 percent and 50.58 percent respectively. This places the district in a better position in terms of food poverty.

1.6 Social, cultural and economic characteristic

In Marakwet district three types of poverty are easily discernable, namely food poverty, overall poverty and hard-core poverty. Food poor are those who are unable to attain a calorie intake of 67,500 per month per adult equivalent. The food poverty line is estimated at Ksh 927 for rural areas. In Marakwet district, 47.57 per cent of the population areas in this category while 38.6 per cent of the households and 46.54 percent individuals fall under the same category. Nationally, the corresponding figures are 50.56 percent, 43.39 percent and 50.58 percent respectively. This places the district in a better position in terms of food poverty.

In terms of overall poverty, an income of ksh 1,239 per month per adult equivalent is the cut off inability to meet basic expenditure of this amount is considered absolute poor. In Marakwet district, 47.82 percent of the population is absolutely poor of which 40.87 percent are households and 46.61 percent individuals while at national level the corresponding figures are 52.93 percent 46.35 percent and 53.06 percent respectively.

Hardcore poor are those who are unable to meet their basic minimum food requirements even if they devote all their basic spending on food items only. In Marakwet this category comprises of 26.01 percent of the adult person equivalent, 21.85 percent of the households and 25.78 percent of the individuals, corresponding national figures are 34.82 percent, 30.1 percent and 34.88 percent respectively.

Table 3: Poverty Comparison between Marakwet District and Nationally

Type	District		National			
	% Of Adult Equivalent	% Of Households	% Of Individuals	% Of Equivalents	% Of House Holds	% Of Individuals
Absolute poverty	47.82	4.87	46.61	52.93	46.35	53.06
Food poverty	47.57	38.6	46.54	50.65	43.31	5o.58
Hard-core poverty	26.01	21.85	25.78	34.82	30.1	34.88

In the recent past, various development programs and projects have been undertaken in the district with a view to improving the standards of living for the local community. These include the rural development Fund Integrated Rural Development program focusing mainly on the semi –arid Kerio Valley, National extension program and National dairy Development program among others. This has also been proliferation of NGOs in the district.

Areas experiencing abject poverty are found in the Kerio Valley Divisions of Tot and Tunyo. This is attributed to semi-arid conditions coupled with cattle rustling. Subsistence crops, like millet, sorghum and cassava do fairly well under these conditions. Cotton and horticultural crops can also be grown but they generate less income because of poor market outlets and poor infrastructure. Most of the income in the district is earn in the highlands where there are good soils, adequate rainfall, better infrastructure and better agricultural practices. Most of the active cooperative societies are also found here. They facilitate better marketing of agricultural produce such as pyrethrum. However some pockets of poverty are also found in the other divisions of Kapcherop, Tirap, Kapsowar, Chebiemit and Kapyego.

Poverty is Marakwet can be attributed to the following causes; lack of quality farm inputs, ineffective marketing channels, inadequate extension staff, poor commodity practices and inaccessibility to appropriate credit programmes.

CHAPTER 2

2.0 Environment and natural resources

2.1 Soils and land use

2.1.1 Soils.

Soils are one of the important non-renewable natural resource that supports life on earth. In Marakwet District, soil resources are especially significant because of the importance of Agriculture to the district and the mounting pressure upon land constantly making this resource even more valuable. Soils in Marakwet are classified on their inherent fertility.

Altitude is the key factor determining the land and soil potential in the district. The upland soils originate from ashes of old volcanic and basement rock. These soils are generally fertile and suitable for cultivation. Although the soils are rich in organic matter, the major problem is that they are shallow and are not easy to cultivate due to rock out crop.

Soil erosion affects most parts of the escarpment and valley floor. This is caused by surface runoff, which sweeps the escarpment during rains. These washes away trees and bushes and cuts gullies especially in Kapsowar and Tirap divisions where vegetation is sparse and the escarpment are not protected. Erosion is also prevalent on the valley floor. Despite the existence of tree and bushes at the vegetation cover, they are not thick enough to withstand the enormous runoff at it descends the escarpment.

Overgrazing and poor irrigation methods also contribute to soil erosion.
The types of soil common in the district include cambisoil, cresoil, invisoil & lithosoil. Cambisoil are distributed all over the district, in the highlands, escarpment and lowlands while cresoil are common in highlands, lithosoil & lunsoil in escarpment and luvisoils are in the low lands.Marakwet district has 6 agro-ecological zones and the following soil types and area coverage

Table 4: Soil Types and Area Coverage

S/N	AEZ	AREA (KM^2)	SOILS
1	Tropical alphine (TA_1 – 11)	171	Cambisols
2	Upper Highlands (UH_1-3)	763	Regosols and Cambisols
3	Lower Highlands (UH_1-3)	334.8	Luvisols and Cambisols
4	Upper Midland (UM_4)	80	Lithosols and Cambisols
5	Lower Midland (LM_4 –5)	240	Luvisols and Cambisols
6	Lower Land (LL_6)	49.37	Cambisols

Soil distribution, fertility and Major Characteristics

The district is bound on the Eastern side by the Kerio River. From its alluvial plain topography gradually rises towards the west. Marakwet escarpment stands out distinctly and causes relief

differences of up to 1500m. in the Northern and southern, part of the district the topography is rugged, giving way to more subdued relief differences going Westwards. The underlying geology mainly consists of gneisses from the basement systems.

Soil of the Mountains and Major Scarps

Are well drained, shallow to moderately deep, dark reddish brown to dark, rocky and bouldery, clay loam to clay; in places with humic top soil (nito chromic cambisols; with haplic phaeozems, lithic phase, lithosoils, eutric Regosols and rock outcrops, friable, sandy clay loam.

Upland Soils

Occur in the northern part of the district where the topography is less like upland within mountains. They often occur with rock outcrops and their topsoil is rich in organic matter.the soils are Complex, well drained, shallow to extremely deep, dark reddish brown, friable clay entric nitosols, nito-chromic cambisols, and partly lithic phase; with rock outcrops.

Soils on Top Hills and Minor Scarps

Soils developed on undifferentiated tertiary volcanic rocks (Olivine basalts, rhyolites, andesites.)
Well drained, shallow, dark reddish brown, friable, very calcareones, boundery or stony, loam to clay loam; in many places ssaline (lithosols; with calic xerosols, stony.In many places they are acid humic topsoil (dystric regosols; with lithosols, humic cambisols.

Soil on Plateaus and High Level Structural Plains

Soil developed on tertiary igneous rocks
Well drained, shallow to moderately deep, dark reddish brown, firm, strongly calcareous clay loam, with stony to boundary sour face, partly saline and/or sodic (calcic xerosols boulder Mantle and saline – sodic phase)

Soils on Volcanic Footbridges

Soil developed on tertiary basic igneous rocks (baskets, nepheline, phenolites; basic tuffs included).They are well drained extremely deep, dusky red to dark reddish brown, friale clay, with acid humic top soil (humic nitosols

Soils on Foot Slopes

Soils developed on colluvium from various volcanic rocks (mainly basalts).
Complex of well drained to moderately well drained, deep, reddish brown to very dark grayish brown, firm, sandy clay loam to clay; partly with humic top soil and /or cracking; often moderately calcareous (luvisols, undifferentiated, luvic phaeozems and chromic vertisols).
They are coarse loamy sandy clay loam (chromic luvisols; with rhodic ferralsols and luvic/ferralic arenosols

Soils on Piedmonts Plains

Soils developed on alluvium from undifferentiated basement system rock.

Well drained deep, dark brown, friable, moderately calcareous clay loam, with sodic deeper sub soil (calcic cambisols, sodic phase.)

Soils on Upper Level Uplands

Soils developed on undifferentiated basement system rocks.
Complex of –well drained, shallow to moderately deep very brown, acid humic, very friable loam in places rocky (Rankers), with acid humic top soil (humic cambisols)

Soil on Upper Middle Level Uplands

Well drained extremely deep, dark reddish brown, with thick acid humic topsoil(humic nitosols) , topsol (humic nitosols) and Well-drained, moderately deep to deep, brown to dark yellowish brown, firm sandy clay loam (Orthic luvisols).

Soils on Sedimentary Plains of Upper River Terraces

Soils developed on sediments mainly from undifferentiated basement system rocks. They are well drained, to moderately well drained, deep, dark brown, friable to firm, slightly calcareous, clay loam to clay (eutric CAMBISOLS)

Soils on Bottom Lands

Soils developed on infill from intermediate igneous rocks (phonolites).They are poorly drained, moderately deep, dark grey, mottled, firm clay, with humic topsoil; in many places over petroplinthite (mollic gleysols.

Soils on Flood Plains

Soils developed on sediments from various sources (recent flood plains).they are well drained to imperfectly drained, very deep, dark brown to yellowish brown, stratified, strongly calcareous micaceous, predominantly loamy soils (calcaric fluvisols).

Table 5: Soil Type, Characteristics, Distribution, Potential Use and Related Hazards

Type of Soil	Characteristics	Distribution (Km²)	Potential use	Current use	Degraded hazard	Proposed intervention
Cambisol	Young little weathered	Occur in association with other soils through-out the district	Barley, Maize, Millet Sorghum, grazing	Maize, millet , grazing	Overgrazing causing runoff	
Luvisol	Well, drained porous, prone to surface sealing	Escarpment & valley Tirap, tot & Tunyo divisions	Cashow nuts, cassava, mangoes, bananas, maize, cotton millet, sorghum cowpea, groundnuts grazing	Maize, Mangoes, Millet, Sorghum & grazing	Sealing causing water erosion.	

2.1.2 Land Use Changes

The district land covers a total of 1,638.17 square Kilometers out of which 1,285.47 square kilometers is arable land. Forest and the rocky steep, Marakwet escarpment covers the rest of the district. The district is 61.6 km long and 51.3 wide.

Table 6: Land Use Types and Administrative Area & Coverage

Name of Division	Land area Km²	Agricultural land Km²	Water covered land Km²	Forest land Km²	Others Km²	No. of households
Kapcherop	448	160	0.5	150	13.4	3024
Tirap	180	112	0.5	73	8	5609
Tot	213	163	2.0	32	60	4153
Tunyo	185	140	1.2	8	89	2758

Kapsowar	124	97	0.5	20	16	4181
Chebiemit	163	120	0.25	122	10	3660
Kapyego	325	120.5	0.25	250	3	2908
Total	1638	912.5	5.2	655	65.3	26,293

Changes have occurred over time particularly the Forest cover, which used to be 40% of the entire district, has reduced because it has been changed into settlement area/Agricultural Farms and grazing fields. Roads here also have been constructed through the Forest.

Effects of land use change in the district include;

- Loss of biodiversity
- Increase of the natural ecosystems
- Pollution of water systems from agro-chemicals
- Changes in rainfall fall patterns
- Reduced water levels in rivers due to destruction of catchment areas

Table 7: Land use potential in Marakwet

Agro-ecological Zone	Potential land use	Current land use	Location
I-III	Intensive arable agriculture & livestock, forestry and game parks	-Crop production -Forestry - Livestock Production	Kapcherop Kapyego Chebiemit Kapsowar
IV-V	Dry land Agriculture/Forestry Renching, wildlife conservation	-Forestry -Livestock -Agriculture Irrigation	Tirap Tunyo Tot.
VI-VII	Marginal –extensive pastoralism & wildlife conservation	Pastoralism	Tunyo Tot.

Dry lands

Dry lands include arid, semiarid and dry-sub humid areas. It occupies 25 % of the total land surface in Marakwet mostly in ecological Zones IV-VI i.e. upper midland zone, lower midland zone and lowland zone. It covers tot and Tunyo divisions and partly Tirap division. These areas are mainly utilized for pastoralism and agro-pastoralism. The dry lands support a large percentage of the livestock in the district thereby contributing significantly to district, economic development further the dry lands are home to over 20 % of the districts population. However, potential productivity of the dry land is threatened by increasing land degradation due to human related activities and adverse climatic factors. Dry lands which covers two divisions in the district has a land areas of 398 Km2 of which 76.1 % is agricultural land area, 10.2 % is forest, 0.8 % is water and 3.7 % is other land uses.

Key Environmental Issues

- Overgrazing resulting from overstocking
- Poor farming practices
- Deforestation resulting from charcoal burning, logging and need for more land for cultivation and settlement.
- Drought.
- natural resources use conflicts
- land degradation
- Soil erosion
- Salinization resulting from poor irrigation methods

Proposed Interventions

- Improvement of irrigation methods – use of drip irrigation or sprinkle irrigation instead of furrow irrigation
- De- stocking to reduces the number of livestock or encourage farmers to practice Zero-grazing to reduce the number of livestock to the right carrying capacity.
- Promote agro-forestry
- Initiate Afforestation and reforestation programmes
- Promote soil conservation measures
- Use of appropriate irrigation systems/methods (e.g.) drips irrigation instead of furrow irrigation. Currently being used along the valley.

2.2 Agriculture, livestock and fisheries

2.2.1 Agriculture

The following are the types of agricultural systems found in the district;

- Dairy cattle and wool sheep which are mainly found in the high altitude Alphine ecological zone.
- Wool sheep, dairy cattle, maize, beans, Irish potatoes, spring onions, cabbage, kales, temperate fruits and beef cattle- found in the upper highlands zone. Area- 76,300 Ha.
- Tea, dairy, pyrethrum, Irish potatoes, wheat, maize passion fruit coffee and mangoes. This is in the lower highland zones LH1 – 3,Area – 33480 Ha.
- Finger millets, mangoes sorghum, maize, beans citrus- theses farming system is found in upper midland zone (UM4) Area of 800 Ha.
- Cotton, mangoes, cassava, bananas citrus sorghum, finger millet goats, local sheep, beef cattle, bee keeping and pigeon peas found in the lower midland zone (LM) 4-5) Area
- Millet, sorghum, mangoes, cassava, goats and local sheep – found in the lowland (LL6) Area – 4937 Ha.

Production Patterns (Cropping Pattern)

Maize, beans, Irish potatoes, cabbage, Pyrethrum intercrops of maize and beans are grown during the long rains Other crops include, garden peas and spring onions whereas, Irish potatoes, cabbage, garden peas pyrethrum, kales and local vegetables are grown during the short rain seasons. The table 10 shows the status and trends of agricultural development. The table 10 below shows the production statistics in the District

Table 8: Production Statistics

CROP	HA. PLANTED		POTENTIAL PRODUCTION LEVEL YIELD HA.	CURRENT PRODUCTION LEVEL (YIELD) TON/HA	
	05	**06**		**05**	**06**
Maize	18929	20633	50 bags	40	40
Beans	14151	13585	12 „	10	8
Irish Potatoes	5935	5462	20 Tons	15	14 tons
Cassava	1734	1208	15 „	13	11 tons
Finger Millet	3985	4290	10 Bags	9	7 bags
Sorghum	2310	1705	18 „	14	14 „
Cow peas	181	280	12 „	7	10
Sweet Potato	208	87	14	11	10
Green grams	902	372	8	7	6
Cabbages	1350	1402	20	15	15 tons
Kales	1600	1328	15	12	12
Tomatoes	210	171	16	14	14
Local vegetable	185	177	19	6	6
Spring onions	200	166	15	13	13
Garden peas	205	190	5	3	3
Spinach	65	39	12	6	7
Carrots	20	38	15	8	7.5

Table 9: Production Level (Yield) Ha.

TREE CROPS	TOTAL HA.	TOTAL HA. 2006	POTENTIAL YIELD	ACHIEVEMENT YIELD	
	2006	2006	06	05	06
Bananas	777	546	16	16	15.7
Mangoes	379	400	20	20	20
Pawpaws	140	80	21	21	15
Orange	257	157	5	5	7
Lemon	69	47	18	18	9
Passion fruit	70	13	14	14	3.3
Grape fruit	52	2.2	18	6	4.5
Tangerines	18.4	7	9	10	4.2
Pineapples	1	0.5	11	8	6
Loquats	14	12	2.6	3	2
Custard apple	14	7	12	10	9.2
Pears	23	0.03	8	7	7
Apples	6	0.25	7	6	6
Peaches	2.4	0.01	6	0	0
Plums	9	0.12	7	4	6
Tree tomato	65	8.0	6	5	5
Guavas	2	5.6	3	4	5.5
White sapota	5	4.3	5	4	6
Avocado	38	37	15	5	10

Source DAO'S reports

Key Environmental Issues

- Catchment degradation
- Changes of Soil properties
- Deforestation
- Encroachment of river banks
- Loss of biodiversity.
- Soil erosion
- Water borne diseases
- Water pollution
- Wetland destruction

Proposed intervention measures

- Build capacity on safe use of agrochemicals
- Encourage community participation
- Enforcement of relevant legislations, regulations and standards
- Enhance soil conservation measures
- Intensification of agro forestry
- Land use planning
- Provision of water drawl points for both human and livestock
- Rehabilitation of degraded sites
- Zoning and gazettement of buffer zones

2.2.2 Llivestock

Livestock keeping is an important economic activity among the Marakwet people especially in the highlands where animal husbandry has become an important farming activity.Cows and merino sheep are kept in the highlands, while traditional goats and local sheep are dominant in the Kerio valley.

Domestic animals and birds kept by the community include; cattle, sheep, goats, donkeys and chicken. These animals and birds provide the community with milk, meat, wool, mutton and hides and skin while chicken are kept for eggs household own-consumption and for sale.

Zero grazing and use of improve cross breeds is not common, but it is being promoted for better dairy farming. The dairy farmers are being encouraged to produce high quality hay and good storage facilities through education and extension to support dairy farmers.

Dairy cattle rearing is gaining importance because of growing land pressure and cattle rustling in the Kerio Valley. This is because cattle rustlers cannot drive dairy cattle over long distance.

Livestock production is an activity that is dominant in the ASAL area in Marakwet district. It remains one of the sub sectors with the highest potential to contribute to poverty reduction through a wide range of value adding activities.

Table 10: Type of Livestock and Total Number per Division and District

Livestock type	Number per Division							District Total
	Kapsowar	Chebiemit	Kapcherop	Kapyego	Tirap	Tot	Tunyo	
Dairy cattle	5,310	11,030	19,030	1,408	4,536	96	55	41,465
Beef cattle	19,520	16,600	5,400	5,000	10,900	2,800	1,800	62,020
Hair sheep	12,050	13,840	7,430	5,310	12,040	12,305	725	63,700
Wool sheep	1,100	31,150	32,200	38,300	10,000	0	0	112,750
Meat	9,090	10,020	4,420	7,010	13,240	25,254	14,426	83,460

goat								
Dairy Goat	0	10	0	0	0	54	26	90
Local chicken	60,000	38,000	35,000	7,000	12,000	17,000	14,000	183,000
Exotic chicken (layers)	760	40	790	0	30	180	500	2,680
Pigs	2	7	28	0	0	0	2	39
Rabbits	120	140	200	475	50	10	50	1,045
Donkeys	150	200	3,000	2,000	1,200	100	100	6750
Hives	Log	2,846	5,000	4,300	3,080	4,000	8,420	4,910	52,556
	KTBH	30	40	36	0	68	20	40	234
	Longstroth	2	5	5	1	0	10	5	28

Source: Livestock marketing annual report –2004

Table 11: Livestock Products in Marakwet District

Division	Product	Total yields (kg)
Kapsowar	Milk	909,760
	Wool	0
	Hides and	

Ski
ns

	Honey	1,514

Beef5,600

Ch 3,9
evo 20
n

	Mutton	42,630
	Eggs	-
Chebiemit	Milk	2,102,700
	Wool	25,000
	Hides and Skins	-
	Honey	1,520
	Beef	5,600
	Chevon	1,880
	Mutton	55,350
	Eggs	-

Kapcherop	Milk	1,877,660
	Wool	35,000
	Hides and Skins	-

Honey2,060

	Beef	11,060

Chevon17,740

	Mutton	75,360
	Eggs	-
Kapyego	Milk	167,000
	Wool	100,000
	Hides and Skins	-
	Honey	1,500
	Beef	0
	Chevon	0

	Mutton	23,500
	Eggs	-
Tirap	Milk	974,700
	Wool	2,000
	Hides and Skins	-
	Honey	3,300
	Beef	0
	Chevon	5.080
	Mutton	6,420
	Eggs	-
Tot	Milk	98,640
	Wool	-
	Hides and Skins	-
	Honey	2,400
	Beef	0
	Chevon	5,790
	Mutton	7,920
	Eggs	-
Tuonyo	Milk	61,800
	Wool	-
	Hides and Skins	-
	Honey	2,000
	Beef	0
	Chevon	5,080
	Mutton	6,420
	Eggs	-

Source: Livestock marketing annual report –2004

Key Environmental Issues

- Agrochemical pollution
- Livestock pests and diseases
- Overgrazing
- Poor disposal of chemical containers
- Soil erosion
- Poor animal husbandry

Proposed interventions

- Community sensitisation.
- Enforcement of waste management regulations.
- Establish and implement carrying capacity and stocking rates.
- Observe animal husbandry requirements
- Control of animal pests and diseases

2.3 Water resources

The major sources of water in Marakwet district include rivers, wells, springs, dams and roof catchment. It is approximated that in the entire district 2,612 households get access to piped water while 2,691 households accesses potable water. The average distance to the nearest potable water point is about 2 Km. The district is endowed with 5 major rivers, 16 wells 257 protected springs, 2 dams and 100 roof catchments households.
The key water resources for irrigation are river water. The main rivers that supply water for irrigation, human and livestock are; Rivers; Embobut, Embolot,Enou, Embomon, Arror, Shesegon and Moiben and They are permanent. Rivers. Other sources include numerous springs emanating from the various forests. The main catchments for these rivers are Embobut Forest.

These rivers are source of water to 56 furrows in the district. The furrows provide water to irrigate over 2000 Ha (5000 Acres) currently.The potential for irrigation is over 7000 Ha (17,500 Acres) in Kerio valley. The dry season available capacity of flow is as follows;Embobut – 19601/s,Embolot – 601/s,Enou - 101/s,Embomon – 3001/s and Arror – 10501/s

The main sources of water within Marakwet district are surface and ground water. Availability of the surface water for domestic and livestock use is limited due to Destruction of water catchment areas, uncontrolled water abstraction and the topography of the area.
Lack of proper disposal of waste water/other wastes lead to runoff from urban and rural areas to water sources. This threatens the health of the population because of contamination of surface water. The tables below shows the type and water sources and the population with access to water access in the district

Table 12: Type and Number of Water Source

Source	No.
Permanent rivers (streams	6
Protected springs	257
Dams & Pans	2
Wells	16
Bore holes	2

Sources: Ministry of Water

Table 13: Population with Access Water

Category	No.

No. of house hold with access to piped water	2613
No. of house hold with access to potable water	2691
Average distance to nearest potable water point	2km

Source: ministry of water

Natural forest cover in the district occupies about 40 per cent of the land that mainly comprise of indigenous trees which are important for **Key Environmental Issues**

- Pollution of water resources
- Loss of biodiversity
- High prevalence of environmental related diseases
- Silting of water sources due to farming along river banks and even general catchment degradation is affecting both water quality and quantity.
- Inadequate technologies on water harnessing

Proposed interventions

- Promote awareness creation on the importance of water bodies
- Initiating projects to promote sustainable use of water
- Desiltation of water sources
- Promotion of soil and water conservation techniques
- Reaforestation of water sheds/catchment areas
- Construction of sewerage treatment plants in the major towns in the district (e.g.) Kapsowar and Kapcherop
- Enforce relevant laws and regulations i.e. water quality regulations 2006 and Public Health Act
- building capacity development in the management of water resources
- Enhance water harvesting technologies

2.4 Forestry

environmental conservation and form good catchment for all rivers, which drain the district. The forest mainly covers most parts of the highlands and escarpment particularly along the Cherangani hills. The Cherangany hills comprise of indigenous forests and small patches of exotic plantation forests.

The escapement forms and the indigenous forests are the main watershed. The Kerio catchment area lies to the east of this watershed and drains in to Lake Turkana. The Western part of this escapement forms part of the lake basin and drains in to the Lake Victoria. The main rivers are; Kerio Chesegon, Embobut, Embomon, Arror, Enou, Maron and Moiben. The Highland is undulating with high forest cover and is a source of the main rivers flowing into Turkana and Lake Victoria basins e.g. Arror, Embobut, Mon, Embolot and Moiben.

The district is rich in forest resources most of which are gazetted. These forests occupy approximately 65,500.3 Ha; which translates to 38% of the total land of the district. Over 95% of the forest cover is made up of various indigenous tree species such as Bamboo, Cedar, Juniperus *Procesa, Prunus Africana* and *Olea Spp.*

Exotic tree species occupy very small fraction, approximately 0.8% of the forest area and mostly found in Chesoi and Cherangany Forest Station. Indigenous trees form a large proportion of private forest in the district especially in kapcherop and Kapyego Divisions.

Plate 1: Partially Degraded Forest In The Hilly Part Of Marakwet District

Status and Changes in the Forest Cover

All the ten (10) Forest reserves of Marakwet District were gazetted under various legal notices within the following area. Vis-a- Vis changes in coverage to date. The table below shows forests reserves and area (Ha) in the district.

Table 14: Forest Reserves and Area

FOREST RESERVE	AREA (HA)	REMARKS ON FOREST STATUS
Embobut	21,933.9	The forest is heavily settled by invaders. Schools and churches are established at the periphery and inside the forest. The Bamboo Zone is over exploited. Approximately 8,000 Ha are degraded.
Kipkunur	15,175.7	Heavily settled by forest invaders, over grazed, encroached sides, schools established and periphery. Over 2000 Ha. is degraded.
Sogotio	3,561.2	Heavily encroached; schools are established at the periphery.
Kapchemutwa	2,125	Encroached from sides, schools, and cattle dip, market centers have been established at the periphery. Families relocated from Kapsowar occupy over 200 acres.
Toropket	117.4	Heavily encroached from all sides. There is rampant poaching of cedar posts.
Chemurkoi	3,965.9	Encroached, over grazed, Schools and other public institutions established along the periphery.
Cheboyit	2,488.8	Encroached, Over grazed, schools and other public institutions established along the periphery.
Kerer	2,160.2	Slightly encroached.
Kipteber	12,886.2	Heavily encroached, schools and other public institutions established along the periphery.
Koisungur	1,085.8	Encroached, schools established along the periphery.

Plate 2: Degraded Hill Tops Due to Deforestation by the Local Community

Key environmental issues

- Deforestation of the indigenous trees e.g. *juniperus procera,* and *hagenia Abyssinica.*
- Encroachment of the forest for cultivation
- Loss of biodiversity
- Soil erosion
- Loss of vegetation through charcoal burning ,extraction of firewood
- Lack of environmental management plans

Proposed Interventions

- Initiating afforestation and reforestation programmes
- Enforcing the relevant laws and legislations
- Awareness creation and sensitization of people living around the forest areas.
- Involvement of the local people in the management of forestry resource through participation in afforestation and management planning processes.
- Introduction of other sources of income generating activities other than charcoal burning
- Improve irrigation system along the escarpment and Kerio Valley for increased agricultural productivity.
- Promote agro-forestry on farmers' fields.
- Enhance adoption of soil and water conservation measures.
- Reduce the number of animals grazing in government-gazetted forest

2.5 Wildlife Resources

The district is endowed with abundant flora and fauna. The Kenya Wildlife Service provides control services in terms of controlling the human-wildlife conflicts in relation to destruction of property or loss of life. The following wild animals are found in the district; Leopards, butterflies, hyenas, monkeys, waterbucks, snakes, crocodiles and various types of birds.

2.6 Biodiversity Conservation

The district is endowed with important fauna and flora due to the presence of gazzetted Forests. They are important sources of food, beverages, medicine, forage, vegetable oil, fiber and hides and skins. The forests are believed to have several species of flora, fauna & micro-organisms. However, many species still remain unknown because they have not been documented or not yet even discovered. This indicates that Marakwet district is one of the contributors to the highest preserves of general pools in the country with some being endemic, rare, threatened or vulnerable in the different forest blocks. The district has good fresh water ecosystems coverage with six major rivers training to either lake Victoria via river Nzoia River or lake Turkana Via Kerio River. The agnatic ecosystems contain a variety of Fauna and Flora too.

Agricultural Biodiversity

Some plant and animal species are either domesticated or are in the wild plants that have been domesticated including cereal crops some of which have been adopted very well owing to their remunerable physiological adoptability. The genetic diversity in agro-system in Marakwet is threatened by pressure from cross breading and the introduction of exotic varieties of crops and animals. For example today in Marakwet district millets have been largely been replaced by maize as the leading stable food as well as income earner and is produced in all the arable places in the district. The destructive habits of the poor people in a desperate bid for survival coupled with the high and unsustainable consumption of resources by a small but fairly rich minoty of the districts population have altered, over –exploited or destroyed natural habitats where biodiversity resides, thereby affecting the status of local agricultural biodiversity.

The greatest factor contributing to the loss of crop and livestock genetic diversity in the district is the spread of high – input agriculture and displacement of the more diverse traditional agricultural systems in the high potential areas. The high yielding varieties of crops like in any other part of the country have gradually been introduced in the district to replace traditional/crop varieties and their wild varieties. These have resulted to traditional crop species being neglected and underutilized by a wide segment of the population in the district.This has undermined conservation efforts of certain genetic resources, which would otherwise be source of livelihood, were it not for the changing production and consumption patterns.

Forest Biodiversity

Forest ranks high among Marakwet's important resources and makes an integral part of districts development agenda. The close canopy forests block in Marakwet district is estimated to be 65,000 Ha; this is about 40% of the entire closed indigenous forest canopy cover occurs in gazzetted forest blocks which are 9 in total.

Plate 3: Forest Diversity in Marakwet District

Key Environmental Issues

- Unplanned land use practices that threatens conservation on biodiversity
- Deforestation
- Lack of soil and water conservation measures.
- Invasive species
- Drought
- Overgrazing
- Forest encroachment for settlement and farming
- Landslides and anomies & mining
- wildfires
- Changing land tenure system
- Poaching of wildlife
- Destruction of wildlife migratory corridors and dispersal areas
- Wildlife diseases.

Proposed Interventions

- Enforcement of legislation to protect endangered species
- Promote diversification of alternative livelihoods
- Formation of Water Resource Users Associations (WRUAs)
- Involvement of community participation in environmental conservation
- Formation of community based conservation groups to protect and conserve the hilltops
- Create awareness on conservation and sustainable utilization of biodiversity resources amongst the community.
- Application of indigenous knowledge (1K) in biodiversity conservation alongside other approaches
- Control of inappropriate land use and encroachment into wildlife conservation areas and protected/gazzetted forests
- Community involvement in forest management.

CHAPTER 3

3.0 Human settlement and infrastructure

3.1 Human settlement and planning

Human settlements and infrastructure are physical articulations or form of the social, economic, political and environmental interaction of people living in communities. The communities can either be urban or rural. The development of these communities involves changing the environment from its natural state to a built one. These activities are significant agents of environmental change and economic development. For example, human settlements and infrastructure influence the location of investment, which provides employment, generates revenue and creates demand for materials and services. This includes education, commercial, industrial, recreational, residential, agriculture, public utility (services include supply of water, sanitation, waste disposal, telephone and power). Public purpose will include (religious institutions) and protected land (public parks, national parks and reserves, forests). Transport (roads, railways, airways, lake/sea ports). These activities can have negative or positive impacts on the environment.

Large part of land in Marakwet falls under freehold (absolute ownership) other forms of land tenure are government land and trust land. Land tenure determines how the local communities can conserve resources.

3.1.1 The Settlement Patterns and Distribution in the District

The settlement patterns and distribution vary from one division to another. Kapcherop Division has the highest population. This is attributed to the good climatic conditions favorable for agricultural activities. The density is however, not high due to large individual farm holdings efforts to alleviate poverty in this division should focus on improving the road condition marketing and diversification to cash crop.

Kapsowar Division has the highest population density of 158 persons per square kilometer. It also has the highest growth rate of 4.8 percent. The density is influenced by the good agricultural potentials and road network. The siting of the district headquarters is also a factor. In the recent past, however, insecurity in Kerio Valley has caused the community to emigrate to Kapsowar. Any poverty intervention should focus on those who are living in the urban centers and the escarpment previously reserved as a buffer zone. Efforts will focus on modern agricultural practices. Security should be enhanced in the division. The population densities for chebiemit and Tirap are 114 and 125 persons per Km^2 Respectively. They are in the same ecological zones with Kapsowar and any poverty intervention strategy would be placed on improving road conditions.

Kapyego Division has the population density of 35 per KM^2, with the second highest growth rate of 4.5 percent in the district. The division is relatively new in terms of settlement and land holdings are still larger than in other divisions. It is still attracting new immigrants hence the high population

growth rate. The division has huge agricultural potential for cash crops particularly pyrethrum, potatoes and wool production.

Tot and Tunyo divisions have relatively low population densities of 82 and 78 persons Km^2 respectively. These divisions are located in Kerio Valley and are semi arid and Prone to insecurity, arising mainly from cattle rustling. This has induced out – migrations to other divisions of the district and even to other district with Tran-Nzoia and Uasin-Gishu being the main destinations. This scenario has resulted in negative population growth rate of 0.1 per cent and 1.8 percent in Tot and Tunyo respectively. Poverty intervention strategies in these two divisions should focus on improving security and improving the road conditions especially those linking Kerio Valley and the highland. These interventions will improve livestock activities and horticulture farming which have enormous potential in the two divisions.

Table 15: Population Densities by Division

Division	Area (Km^2)	1999	2002	2004	2006	2008
Kapcherop	438	90	97	102	108	113
Kapyego	325	35	38	40	42	45
Chebiemit	163	114	123	130	137	144
Kapsowar	124	158	171	180	190	200
Tirap	186	125	135	143	150	158
Tot	217	82	88	93	98	103
Tunyo	135	78	85	89	94	99
Total	1,588	89	96	101	106	112

3.2 Infrastructure

The disparity between the rate of urbanization and economic development in relation to social, infrastructure, industrial growth, commerce and employment has exacerbated the proliferation of slums and squatter settlements that suffer from inadequate water, poor sanitation, waste disposal, health facilities, environmental pollution, land degradation, loss of biodiversity, loss of aesthetic values, radiation and inadequate enforcement of legislation. These conditions have an impact on the quality of urban environment and the surroundings.

Key Environmental Issues

The following are environmental issues related to human settlement and infrastructure:

- Inadequate physical planning
- Inadequate infrastructure
- Pollution of water sources by human waste
- Inadequate waste management
- Inadequate enforcement of by-laws by local authorities

Proposed Interventions

- Carry-out comprehensive urban/physical planning

- Develop and improve on the existing infrastructure
- Develop land-use plans
- Plan and develop sewerage facilities for all urban areas
- Designate and manage waste disposal sites
- Enhance the enforcement of relevant laws and regulations
- Rehabilitation of degraded areas
- Encourage public private partnership
- Promote cleaner production technologies
- Encourage use of appropriate building technologies and materials
- Integration of environmental concerns into projects, programmes and activities.
- Improvement of sanitary accommodation and hygiene promotion
- Enforcement waste management and water quality regulation 2006

3.3 Human and Environmental Health

The major types of sanitation facilities found in the district are mainly pit latrines water closets and sewer reticulations are not in existence amongst the rural population and very few get access to water closets in the urban centers. The density and land areas served by the services or facilities have been determined. All the market centers and urban centers in the district lack sewerage facilities in the district.

The major diseases found in the district are water borne and water related diseases and these include; cholera, diarrhea, typhoid, malaria, and dysentery.

3.4 Pollution and Waste Generated from Human Settlement

Human settlements are associated with generation of huge amounts of wastes. This has had serious implications on the general cleanliness of the surrounding areas and has contributed to environmental degradation, more so if the waste is composed of non-biodegradable materials. In rural areas most households dispose their garbage by dumping it on farms or gardens within the homesteads. The most common method of garbage disposal in the urban areas is through public garbage heaps, pits and other undesignated dumping sites.

Urban centers form a large portion of pollution sources. Liquid and solid wastes from various activities in these areas find their way into rivers and other water sources hence causing contamination. Pollution problem is compounded by the fact that most urban centers do not have sufficient waste disposal facilities notably a designated dumping site. Despite the existence of waste by - laws in all the local authorities within the district, enforcing them has always been a challenge.

Some of the waste generated within the district include**,** solid wastes, liquid wastes, medical wastes, industrial wastes, radioactive wastes, excreta and urine and dead animals.

There are no reported serious cases of air and noise pollution in the district. Lack of enforcement of municipal by - laws and low fines for polluters encourages bad management of liquid and solid waste.

Key Environmental Issues

- Water pollution
- Environmental related diseases
- Improper sitting of sanitary facilities
- Low level of awareness on sanitation

Proposed Interventions

- Enforce Public Health Act and other relevant regulations
- Enforcement of EMCA, 1999 and subsidiary legislations
- Promote land use planning
- Intensification of health education especially on hygiene

3.5 Communications Network

The district is fairly covered in terms of roads and communication networks. The district has got one poorly maintained airstrip at Tot. The district has 1015 kilometers of classified and 155 kilometers of unclassified roads. Although most of the centers in the district are connected to the road network, most roads are impassable especially during the rainy seasons. Apart from the classified and un-classified roads, there exist rural access roads that are constructed and maintained by the local community.

The major roads in the district include; Kapcherop-Cheptongei-Chebiemit; cheptongei-Kapsowar-chesoi-Chesongoch roads which transverse the highlands to the neighboring Keiyo district and onto the Kerio valley. Others are Chesongoch –Tot - arror-Chegilet road, which passes through the Kerio River; and the Chesoi- Chesongoch road that passes through the escarpment down to the valley. Under construction is chesoi –Marron road sponsored by the government of Kenya.

Other major roads in the district include Kapsowar-Kipsaiya; Kipsaiya-Sisiya, Kapsowar Koibaben, Kapsowar Litei, Chesongoch Koitilial. There is need to upgrade the existing roads as well as opening up new ones to cover entire district particularly the highlands and valley regions.

The postal and telecommunication services in the district are not adequate. The telephone services are only available in Kapsowar, Tot, Arror, Chebiemit and Kapcherop centers though the reception is poor. Major Service providers include Safaricom, Zain and Telkom Kenya Ltd.

The district has 4 post offices and 5 sub-post offices in the major centers. It has 7 telephone booths and 90 % of households have access to radio with only 10 % without radios. The entire district has no cyber cafes.

3.6 Health facilities

The District has a reasonable number of health facilities, which include mission, government and private hospitals. Traditional doctors also play a role in providing medical services/herbal services to residents. The number of health facilities in the district include; one hospital one health center, five dispensaries and two private clinics.

3.7 Education facilities

The district has primary, secondary and tertiary institutions as elaborated below;

Pre-Primary	- 213 Number (18 Private Pre-schools)
Primary	-172 Number (8 Private primary)
Secondary	- 33 Number (7yet to be registered)
Tertiary	- 03 Number (1 Private)

Key Environmental Issues

- Poor landscaping in schools
- Poor drainage systems in schools
- Poor disposal of waste
- Inadequate sanitation facilities
- High malaria prevalence

Proposed Interventions

- Quality assurance visits to cover environmental aspects
- Proper waste management
- Increase and improve sanitation facilities
- Improve drainage systems in schools
- Formation of environmental clubs in schools
- Establish emergency fund for disaster management
- Encourage water harvesting techniques in schools
- Encourage school to develop tree-nurseries and woodlots
- Encourage prevention and control of malaria
- Encourage of proper landscaping in schools

3.8 Energy sector

The major sources of energy supply in the district include fuel, wood, gas, paraffin, biogas, electricity and solar. The utilization of the above type of energy varies, about 94% of the population in the district utilize firewood/charcoal, while 90% of households uses kerosene, gas or biogas, 2 % rural

households uses solar power, while the only population in the 5 trading centers in the district uses electricity. The town include Chebiemit, Cheptongei, Chebara, Kapcherop and Kapsowar.

Key Environmental Issues

- pollutions
- deforestation
- loss of biodiversity.
- respiratory tract related diseases

Proposed Interventions

- Promotion of agroforestry
- Promote afforestation programmes
- Development and promotion of alternative cheap and affordable sources of energy
- Petroleum products dispensing stations be constructed with grease/oil traps and oil/water separators.
- Create incentives/disincentives for cleaner and modern technology
- Increase research and development for development of affordable biomass energy technologies for the poor, especially those in rural areas.
- Increase access to affordable electricity by importing from the regional grid/power pool to the district.
- Built capacities through training and motivation.

CHAPTER 4

4.0 Industry, trade and services

4.1 Industry

Industry is a very important sector as it is a source of employment, income and overall development. The districts industrial sector has not been fully exploited. A few of the industries found in the district are agro-based and spread throughout the district.

4.2 Trade

The major types of trade practiced in the district include;

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

4.3 Services

The following are some of the services undertaken by various entrepreneurs in the district:

- Dry cleaning
- Hospitality and tourism
- Shoe repairs/shining
- Garages
- Carpentry
- Tailoring,
- Posho milling,
- Hairdressing and cuts

These activities have created self-employment for the youth who form a majority of the population.

Key Environmental Issues

- Waste water
- Gaseous emissions
- Solid waste
- Health and safety concerns for the workers
- Ignorance and selfishness among resource users

- Lack of awareness among the public
- Inadequate personnel and financial resources

Proposed Interventions

- Adopting cleaner production technologies
- Environmental monitoring to ensure compliance
- Enforcing water quality and waste management regulations 2006
- Conducting research on possible alternative use of wastes and/or better methods of waste disposal
- Adequate sensitization and awareness on environmental issues, EMCA, 1999 and need for compliance
- Offer incentives, rewards, sanctions and recognition to the best technology in use
- Establishing appropriate sites and ensuring proper waste disposal.
- Ensuring proper restoration of borrow pits.
- Public private Partnership in good environmental management/ clean management practices

4.4 Tourism

The district has potential in tourism but this has not been fully developed, mainly due to the poor road network and insecurity. The main tourist attraction in the district is mainly scenery beauty.

4.5 Mining quarrying

Marakwet district is endowed with minerals, which can be commercially mined. The minerals believed to be in Marakwet escarpment and a along the valley include traces of gold and marble but due to high financial costs involved, risks and costs have retarded the exploration and extradition of these minerals.

The district is endowed with abundance of building stones and sand whose local demand is picking up. Marakwet district is close to Eldoret town where demand for construction materials is very high. Opportunities therefore exist for the setting up of quarries to supply ballast, cut stones and building blocks for the construction industry.

4.6 Sand harvesting

Sand harvesting is one of economic activities in the district. Most of the activity takes place along the banks and it is scooped manually in all the sites. Sand harvesting is regulated by Marakwet country Council under the local government Act.

Key Environmental Issues

- Uncoordinated sand harvesting
- Land degradation
- Destruction of habitats

- Loss of biodiversity
- Accumulation of wastes

Proposed Interventions

- Formation of sand harvesting groups/CBOs
- Development of sand harvesting plans
- Regulation of sand harvesting through proper enforcement of EMCA, 1999 and sand harvesting guidelines
- Rehabilitation of the damaged sites by planting the appropriate tree species and establishing the appropriate soil conservation measures.
- Involve community in sand harvesting activities.

CHAPTER 5

5.0 Environmental Hazards and Disasters

People and Environment face threat to their life and livelihood from naturally and human related hazards .Natural hazards include dry spells, soil erosion and landslides. Drying up of water sources lightening and hailstorms among others. Disasters happen when these natural hazards interact with vulnerable people, property, and livelihood causing varying damage depending on the level of vulnerability of the individual property or livelihood.

Anthropogenic factors causing land degradation .deforestation of catchment areas, poor agricultural practices in appropriate land use systems. Changing living conditions among others have established to be contributing to increased impacts from the various hazards.

Some of the most frequent disasters that have occurred in Marakwet district include landslides, drought famine and disease outbreak.

Landslides are a common occurrence in the district especially during rainy seasons. They are mainly common settlement has exceeded the recommended slopes gradient. Landslides have occurred in Embobut, Tirap division some of these disasters are exacerbated by human activities such as clearing of natural Forest/vegetation, quarrying and construction.

Drought is also common in the district especially along the valley. Severe weather conditions in Tunyo and Tot divisions (ASALS) have led to loss of vegetation cover, which has reduced the availability of forage to support animals. As a result, drought has increased animal mortality famine and lack of drinking water for both humans and animals. Marakwet experienced a very severe drought during the year 2000 which resulted in a high mortality rate of livestock. Pastoral communities along Kerio Valley experienced the most loss.

Disease outbreak has also struck the district. The diseases outbreaks are more prevalent in the valley as compared to high lands. The latest disease outbreak in the district was Rift Valley fever, which killed a sizeable number of livestock between late 2006 to early 2007.

Status of Early Warning & Preparedness

The capacity of the district to handle, mitigation and help recovery from disaster is lacking. The district lacks an early warning and preparedness system.

Key environmental issues

- Soil erosion
- Landslides
- Droughts

- Diseases outbreaks
- Loss of vegetation cover
- Loss of habitats
- Destruction of food crops, dwelling structures and even loss of human life.
- Loss of biodiversity
- Food insecurity.
- Conflicts over Resources e.g. at Embobut forest areas.
- Destruction of the fragile ecosystem through encroachment and unsustainable farming practices.
- Loss of Biodiversity
- Destruction of property and even loss of life.

Proposed Interventions

- Proper farming methods should be practiced with soil conservation structures in place along the escarpment.
- Stop any agricultural activities in areas where the slope is over 35%.
- Degraded areas must be reforested with the right tree species with immediate effect.
- Ban charcoal production in affected areas.
- Introduction of drought tolerant crops.
- Digging of boreholes and construction of dams.
- Introduction of water harvesting and conservation technologies such as roof water catchment.
- Crop and animal diversification e.g. cotton farming, Camel rearing and Bee keeping.
- Practice dry season copping feeding mechanism.
- Sensitization of people through public barazas and churches.
- Creation of firebreaks in forests.
- Purchase and Installation of fire extinguishers and horses in all government buildings.
- Training and regular drilling of personnel on fire fighting techniques.
- Develop an early warning systems
- Enforcement of relevant laws and legislations

CHAPTER 6

6.1 Environmental Information Networking and Technology

Information is a fundamental resource in decision - making process. Information is required in defining objectives, setting targets and it guides in the implementation of programmes. In order to make an informed decision about policies and priorities, there is need to establish a strong, authoritative data gathering mechanism. Reliable and comparable information allows organizations to develop indicators and link them to other critical issues such as health and poverty. Implementation of environmental education and dissemination of environmental information is fundamental to enhancing public involvement and participation in environmental management that leads to behaviour change resulting in responsible living and interaction with the environment.

Environmental information and networking technology has not received much attention and priority for many decades as compared to other sectors. Lack of capacity, poor coordination and linkages, documentation, utilization and preservation of indigenous knowledge are key issues affecting environmental information and networking at community, civil society, and private sector, learning institution, government institutions and international levels. Information Communication Technology sector is vital for development. There is need for Telkom Kenya, Kenya News Agency and other service providers to enhance information communication through telecommunication services and e-mail facilities.

6.2. Environmental Education

Information technology has become a powerful tool for environmental information dissemination. Environmental education among the Marakwet population is critical for active involvement in conservation. Formal and informal education is helpful in changing people's attitudes and behaviour. It imparts skills and knowledge that enable people to strive for sustainable development through effective public participation in decision-making processes. Types of environmental education programmes which do exist in the district include the various environment related clubs including 4k club, Wildlife Club, Geography clubs, eco-school, chebororwa farmers training Institute/college has formal eco-Programme where they participate in promotion of establishment of woodlots. A number of primary schools including Kapsowar primary school have eco-programmes while Moi Kapsowar girls, Sambirir Sec. School, chebara Boys, Marakwet High school have different eco-programmes

Plate 4: Informal Environmental Education and Awareness

Public Awareness and Participation

Public awareness initiatives in the district are mainly through print and electronic media, barazas, commemoration of environmental days such as World Environment Day, workshops and seminars.

6.3. Technology

Cleaner production technologies have not been embraced in the district. Waste recycling firms have not been established either in spite of huge amounts of recyclable garbage. Scrap metals and high density plastics are collected by 'waste pickers' and transported to recycling plants outside the district.

6.4. Environmental Information System

Environmental information refers to all forms of knowledge, which relates to the environment in one way or the other needed to understand or manage the environment. Main sources of information in the district include international organizations research institutions and centres, educational institutions and civil society organizations.

6.4.1 Status of environmental information management system

Information on environmental related issues is easily available in the district. This is because institutions and organizations do share the information in workshops and seminars. Marakwet Municipal Council, District Public Health office both have environment unit. The daily newspapers, which occasionally contain environment related information, are kept at the District Library and the District NEMA office. Despite the existence of valuable indigenous knowledge (IK) on environmental issues it still remains undocumented. IK is normally discussed in seminars and workshops. There is an urgent need to document this information so that policy makers can make good use of it.

The main source of environmental information in Marakwet district includes international Organizations (e.g.) JICA, World Vision international, and government ministries, Parastatals NEMA, KVDA , KWS ,research institutes/ centers and civil society Organizations & educational

institutions. The data type available in Marakwet district is mainly biological, Agricultural, physical land use and social-economic and cultural.

6.5 Indigenous knowledge

The local inhabitants have strong ties with their cultural and social life that address the well being of people, animals and the environment. Some of these beliefs and practices exist as indigenous knowledge and have been applied since time immemorial to save land, forest and animals from overexploitation. The life styles of age group like Korongoro in Marakwet are the only proven working models for the sustainable consumption of biological resources.

The people of Marakwet have been relying on biological, diversity to meet their basic needs. As a result of this reliance, the community has accumulated knowledge on the uses of various animal and Plant species and how they can be conserved. This knowledge covers areas such as animal and human health, weather and climate changes predictions and best practices for conservation of biological diversity.The indigenous knowledge on various aspects of biodiversity has helped to great extend in environmental management, for example the protection of cultural sites for ritual performance and protection of certain tree species and animal have help in reduction of environmental degradation in the indigenous forests managed through clanism in the district.

Key Environmental Issues

- Bias and preference of modern technologies-The young generation belief that modern technology is far more superior to traditional knowledge thus reducing uptake and utilization
- Inadequate documentation of IK
- Lack of scientific studies to validate these technologies
- Inadequate support of IK by the GoK
- Inadequate Frameworks for equitable benefit sharing and access
- Lack of a policy on indigenous knowledge
- Inadequate awareness on the potential economic value of IK among local communities

Proposed interventions

- Conduct research to document IK
- Training both the public and government institutions to enhance their use
- Raise awareness on application of IK in conservation
- IK policy formulation (Develop IK Policy)
- Awareness Creation on the potential economic value of IK among the community
- Develop IK database, inventories and documentation
- Dissemination of Information on IK
- Develop an institutional framework for IK
- Build capacity to enable the community to negotiate benefit sharing arrangements with those who need to use their knowledge.

CHAPTER 7

7.0 Governance, Legal Framework, Institutional Arrangements and Policies

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 on overarching framework law, environmental management was scattered in various sectoral legislations and some were conflicting. 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 conservation and management plans, through NEAPC, PECs and DECs.

7.1 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 and monitoring of 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 Trade
- Ministry of Industrialization
- Ministry of Planning, National Development and Vision 2030
- Ministry of Home Affairs and National Heritage
- 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

Committees under EMCA

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

7.2 Regulatory and Management Tools

There are various mechanisms in place in the district that ensure that the environment is conserved. EMCA1999 provided for the establishment of the District Environment Committees. The Local Authority (Town Council) has an environment Division to ensure that the environment's integrity is maintained. Some of the environmental tools being used in the district include:

- Environmental Management and Coordination Act of 1999
- Environmental Impact Assessment regulations of 2003
- Environmental Audit regulations of 2003
- Water Quality Regulations of 2006
- Public Health regulations
- Local Authority Regulations
- Waste Management Regulations of 2006
- Access and Benefit Sharing for Conservation of Biodiversity, 2007
- Noise pollution and excessive vibration 2009

CHAPTER 8

8.1 Implementation Strategy

Environmental concerns are cross cutting in nature and their impacts are felt at local, district, regional, national and global levels. The overriding goal of this Environmental Action Plan is to enhance integration of environmental concerns into local development planning and implementation. The purpose of the implementation strategy is to catalyse the development enabling environment and establish synergies to achieve this goal.

Implicit in this strategy is the recognition that significant activities are already ongoing and will ultimately lead to the realization of the EAP goal. This implementation strategy seeks to support the initiatives and develop new activities. Accordingly, the strategy outlines a wide range of strategic catalytic actions to achieve each objective, without presenting them as an exhaustive list since environmental issues are expected to remain dynamic, responsive and catalytic to specific needs that may arise in the course of time before the review of this DEAP.

The implementation strategy is composed of division, location, issue category, problem statement, actions and time frame and lead agencies involved.

8.2 Stakeholder Involvement

The implementation Strategy of Environment Action Plans will involve lead agencies, policy makers, communities, civil society, private sector, learning institutions, and development partners. Engagement of stakeholders in the implementation process will be guided by their statutory mandate, their capacities and priorities. The target will be to develop District Programmes and Projects from the EAP framework. The recently formulated Public Private Partnership strategy sets the framework for private sector involvement. Stakeholders will be involved at all stages of project preparation and implementation including monitoring and evaluation. Measures will also be explored to enable donors finance various projects.

8.3 Resource Requirements

Implementation of the District Environment Action Plan requires a deliberate and targeted allocation of resources (financial, human, and technological) that calls for resource capacity assessment. The impacts from various interventions in integration of environmental concerns often take time to be realised hence the need for prioritisation as resources for allocation are usually scarce. Potential sources of funding should include locally available resources as well as Local Authorities Transfer Fund; Constituency Development Fund; Government Budgetary allocations; support from NGOs; CBOs; religious originations, private sector and development partners.

It is recognized that Marakwet district has considerable technical capacities in various disciplines. These capacities are found within specialized departments of government, state corporations, private sector research and learning institutions. There may be access to capacities from international

research institutions and regional development organizations. It is expected that the preparation and implementation of the District Environment Action Plan may seek technical support from these sources.

8.4 Monitoring and Evaluation

The purpose of monitoring and evaluation of the District Environment Action Plan is to ensure their effective and efficient implementation as well as ensuring that environmental concerns are addressed and integrated in the development process. In order to evaluate the implementation of this DEAP, a monitoring and evaluation plan has been formulated. The set parameters will be monitored on an annual basis to evaluate impacts so that a pro-active action can be taken

Monitoring and evaluation will be undertaken by lead agencies. However, other actors/stakeholders in the respective sectors will be considered key in the implementation of the EAP. It will involve documentation of 'Best Practices' for the purpose of replication. Monitoring will be undertaken on continuous basis and an annual report prepared. There will be a review of the DEAP after five years.

Table 16: Implementation Matrices

Division	Location	Issue Category	Problem Statement	Actions Needed	Stakeholders	Time Frame 2009 - 2013
District Wide	District Wide	Air	Air pollution	Establish air treatment systems in factories & Industries	Min. of trade	
	Marakwet Town			Enforce air standards requirements	Min. of trade	
	District Wide	Climate & related environmental hazards	Destruction of property by thunderstorms and strong winds	Install lightening arresters	Min. of energy, Min. of public works	
				Afforestation and re-afforestation	KFS, Min. of Agric	
				Undertake public awareness on disaster preparedness	Dist. Disaster preparedness committee	
				Strengthen District Disaster Preparedness Committee	Dist. Disaster preparedness committee	
				Enrich riparian areas with suitable vegetation cover	Min. of Agriculture, KFS, WRMA	
District Wide	District Wide	Crop production & Soils	Soil erosion	Construct terraces	Min of Agriculture,	
				Plant Napier grass	Ministry of agriculture	

Division	Location	Issue Category	Problem Statement	Actions Needed	Stakeholders	Time Frame 2009 - 2013
				Afforestation & Re-afforestation	KFS, KVDA	
				Practice contour farming	Min. of Agriculture, KFS,	
				Build gabions	Min of Agriculture	
District Wide	District Wide	Crop production & Soils	Soil erosion	Rehabilitate and restore gullies	Min of Agriculture, Min of special programmes	
				Protect and conserve water catchments	KFS, KVDA, WRMA	
				Increase awareness on agriculture act	Min. of Agriculture	
				Construct storm drains	Min. of special programmes, local authorities	
				Sensitisation of community on global MEAs		
			Poor crop yields	Promote Agroforestry in sloppy areas	Min. of Agriculture, KFS	
				Undertake appropriate soil conservation measures	Min. of Agriculture, KVDA	
				Promote use of organic manures	Min. of Agriculture	
				Practice crop rotation	Min. of Agriculture	
				Promote Integrated Pest Management	Min. of Agriculture	
			Water Pollution	Promote proper use of fertilizers and farmyard manures	Min. of Agriculture	
				Training on safe handling of agrochemicals	Min. of Agriculture, Pesticide control bard	

Division	Location	Issue Category	Problem Statement	Actions Needed	Stakeholders	Time Frame 2009 - 2013
		Energy	Deforestation	Afforestation and re-afforestation	KFS, KVDA	
				Hold seminars on good forestry practices	KFS, KVDA	
				Promote use of renewable sources of energy such as Biogas, solar and wind	Min. of energy	
District Wide	District Wide	Energy	Deforestation	Promote use of energy efficient devices	Min. of energy	
				Re afforest hilltops	KFS, Local authorities	
		Environmental Education & Awareness	Low awareness on sustainable environment management	Establish Adult Literacy Centres with a focus on environmental issues	Min. of culture and social services	
				Collect data through baseline surveys on level of awareness	Min. of planning and national development	
				Enhance documentation of Indigenous Knowledge	National museums of Kenya	
				Increase community awareness on EMCA 1999 and other environmental related laws	Office of the President	
				Undertake training on safe use of agrochemicals and disposal containers	Min of Agriculture	
District Wide	District Wide	Fish & Fisheries	Shortage of fish	Construct water control structures	KVDA, WRMA, Min. of Public Works	
				Reclaim encroached water systems to encourage natural fish production	Min of Fisheries, Min of Lands, WRMA	
				Adopt modern/artificial control measures to discourage predators	Min. of Fisheries	

Division	Location	Issue Category	Problem Statement	Actions Needed	Stakeholders	Time Frame 2009 - 2013
				Reclaim wetland ecosystems to ensure increased water volumes	Min of Fisheries, Min of Lands, WRMA	
				Apply and enforce the Fisheries Act	Min. of Fisheries	
		Forests & Trees	Deforestation	Plant agroforestry trees	KFS, Min. of Agriculture	
				Promote education awareness on good forestry practices	KFS	
District Wide	District Wide	Forests & Trees	Deforestation	Promote sustainable use of forests	KFS	
				Afforestation and re-afforestation programmes	KFS, KVDA	
				Identify and rehabilitate hill tops prone to erosion	KFS, Local Authorities, Min of Agriculture	
				Initiate alternative income generating activities	Min of trade, Min of Youth	
				Protect and Re-afforest hill tops and slopes	KFS, Local Authorities	
		Health	High incidences of air and water borne related diseases	Promote public health education	Min of Public Health and Sanitation	
				Apply and enforce public health and sanitation Act	Min of Public Health and Sanitation	
				Promote use of treated mosquito nets	Min of Public Health and Sanitation	
				Apply and enforce the Physical planning Act	Min of Lands	

Division	Location	Issue Category	Problem Statement	Actions Needed	Stakeholders	Time Frame 2009 - 2013
				Apply and enforce Water quality and Waste management regulations	WRMA, Local Authorities	
				Establish proper drainage infrastructure	Local Authorities	
				Improve conditions at work places particularly lighting and ventilation	Min of Industry, Min of Public Health and Sanitation	
				Provide personal protective equipments	Private sector	
District Wide	District Wide	Industries and other Business Activities	Water pollution	Protect water springs	WRMA, Local Authorities	
				Promote cleaner production technologies	Min of Industry,	
				Apply and enforce Water quality and Waste management regulations	Min. of Public Heath and Sanitation, Local Authorities	
				Promote environmental education awareness among business community	Min. of Public Heath and Sanitation, Local Authorities	
			Air pollution	Incinerate industrial waste	Local Authorities	
				Apply and enforce Waste management regulations	Min. of Public Heath and Sanitation, Local Authorities	
				Afforestation and Re-afforestation	KFS	

Division	Location	Issue Category	Problem Statement	Actions Needed	Stakeholders	Time Frame 2009 - 2013
				Enforce air quality regulations	Min. of Public Heath and Sanitation, Local Authorities	
			Land degradation resulting from brick making activities	Improve brick making production technology	Min of industry, Civil Society	
				Restore/rehabilitate degraded sites	Local Authorities	
				Standardize the brick sizes	Min. of Industry, KEBS	
				Encourage formation of brick making groups	Min of Culture and Social services	
District Wide	District Wide	Livestock & Grazing	Soil erosion	Control livestock numbers	Min. of Livestock a	
		Mining & Quarrying	Land Degradation	Rehabilitate and restores mined sites	Mines and Geology Dept	
				Apply and enforce EMCA 1999	Mines and Geology Dept, local Authorities	
			Accidents & Deaths	Apply and enforce mining Act	Mines and Geology Dept	
				Fence mining areas	Mines and Geology Dept	
	Urban areas	Settlements & Infrastructure	Poor sanitation	Construct pit latrines	Min. of Public Heath and Sanitation, Local Authorities	
				Construct sewerage systems/septic tanks in urban areas	Min. of Public Heath and Sanitation, Local Authorities	

Division	Location	Issue Category	Problem Statement	Actions Needed	Stakeholders	Time Frame 2009 - 2013
				Enforce physical planning Act	Min. of Public Heath and Sanitation, Local Authorities	
				Promote proper hygiene & sanitation	Min. of Public Heath and Sanitation, Local Authorities	
				Apply and enforce the public health and sanitation Act	Min. of Public Heath and Sanitation, Local Authorities	
District Wide	District Wide	Waste Management & Sanitation	Poor waste disposal	Construct sanitary landfills/ garbage pits	Min. of Public Heath and Sanitation, Local Authorities	
				Promote waste recycling	Min of Industry, Local Authorities	
				Apply and enforce the public health and sanitation Act	Min. of Public Heath and Sanitation, Local Authorities	
				Apply and enforce Waste management regulations	Min. of Public Heath and Sanitation, Local Authorities	
				Regular garbage/refuse collection in temporary holding bins	Local Authorities, Min. of Public Heath and Sanitation	
				Apply and enforce municipal council by laws	Min. of Public Heath and Sanitation,	

Division	Location	Issue Category	Problem Statement	Actions Needed	Stakeholders	Time Frame 2009 - 2013
				Apply and enforce the Physical Planning Act	Min of lands	
				Promote public awareness on proper disposal of waste	Min. of Public Heath and Sanitation, local Authorities	
				Promote the use of biodegradable packaging materials	Min. of Trade, Min of Industry	
				Privatise waste collection and recycling	Min. of Public Heath and Sanitation	
		Water Resources	Shortage of water for domestic and Agriculture use	Promote water harvesting – tanks/dams	WRMA, Local Authorities, Min of Agriculture	
				Plant suitable tree species along water sources	KFS, Min of Agriculture, WRMA	
				Establish indigenous tree nurseries	KFS	
				Drill wells/boreholes	WRMA	
				Apply and enforce the Water Act 2002	WRMA	
				Promote education awareness on environmental laws	Provincial Adm. KFS, Min of Agriculture, WRMA	
				Protect springs	WRMA	
				Protect and restore water catchments areas through re-afforestation	WRMA, KFS	

Division	Location	Issue Category	Problem Statement	Actions Needed	Stakeholders	Time Frame 2009 - 2013
			Water pollution	Apply and enforce waste management and Water quality regulations	Local Authorities, WRMA	
				Construct effluent treatment plants	Local Authorities	
				Construct proper waste water drainage systems	Local Authorities	
				Protect and conserve water sources	WRMA	
				Increase public awareness on water pollution control	WRMA	
				Remove blue gum from waterways and sources	WRMA, Min of Agric., KFS	
District Wide	District Wide	Wetlands	Degradation of wetlands	Protect, Conserve and rehabilitate wetlands	WRMA, Local Authorities	
				Create public awareness on values of wetlands	WRMA	
				Establish District Wetland Conservation and Management committees	WRMA	
				Promote sustainable use of wetland resources	WRMA,	
				Develop and strengthen community wetland conservation programmes	Min. of Culture and Social Services, WRMA	
				Apply and enforce EMCA 1999	Community	
				Apply and enforce Water Act 2002	WRMA	
		Wildlife, Biodiversity & Tourism	Loss of biodiversity due to habitat destruction	Protect Hill tops	KFS, Local Authorities	

Division	Location	Issue Category	Problem Statement	Actions Needed	Stakeholders	Time Frame 2009 - 2013
				Apply and enforce existing regulatory and management instruments on biodiversity	KFS, National Museums of Kenya	
				Practice proper land use planning	Local Authorities, Min. of Lands	
				Afforestation and re-afforestation	KFS	
				Control charcoal burning	KFS, Provincial Administration	
				Reclaim wetlands	Min. of Lands, Local Authorities, WRMA	
				Apply and enforce biodiversity regulations on access and benefit sharing	KFS, National Museums of Kenya	

APPENDICES

APPENDIX 1: EXTRACT FROM EMCA, 1999

PART IV OF THE ENVIRONMENTAL MANAGEMENT AND COORDINATION ACT (1999) – ENVIRONMENTAL PLANNING (National Environment Action Plan Committee)

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

a) the Permanent Secretary in the Ministry for the time being responsible for national economic planning and development who shall be the chairman;
b) the Permanent Secretaries in the Ministries responsible for the matters specified in the First Schedule or their duly nominated representatives;
c) four representatives of the business community to be appointed by the Minister;
d) representatives of each of the institutions specified in the Third Schedule;
e) five representatives of non-governmental organizations nominated by the National Council of Non-Governmental Organizations;
f) representatives of specialized research institutions that are engaged in environmental matters as may be determined by the Minister; and
g) a Director of the authority who shall be the secretary.

2. 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.

Provisions of the National Environment Action Plan

The national environment action plan shall: -

a) 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;
b) contain an analytical profile of the various uses and value of the natural resources incorporating considerations of intergenerational equity;
c) 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;
d) recommend methods for building national awareness through environmental education on the importance of sustainable use of the environment and natural resources for national development;
e) set out operational guidelines for the planning and management of the environment and natural resources;
f) identify actual or likely problems as may affect the natural resources and the broader environment context in which they exist;

g) 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;
h) propose guidelines for the integration of standards of environmental protection into development planning and management;
i) identify and recommend policy and legislative approaches for preventing, controlling or mitigating specific as well as general adverse impacts on the environment;
j) prioritise areas of environmental research and outline methods of using such research findings;
k) without prejudice to the foregoing, be reviewed and modified from time to time incorporate emerging knowledge and realities; and
l) be binding on all persons and all government departments agencies, state corporations or other organs of Government upon adoption by the National assembly.

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.

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

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.

REFERENCES

GOK 2002, Marakwet District Development Plan, 2002-2008

NEMA 2005: NEMA Strategic plan 2005-2010

NEMA 2004: State of Environment Report for the year 2003

NEMA 2005: State of Environment Report for the year 2004

Ralph Jaetzold et al: Farm management Hand book of Kenya Vol.II;

Soil description from Kenya Soil survey

GOK 2001: Poverty Reduction Strategy Paper (PRSP) 2001-2004

GOK 2005: Vision and Strategy: Natural Resources Management 2005-2015

GOK 2000: Statistical Abstract

GOK 2002: Economic Survey