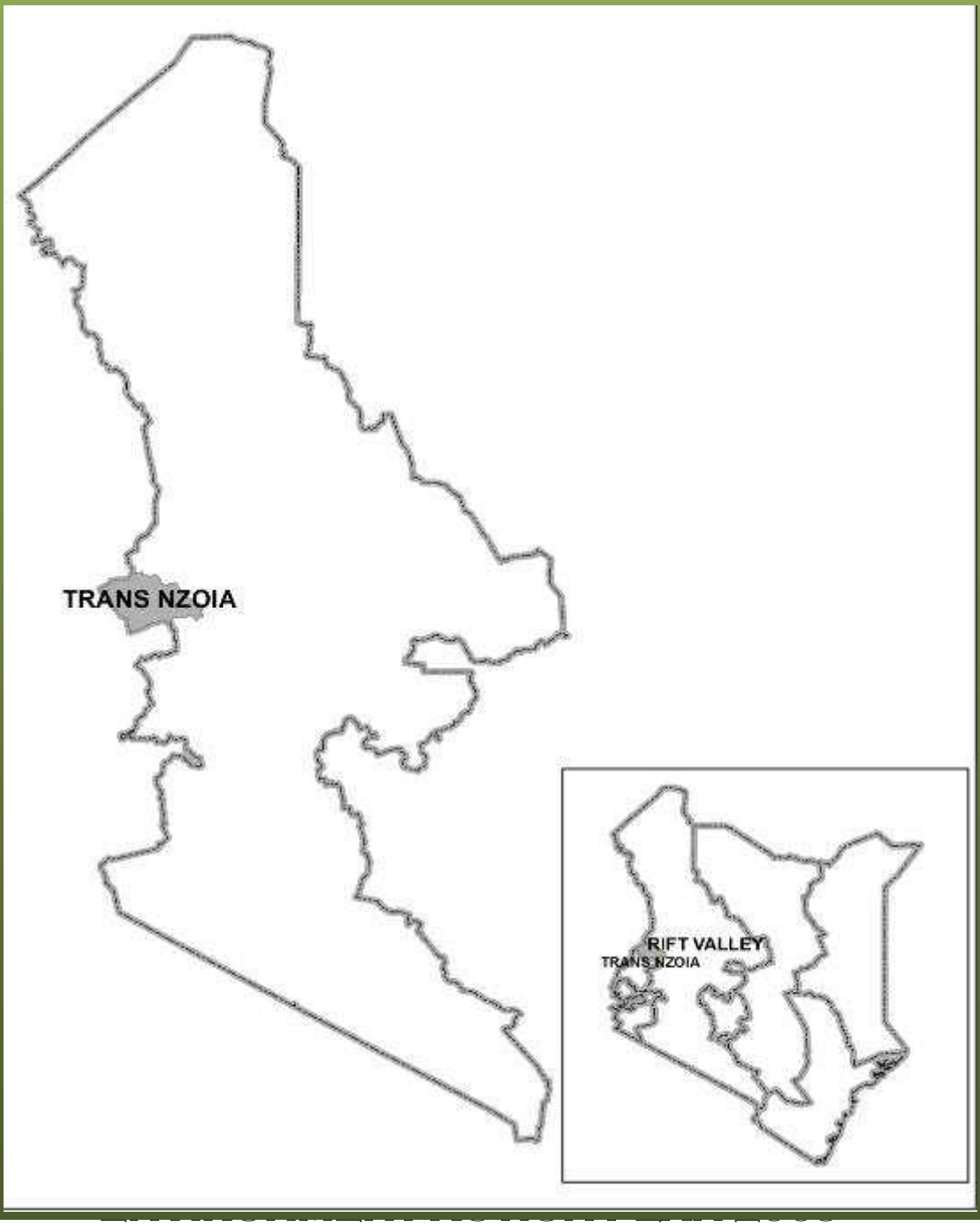
REPUBLIC OF KENYA

MINISTRY OF ENVIRONMENT AND MINERAL RESOURCES

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY



ENVIRONMENT ACTION PLAN 2009-2013

TRANS NZOIA DISTRICT ENVIRONMENT ACTION PLAN 2009-2013

EXECUTIVE SUMMARY

The Environment Management Coordination Act 1999 provides for the formulation of the District Environment Action Plans every five years. This is the first District Environment Action Plan (DEAP) for Trans Nzoia 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 and also describes the rationale for and preparatory process of the DEAP. This Chapter presents the district's profile covering the physical features, demographic, agro-ecological zones, and population. Chapter two describes the District's Environment and Natural resources of Land, Water, Biodiversity, wetlands and agriculture, livestock and fisheries. For each resource, major environmental issues, challenges and proposed interventions are identified.

Chapter three gives details on human settlements and infrastructure in Trans Nzoia 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 services sectors. The key issues under this chapter are high pollution levels from industrial activities and weak enforcement of relevant legislations. Chapter five discusses environmental hazards and disasters. The major hazards covered include; drought and famine and lightening human and livestock diseases, and invasive species.

Environmental information, networking and technology are discussed in chapter six. It emerges that environmental information and networking technology have continued to receive inadequate attention. In order to achieve sustainable environmental management, it is necessary to focus on raising awareness and enhancing public participation at all levels. Governance, Policy and Legal Framework as well as Institutional arrangements are set in chapter Seven. The key issues addressed include; harmonization of environmental legislations and institutional mandates, incorporation of indigenous knowledge in

environmental management. Chapter eight describes the implementation matrix for the district.

FOREWORD

Environmental protection and management play a significant role in ensuring a health environment for all. It is against this background that any activities to be undertaken in the district should incorporate environmental considerations during planning and its subsequent implementation. In the recent past it has been very challenging to coordinate activities that have direct or indirect impact to the environment. As a result of this the environment has been the biggest looser in line with the principals of environmental conservation and preservation. In response to this, the Environmental Management and Coordination Act (EMCA, 1999) was enacted which requires each one of us to safeguard and enhance the environment.

The Act provides for the preparation of the District Environment Action Plan every five years as provided for by the District Environment Committee. This action plan forms part of the building blocks to the Provincial and National Environment Action Plans respectively.

This Action Plan was meant to be applied in the entire larger Trans Nzoia district, however at the time its preparation was coming to conclusion, the district was split into three i.e. Trans Nzoia West, Trans Nzoia East and Kwanza districts. Therefore for it to achieve its intended purpose, it will be applied as a whole with issues unique to respective districts being implemented.

The Action Plan sets out responsibilities for all the stakeholders for the period 2006-2011 to ensure achievement of positive outcomes for our environment. The various stakeholders commit themselves and set targets in their respective sectors on issues that are in line with environmental conservation and protection. The Plan builds on the commitments set out in Environmental Management and Coordination Act (EMCA) of 1999, Economic Recovery Strategy and Wealth Creation, District Development Plan, Agenda 21, Johannesburg plan of action and the Millennium Development Goals.

Dr Ayub Macharia(PhD),
DIRECTOR GENERAL (Ag),
NATIONAL ENVIRONMENTAL MANAGEMENT AUTHORITY (NEMA)

ACKNOWLEDGEMENT

The District Environment Action Plan for Trans Nzoia is a product of the efforts of a large, cohesive and spirited team. I am grateful to everyone who has, in one way or another, contributed to the preparation of this Environment Action Plan.

I appreciate the staff of NEMA and the tireless effort of the members of the department of EE, I & PP for their time and input that led to a successful completion of this plan. I also note with appreciation the coordination role played by the department of Environmental Planning and Research during the preparation of this action plan.

I further thank the IUCN through the MERECP for its financial support towards the finalisation of this plan. I also acknowledge the contributions made by stakeholders, lead agencies, private sector, nongovernmental organizations and the donor community.

I appreciate the NEMA management whose input has shaped the quality of this plan and reflect the vision and mission of the Authority.

It is my hope that this plan will provide the most needed direction in our actions towards addressing the environmental challenges that affect our district through enhanced partnership with stakeholders to bring about environmental sustainability.

Dr. Kennedy I. Ondimu

DIRECTOR, ENVIRONMENTAL PLANNING

AND RESEARCH CO-ORDINATION DEPARTMENT

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

PLATES

ACRONYMS

ADC	Agricultural Development Corporation
AIDS	Acquired Immunodeficiency Syndrome
AU	African Union
CBO	Community Based Organization
CDF	Constituency Development Fund
CACC	Constituency Aids Control Council
CITES	Convention on International Trade on Endangered Species
DEO	District Environment Officer
DECs	District Environment Committees
DEC	District Environment Committee
DEAP	District Environment Action Plan
DFO	District Forest Officer
DPHO	District Public Health Officer
EE, I & PP	Environmental Education, Information & Public Participation
EIA	Environmental Impact Assesment
EA	Environmental Audit
EAC	East African Community
EAPs	Environmental Action Plans
EMCA	Environmental Management and Coordination Act
GOK	Government of Kenya
HECA	Health Environment of Children Alliance
HIV	Human Immunodeficiency Virus
ICRAF	International Centre for Research in Agro forestry
IUCN	International Union for Nature Conservation
IK	Indigenous Knowledge
KWS	Kenya Wildlife Service
KEPHIS	Kenya Plant Health Inspectorate Service
KFS	Kenya Forest Service
KMC	Kitale Municipal Council
KARI	Kenya Agricultural Research Institute
LATF	Local Authority Transfer Fund
MEAs	Multilateral Environmental Agreements
MERECEP	Mt. Elgon Regional Ecosystem Conservation Program
MENR	Ministry of Environment and Natural Resources

NBI	Nile Basin Initiative
NEMA	National Environment Management Authority
NCC	Nzoia County Council
NZOWASCO	Nzoia Water and Sewerage Company
NMK	National Museums of Kenya
NEAPC	National Environment Action Plan Committee
NEAP	National Environment Action Plan
NEPAD	New Partnership for African Development
NZOWASCO	Nzoia Water & Sewerage Services Company
PEAP	Provincial Environment Action Plan
PECs	Provincial Environmental Committees
POPs	Persistent Organic Pollutants
PIC	Prior Informed Consent
SFT	Settlement Fund Trust
SoE	State of Environment
SERC	Standards and Enforcement Review Committee
SORDIS	Solar Disinfection
SMEs	Small Medium Enterprises
TAC	Technical Advisory Committee
URTIs	Upper Respiratory Tract Infections
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCCD	UN Convention to Combat Desertification
UNFCCC	United Nations Framework Convention on Climate Change

CHAPTER ONE

1.0 Introduction

1.1 Preamble

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

Sustainable development is commonly defined as "development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs". Development is also said to be sustainable if it meets ecological, economic and equity needs. The process of attaining sustainable development calls for the integration of environmental considerations at all levels of decision making in development planning and implementation of programmes and projects. The theme of the Summit was on how nations could attain the sustainable development objective. The Government of Kenya embraced this noble idea when it developed the first National Environment Action Plan (NEAP) in 1994.

The country also prepared the National Development Plan (1994-97) that ensured that there was not only a chapter on Environment and Natural Resources but also those 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 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 The Environmental Action Planning Process
DEAP Methodology

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

1.4 Objectives of District Environment Action Plans

The objectives of District Environment Action Planning include the following:

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

Scope

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

1.5 District Profile

1.5.1 Geographical Location, Size and Administrative Units

This section presents a brief description of the geographical location of the district and attempts to give an overview of the physical and biological features in relation to human settlement and development and their impact on the environment. Trans Nzoia has since been subdivided into three administrative units at the time this document was being concluded. Trans Nzoia in this document will therefore be referring to Trans Nzoia West, Trans Nzoia East and Kwanza Districts.

Trans Nzoia is one of the 33 districts of Rift Valley Province. To the West it borders the republic of Uganda while Bungoma and Lugari districts to the south, West Pokot district to the north, and Marakwet district to the east and Uasin Gishu district to the southeast (Figure 1 & 2).

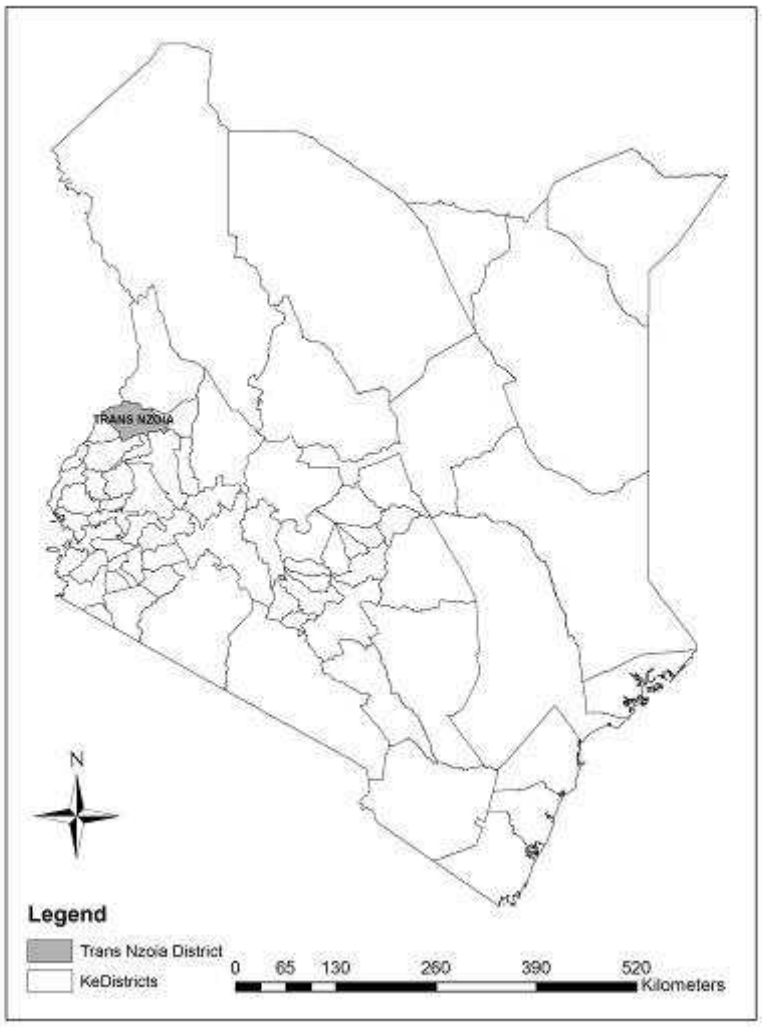


Figure 1: Location of Trans Nzoia district

The district lies between latitudes 0^0 38' and 1^o 18' north of the equator and longitudes 34^o 38' and 35^o 23' east. It covers an area of 2,467 Km^2, which represents 0.42% of the whole republic and 1.4% of Rift Valley province.

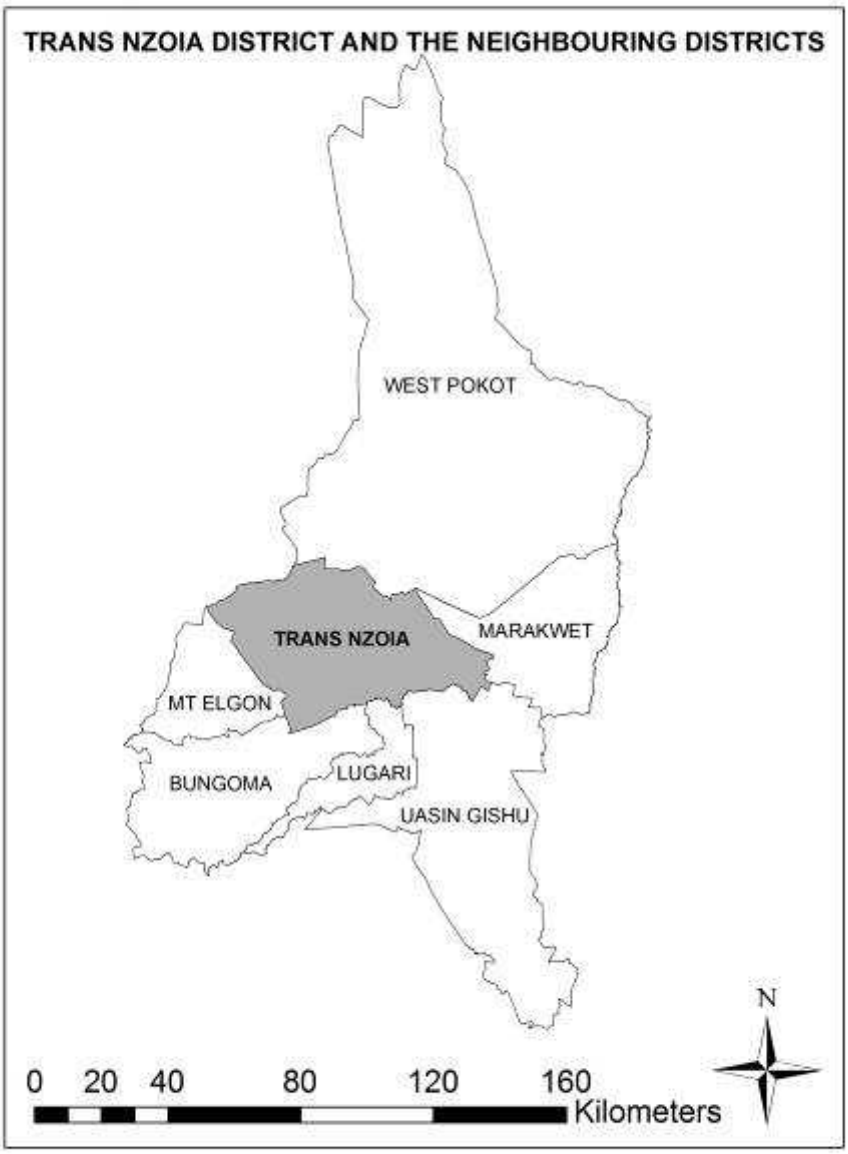


Figure 2: Districts neighbouring Trans Nzoia district

Administrative and Political Units

The district consists of seven administrative divisions which are further subdivided into 25 locations and 50 sub-locations (Table 1 & Figure 3). Kwanza is the largest division while Central is the smallest.

Table 1: **Area and Administration Units by Division (Km^2)**

Division	Area (Km^2)	No. of Locations	No. of Sub-Locations
Kwanza	425.9	4	10
Endebess	679.6	3	7
Saboti	299.2	5	6
Cherangani	296.5	5	10
Central	263.4	5	11
Kiminini	191.9	2	3
Kaplamai	330.8	5	7
Total	**2,487.3**	**29**	**54**

Source: Poverty Reduction Strategy Paper2001-2004

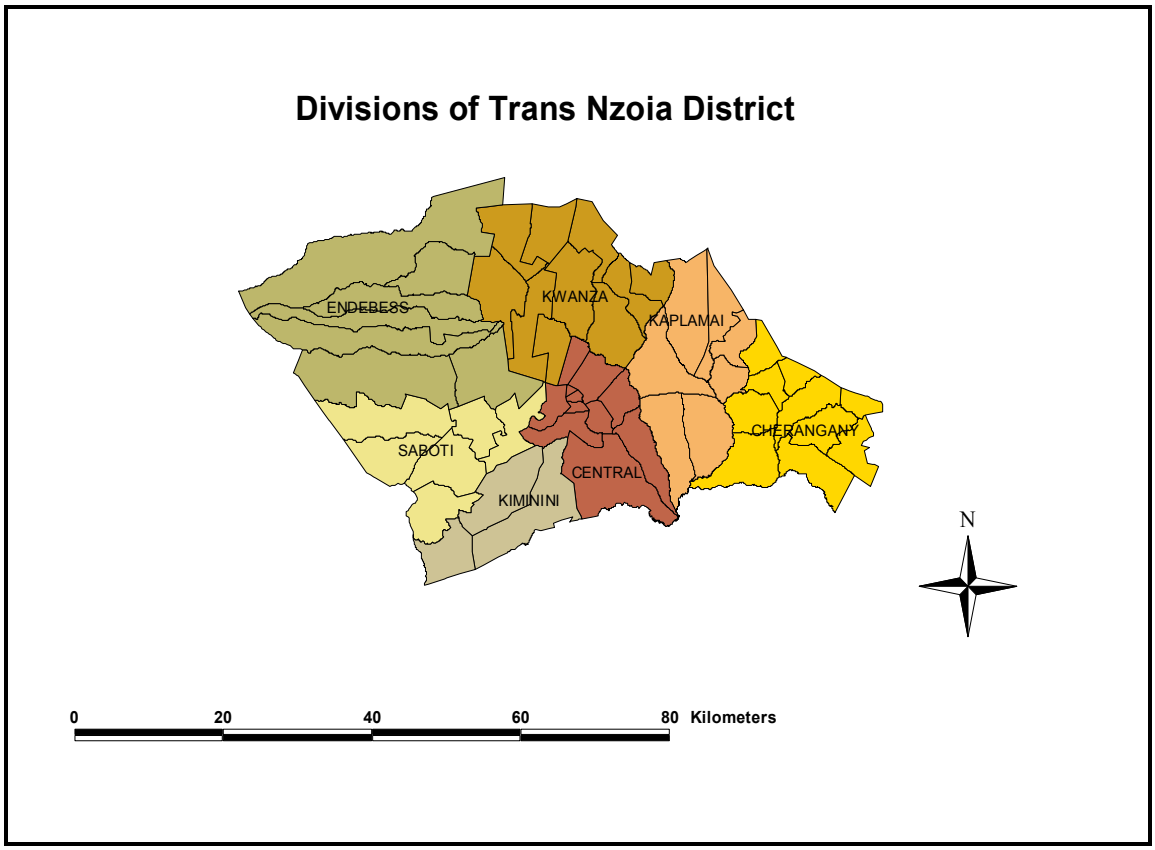


Figure 3Administrative boundaries

There are 15 wards (Table 2) against 26 locations in the district due to the fact that the new locations were but created recently as the district awaits the creation of more wards to correspond to the number of locations. In addition, tthere are three constituencies

namely; Kwanza, Saboti and Cherangani. Saboti constituency comprises of Saboti, Kiminini and Part of Central divisions, Kwanza constituency comprise Kwanza division and part of Central and Cherangani constituency comprise Cherangani and part of central division.

There are two local authorities in the district i.e. Kitale Municipal Council which has 12 electoral wards and Nzoia County Council which has 15 electoral wards, see Table1.2.

Table 2: **Local Authorities**

Local Authority	**No. of Wards**
Kitale Municipality	12
Nzoia County Council	15
TOTAL	**27**

1.5.2 Climate and Physical Features

The Trans Nzoia District has a diversity of natural resources, social, economic and political conditions. The abundance and quality of natural resources in the district are mainly influenced by the topography and climate of the area. The three important topographical features in the district are Mt. Elgon, the Cherangani Hills and the river Nzoia. Of the five water towers in the country, Trans Nzoia is a host of two which include Mount Elgon and Cherangani hills catchments. The other three are Abadares, Mau and Mount Kenya. This makes Trans Nzoia to be a significant catchment to both Lake Victoria and the Nile River.

The District is generally flat with gentle undulations rising steadily towards Mt. Elgon in the northwest and to the foot of Cherangani Hills in the east. Cherangani hills reach an altitude of 3,371m a.s.l while Mt. Elgon reaches an altitude of 4,313m a.s.l making it the second highest mountain in Kenya. Mt. Elgon is an important ecosystem shared between Kenya and Uganda, hence a unique resource in conservation fronts. The altitude drops steadily to 1,400 metres a.s.l towards the north.

The District is endowed with a variety of natural resources including fertile soils, natural forests and water resources. Whereas the District experiences high precipitation, there

have been incidences of prolonged drought. The highland and forests in the district are critical as they form the water catchment areas which serve both the lowlands and distant lakes. Other natural resources include a wildlife, fish and habitats such as hills, escarpments, woodlands, grasslands, wetlands and arid areas.

Because of the hilly nature, the northwest and the eastern parts of the district have difficulty in communication especially during the rain season when the roads are practically impassable.

The District is drained by river Nzoia with its major tributaries Sabwani, Ewaso, Rongai, Koitobos and Noigamet rivers (Figure 4). These rivers flow into Lake Victoria through River Nzoia, while Suam River drains into Lake Turkana through Turkwel. These rivers are threatened by encroachment and human activities in the catchments and riverbanks.

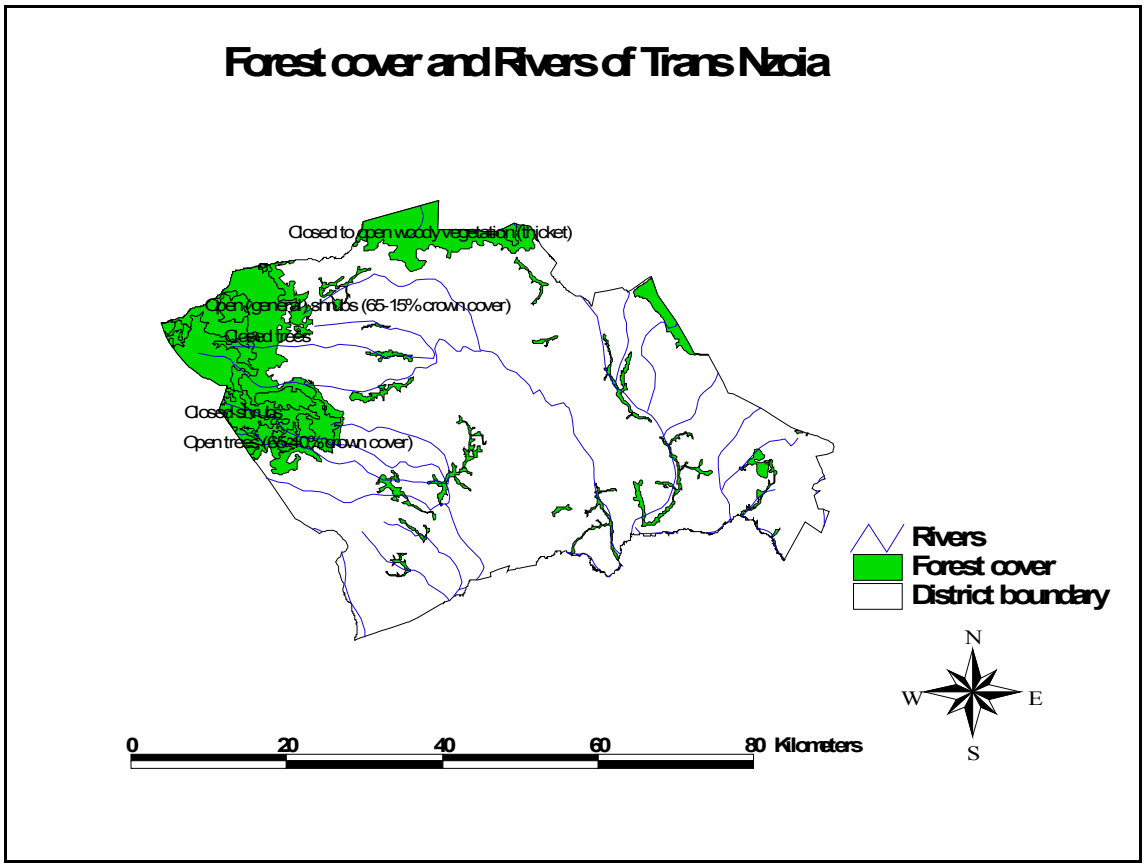


Figure 4 Forests and rivers in Trans Nzoia district

The natural forest cover occurs in Mt Elgon catchment which is within the protected area and being a shared ecosystem between Kenya and Uganda on the other hand. Cherangani hills are yet another significant catchment with indigenous forest cover.
The continued human pressure has, however, impacted negatively on the two catchments. Most rivers flow all year round except from a few springs that dry up during dry-spell.

The floods are no longer the preserve of the lower catchments in Budalangi and Nyando but a common feature in Trans Nzoia. Recurrent floods in Namanjalala, Kiminini and Endebess has continued causing despair to people living along these main rivers. The main cause of floods is the enormous surface vegetation cover depletion in upper catchment region. The Cherangani and Mt. Elgon catchments are the most affected. Illegal logging activities in Kapolet forest have significantly threatened ecological functions of Cherangani watershed. There is a significant sharp decline of tree cover as one approach Mount Elgon.

Establishment of a transition zone around the park would play a significant role in buffering the protected area and mitigate against human-wildlife conflicts. Clean water is a rare commodity in the District. Both Mount Elgon and Cherangani form the best source of clean water to the rapidly expanding Kitale town and other subsidiary towns by gravity. The water from these rivers could be beneficial in many ways too, such as the generation of hydroelectric power for rural electrification, irrigation, fisheries and domestic consumption and subsequently contribute towards floods mitigation.

The district has approximately 45 dams and significant swamps whose functions are gradually being compromised due to poor farming techniques and draining respectively. Most dams in the district have silted which has contributed to increased surface run-off. Most farmers depend entirely on rain-fed agriculture. The role of the dams can not be underestimated; besides mitigating against the flooding rivers they are also a water storage that can be useful for irrigation and provision of domestic water.

About 82% (2,011 km^2) of the land in the district is used for crop and livestock production. Swamps, hills and rivers occupy about 1% (36 km^2) of the land. Farming activities take place between 1,800-2,000m a.s.l with the amount of arable land decreasing

in the north towards West Pokot district. This is attributed to the rain shadow effect of Mt. Elgon and Cherangani hills.

The Endebess-Kitale plain is the best for maize (Plate 1) and sunflower farming in the district because it is ideal for late maturing hybrid maize. The area covers 50% of the district located between 1,800-2,000 m above sea level.

*plate 1**: Maize crop***

Plate 2.1: Maize farming in the District - fields left bare after harvesting, thus subjecting to external environmental factors that causes degradation.

The District has a highland equatorial kind of climate. The rainfall is fairly well distributed throughout the year. The average annual precipitation is 1,296.1mm. The slopes of Cherangani and Mt. Elgon to the west receive the highest amount of rainfall while the region bordering West Pokot District receives the least.

The district experiences bimodal rainfall pattern. The long rains occur from April to June, while the short rains fall from July to October. The mean temperature in the district is 18.6^{o} C; however, temperatures vary between 10^{o}C to 37^{o}C. The district has favourable climate for both livestock and crop production.

Agricultural activities by man has had its share in environmental degradation ranging from high amounts of fertilizers, poor farming practices to poor disposal of waste chemicals. The demand for increased food production has resulted to opening up of marginal areas.

Agro climatic Zones

Trans Nzoia district has a highland type of equatorial climate. The dry season begins in December and ends in March. Long rains occur in periods between April/May and July/August. The average annual rainfall is 11200mm. The region bordering West Pokot district in the north of the district have a long-term annual precipitation of 970mm, which is 200mm less than the average of the whole district. The slopes of Cherangani in the west and those of Mt. Elgon to the east have an average rainfall of 1270mm per annum.

Soils and Geology

Trans Nzoia lies in a basement system. The rocks are mainly sediments: grits, sand stone, shales and limestone. The rocks have been formed through metamorphosis of a series of shales sandy and calcareous shales sandstone and limestone enabling the resultant gneisses. A gradation is recognized from pure quartzite, psamitic rocks to semi pelitic biotitic gneisses and hornblende gneisses and semi calcareous gneisses.

Soils found on the south east to the east of the District consists of well drained dark red, deep red to dark red, very friable to friable clay, dark sandy loam to loam derived from the basement rock complex. In the north there are soils of low fertility consisting of those formed from colluvium and alluvium basement rock. On the mountain foot, soils found here are dark brown and dark brown with acidic humic topsoil, andosols and nitosols less enriched with ash. These soils have moderate to high fertility. On the mountain are soils developed from diving basalt and ashes, imperfectly drained, shallow to moderate deep, dark greyish brown, friable, acid humic, loam to clay loam and very rich in organic matter.

1.5.3 Population Size and Distribution

This section analyses the population of the district in terms of structure, size and their distribution as well as the density and compares the level of urbanization including its level of literacy and skills development.

The population of Trans Nzoia is estimated at 705,732 people at a growth rate of 4.2% according to 1999 population census (Tables 3, 4 & 5). This growth rate is perceived to be among the highest. The increase of population has resulted to increased pressure on

land. This has subsequently impacted on the quality of the environment and the livelihood of the people. The steady but rapid population growth has and continues being driven by the good agro-climatic conditions and the need to own land in a cosmopolitan district. This has put pressure on land as a valuable resource and subsequently resulted to cases of landlessness dating back to pre-colonial period.

Table 3 **Population Size and Distribution (Density)**

	1979		**1989**		**1999**		**2005**		**Projection 2010**	
	No.	**Density**	**No.**	**Density**	**No.**	**Density**	**No.**	**Density**	**No.**	**density**
Population size	259,503	105	393,682	160	575,662	233	705,732	286	803,398	325
Population growth rate	5.6%		4.9%		3.8%		3.8%		3.8%	

Source: CBS Population projection for Kenya 1980-2005; Kenya Population census 1979&1999

The demand for more land for settlement and farming has witnessed people open up steep slopes of up to 70^{o} gradient in Cherangani and wetlands across the district. The disputes over wetlands ownership is on the rise in the district. The slopes of Cherangani could start experiencing landslides hence a disaster in waiting if they will continue cultivating. The degradation of wetlands will affect the quality and quantity of water in the long term. It will also erode the ecological functions of wetlands.

The inter-census population growth rate for Trans Nzoia district during the period 1979-1989 indicated a growth rate of 4.2%. The growth rate is based on constant fertility and mortality and has been used to project the population of the district up the year 2001.

The district had a population size of 575,662 people in the 1999 population census. The results of the population projections have indicated a steady population growth of 597,959 in 2000 to 621,117 in 2001, 645,174 in 2002 and 670,163 in 2003.

Kitale town has recently experienced population explosion estimated at 200,000 people against the infrastructure designed during the pre-colonial period. Inadequate housing and low income has resulted to emergence of slums as people look for shelter they can afford. The road network in town cannot hold the ever increasing traffic (vehicles & bicycles). The town has also been experiencing water shortages in the recent times.

The increase in population has also resulted to increased waste generation which is often left piling in the streets and the estates. The town does not have adequate waste management infrastructure be it the equipment or the skills and physical infrastructure.

Table 4: **Population Distribution by Gender**

Location	Years			
	1979	**1989**	**1999**	**2005**
Male	131,890	197,874	301,160	351,646
Female	127,613	195,808	298,008	354,085

Table 5: **Fertility and mortality**

Factor	Fertility			
	1979	**1989**	**1999**	**2005**
Fertility	-	-	-	4.9%
Mortality rate	-	-	-	62/100
Migration	5.4%	5.4%	-	-

1.5.4 Social Cultural and Economic Characteristics

The main stay of the district economy is agriculture with 82% of the area being used for agriculture and livestock productivity while 17% is forest reserves. The agricultural base of the district is evidenced by the amount of maize and milk produced.

The people's livelihoods evolve around the existing natural resources that include forests (natural and plantations), land (rich soils and rocks), water (rivers, ground water, dams, and wetlands) and wild life (flora and fauna) among others. The agricultural activities include horticulture, livestock and maize farming and other cash crops such as tea, sunflower and coffee. Most large scale farms are highly mechanised coupled with heavy use of agrochemicals leading soil pollution. When surface runoff and soil erosion sets in, the water system is eventually polluted. This due to the fact that there is little or no soil and water conservation structures. Other activities are industrial and commercial enterprises and small-scale business enterprises (Jua Kali). With over 90% depending on wood fuel, charcoal burning as a source of income has significantly contributed to serious deforestation in the catchments.

The road network in the rural areas is not sufficient to enable farmers transport their farm produce and access markets with competitive prices. The poor roads prompt farmers to sell their goods to middlemen who eventually exploit them.

Ethnic Groups

Trans Nzoia is a district of cultural diversity. The 1989 population census indicates Trans Nzoia as being a cosmopolitan district hence enriched with different cultural values. The tribes include Luhya 52.039%, Kalenjin 21.29%, Kikuyu 9.48%, Turkana 4.61%, Teso 3.33%, Kisii 2.77%, Luo 2.53%, Maasai 1.13%, Kamba 0.53%, Dorobo 0.48%, Uganda 0.47% and Meru 0.10%. The Singers is a minority tribe that is indigenous to Kapolet forest.

The main religions are Christianity and Muslim. The common languages used for communication include Kiswahili, English and the local languages.

High poverty incidences coupled with high population growth has contributed to over-reliance to the natural resources. Hence intensive unconventional cultivation, charcoal burning and informal settlement have resulted to environmental degradation.

The study found out that the number of females who were literate was 125,509 while the males were 114,570 in the district (GOK, 1989 population census).

1.5.5 Poverty Incidence

A good measure of economic well-being is the number of people or proportion of the population living below the poverty line of $ 1 per day per person. The most recent study showed that the percentage of population below poverty line in Trans Nzoia district is 48%. This translates to 240,000 people according to the 1999 population census. The poverty incidence range at the divisions is between 15% and 61% while at the Locations it is between 44% and 56% (Tables 6 – 11).

Table 6: ***District, Divisions and Locations' Poverty Incidences***

Division/Location	% of Individuals below poverty line	Poverty Gap as % of Poverty line	Number of individuals from 1999 census	Estimated Number of Individuals
CENTRAL DIVISION	**44**	**16**	**82,207**	**36,513**
Municipality	15	4	1,807	278
Kibomet	26	8	19,899	5,123
Waitaluk	49	17	47,135	22,965
Namanjalala	57	22	13,366	7,565
CHERANGANY DIV	**51**	**18**	**52,275**	**26,567**
Suwerwa	41	13	11,163	4,585
Kiptoror	48	16	15,862	7,648
Cherangani	51	18	12,006	6,086
Chepsiro	60	23	13,244	7,916
KAPLAMAI DIV	**46**	**16**	**87,854**	**40,260**
Sinyerere	40	13	20,950	8,380
Makutano	44	15	14,732	6,530
Motosiet	46	16	15,678	7,239
Sitatunga	50	18	17,466	8,723
Kaplamai	51	18	19,028	9,734
ENDEBESS DIV	**56**	**21**	**60,445**	**33,747**
Kaibei	48	16	21,619	10,287
Endebess	61	24	17,259	10,445
Chepchoina	61	24	21,567	13,131
KIMININI DIV	**45**	**15**	**63,309**	**28,190**
Sikhendu	40	12	16,717	6,647
Kiminini	43,	14	46,592	19885
KWANZA DIVISION	**49**	**17**	**87,384**	**42,685**
Kwanza	45	15	34,233	15,462

Division/Location	% of Individuals below poverty line	Poverty Gap as % of Poverty line	Number of individuals from 1999 census	Estimated Number of Individuals
Kaisgat	47	16	22,244	10,387
Kapomboi	48	17	30,907	14,879
SABOTI DIVISION	**49**	**17**	**68,227**	**33,678**
Machewa	46	16	14,879	6,832
Saboti	47	16	18,608	8,799
Kiboroa	49	17	8,088	3,958
Kisawai	53	19	7,621	4,001
Kinyoro	55	20	19,031	10,397

Source: Geographic Dimensions of Well-Being in Kenya, Where are the Poor? From Districts to Locations Volume 1

*Table 7**: Urban Poverty***

	Male Headed Household		Female Headed Household	
Name of Constituency	Poverty incidence % of individuals below poverty line	Poverty Gap as a % of poverty line	Poverty incidence % of individuals below poverty line	Poverty Gap as a % of poverty line
Saboti	54	18	54	18

*Table 8**: Rural Poverty***

	Male Headed Household		Female Headed Household	
Name of Constituency	Poverty incidence % of individuals below poverty line	Poverty Gap as a % of poverty line	Poverty incidence % of individuals below poverty line	Poverty Gap as a % of poverty line
Kwanza	52	18	52	18

	Male Headed Household		Female Headed Household	
Saboti	45	15	44	14
Cherangani	49	16	49	16

Source: Geographic Dimensions of Well-Being in Kenya, Who and Where are the Poor? A Constituency Level Profile Vol. II

Table 9: **Dependency Ratios**

Years			
1979	**1989**	**1999**	**2005**
100:118	100:135	-	100:104

Source: CBS Kenya population census 1979/1999

Table 10: **Settlement Patterns**

Location	Population Size		
	1979	**1989**	**2002**
Rural	231,176	393,913	502,396
Urban	28,327	45,898	104,859

Source: CBS Kenya population census 1979/1999

Table 11: **Number of Urban Centres**

Type	1979	1989	1999-2005
Urban centres	19	21	30
Municipality/City	1	1	1

Key Environmental issues

Deforestation

Wood fuel forms the main source of energy with over 90% of the population (urban and rural) depending on it. The main source of energy is firewood and charcoal. Demand for productive land and for wood products is on the steady increase with the ever increasing urban and rural population. This calls for appropriate interventions to meet the demands of the community, increase the tree cover within the private farms and forest cover in

the gazetted forest land. There is also be need for appropriate cleaner and affordable alternative sources of energy.

Wetlands degradation

Wetlands forms about 1% of the total area of the district contributing significantly to the hydrology system of the district. Saiwa swamp is one of these most important wetlands in the district which is a protected area due to its rich biodiversity. However, demand for more land for settlement and agriculture due to population pressure and decline in land productivity has contributed to opening up of these fragile ecosystems (Plate 2).

plate 2: **Encroachment of a wetland**

This has subsequently compromised their ecological functions such as underground water recharge and purifications, water reservoir and habitat to rare birds and animals. The most affected wetland resources include rivers, swamps and dams. Activities that threaten these resources include riverbank cultivation, draining of swamps and cultivation on slopes leading to siltation of the dams.

Poor waste management

The volume of waste generation especially in the urban environment has by far overstretched the existing waste management infrastructure (Plate 2.3). The councils lack the capacity (technical and physical) to effectively collect, transport and dispose off the waste. Recycling efforts more often than not are met with a number of challenges.

plate 3: Clean up exercise during World Environment Day

Degradation of water systems

The water resources currently face serious threat arising from intensive human activities in the catchment areas, wetlands, farms and industrial processes. Pollution from the non point sources such as farming activities in the farm lands contributes immensely to the degradation of the water resources. Clean water which is an important resource in supporting livelihood is now a scarce resource. The water sources vary depending on the use and availability ranging from rivers, boreholes, shallow wells to piped water.

Land and soil degradation

Land is prime resources in Trans Nzoia always sort for its agricultural potential, settlement and for purposes of industrial development. These has resulted to ever increasing pressure on the land leading degradation through erosion, pollution from over use of agrochemicals, encroachment of the marginal areas. Poverty and population pressure contributes significantly to land and soil degradation.

Unplanned settlement and development

The mushrooming slums settlements in Kitale are an example of unplanned settlement that is emerging. This can be attributed to lack of employment, low income and lack of appropriate housing infrastructure.

Proposed interventions

- Enhance afforestation and reforestation programmes
- Train communities of Protection of wetlands and sustainable use

- Delineate wetlands
- Enhance soil and water conservation activities
- Enhance waste management

CHAPTER TWO

2.0 Soil and land use

2.1 Soils

Trans Nzoia is well known for its rich soils and favourable climatic conditions for agricultural activities. A large proportion has a high agricultural potential. Although the government has put in place policies and strategies to govern the use of land in a sustainable way, laws, regulations and practices that govern rights and obligations of landowners or occupiers are influenced by:

- Public land tenure – categorized into Trust land and Government land in terms of access rights,
- Individual land tenure – categorized into freehold and leasehold in terms of access rights

Land degradation is the reduction of land capability to satisfy a particular use. Causes of land degradation in Trans Nzoia include inappropriate land use, deforestation, intensive tillage and cropping and climate change.

Trans Nzoia lies in a basement system. The rocks are mainly sediments: grits, sand stone, shales and limestone. The rocks have been formed through metamorphosis of a series of shales sandy and calcareous shales sandstone and limestone enabling the resultant gneisses. A gradation is recognized from pure quartzite, psamitic rocks to semi pelitic biotite gneisses and hornblende gneisses and semi calcareous gneisses.

Soils found on the south east to the east of the district consists of well drained dark red, deep red to dark red, very friable to friable clay, dark sandy loam to loam derived from the basement rock complex. In the north there are soils of low fertility consisting of those formed from colluvium and alluvium basement rock. On the mountain foot, soils found here are dark brown and dark brown with acidic humic top soil and sols and nitosols less enriched with ash. These soils have moderate to high fertility. On the mountain are soils developed from diving basalt and ashes, imperfectly drained, shallow

to moderate deep, dark greyish brown, friable, acid humic, loam to clay loam and very rich in organic matter (Table 12).

Table 12: **Distribution, Use and Degradation Status of Major Soil Types**

Type of soils	Characteristics	Distribution (km^2)	Potential use	Current use	Degradation status
Nitosols	Deep, dark reddish brown volcanic clay soils	260	Forestry, Pyrethrum, Wheat livestock, Maize Tea, Barley Coffee Horticulture	Forestry, Livestock, Maize, Tea, Wheat Citrus fruits	Soil Erosion
Ferralsols	Deep, red, sandy clay soils	1,900	Sunflower, Livestock Horticulture, Maize Coffee, Wheat, Barley	Wheat, Sunflower Tea, Maize, Coffee Horticulture, Livestock Tobacco	Soil erosion
Gleysols	Poorly drained dark greyish brown clay soils	100	Livestock, Horticulture	Livestock Maize Horticulture	Soil erosion
Vertisols	Black cotton soil	50	Cotton, Livestock Rice	Maize Horticulture Livestock	Leaching of minerals
Combisols	Rocky, stony clay loam soils	150	Forest Wildlife	Forests (encroached) Livestock Maize	-

Source: District Agricultural Office, Kenya Soil Survey

2.1.1 Land and Land use Changes

There are basically two forms of land tenure in the district

1. Free hold or absolute tenure
2. Government land - include land owned by ADC, KARI, KEPHIS, Prison, Forests land
3. Settlement Fund Trust (SFT) - is government land under translation into freehold status. Trans Nzoia has never had the trust land.

Free hold land tenure forms an estimate 40% of the total land surface. It is the most desirable system of tenure by considering its advantage of title ownership applied as security in investment proposals and as an incentive towards the development of the same. Prices of land in such areas with titles are higher. Freehold is land that is used for agricultural purpose while leasehold land is that found mainly within the township and the municipality area. However, there are large-scale farms formerly held by the European farmers, which are leasehold but undergo conversion through subdivision and registers later as free hold.

Land Use Changes

There are several land uses within the district which include:

- Agricultural
- Industrial
- Commercial/ residential use
- Other uses including roads

plate 4: Maize crop

plate 5: Sorghum crop.

Crop farming is the major economic activity in the district (Plates 4 & 5). Land that was formerly under SFT was well planned with a lot of soil erosion and water management measures. However, those farmers who settled in them have subdivided the land parcels to their families or sold them with little regard of the conservation structures. What were once waterways or broad-based terraces have since been destroyed giving way to serious soil in the schemes.

Land use may change owing to factors such as population increase in an area, business patterns e.t.c. that may dictate land use changes (Table 13). Land use is also determined by agro-climatic conditions (Table 14). There is a significant change in Trans Nzoia from a state where though land initially was for agricultural use, increase in population has forced such farms to change to commercial as well as residential.

Table 13: **Land Use Systems**

	1979	**1989**	**1999**	**2005**
Arable	2068.3	2018.4	2,011.25	1,980
Non-Arable			-	507
Others (swamps, rivers, hills & Dams)	12.7	12.7	35.95	
Gazetted forests	234.4	234.4	76.2	488.08
National Parks	156.7	156.7	158.1	
Urban areas				111.5
Municipality	17.4	17.4	19.2	87

Source: Ministry of Lands and Housing

Table 14: **Land Use Potential**

Agro-Ecological zone	Potential land use	Current land use	Location	Extent
Upper Highland Zone (UHZ)	-Sheep and diary farming -Forest reserves -tropical alpine zones -National parks	-Sheep and dairy farming -Forest reserves -tropical alpine zones -National parks -Maize, coffee tea & horticultural farming	-Kwanza -Cherangani -Saboti -Kaplamai	395km^2
Lower Highland Zone (LHZ)	-Agricultural and livestock activities	-Growing of wheat, tea, maize, barley, sunflower, coffee and horticultural crops -Rearing of cattle, sheep, goats	-Kwanza -Cherangani -Kaplamai	840km^2
Upper Midland Zone (UMZ)	-Agricultural and Livestock production activities	-Growing of wheat, tea, maize, barley, sunflower, coffee and horticultural crops -Rearing of cattle, sheep, goats	-Kwanza -Cherangani -Saboti -Kaplamai -Central -Kiminini -Endebess	1,234km^2

Source: District Agriculture Office, Kitale 1996

2.2 Drylands

There are no dry lands in the district. It is only the Northern frontier that experience longer dry spells. The rainfall received in this region is considerably lower compared to the rest of the district. It is the transition between West Pokot and Trans Nzoia Districts, thus it exhibits dry lands characteristics in form of rainfall and vegetation distribution.

Priority Issues (Table 15)

Change of land use conflicts

The emerging trend in Trans Nzoia is that the planers services are no longer meeting the developers' demands. This is where the development processes emerge in areas where they were not designated or through change of earlier plans by going through change of user. As a result this has witnessed excision of forested land to give way for settlement, Market centres and industrial development in residential areas.

Declining land sizes

The land sizes are on the shape decline in the district. These small sizes of farms can no longer support agricultural activities of maize farm farming. There is need to introduce high value interventions for higher returns and sustainability.

Landlessness

The number of landless people has remained high. These has subsequently contributed to these people opening up catchments, riverbanks and wetlands for settlement which has been one of the major factors leading to environmental degradation.

Table 15: ***Summary of Priority issues***

Land use type	Impact to the environment	Mitigation measures
Agriculture	Environmental pollution including aquatic environment, decline in yield per unit area	Create awareness on safe use of agrochemicals, training, promote use of dips as opposed to hand sprays, promote integrated pest management, Crop rotation, discourage monocropping
	Biodiversity loss, settlement in fragile ecosystems,	Diversification, Improve land productivity, Zone out fragile ecosystems for gazettement and protection, Environmental education and awareness
Commercial/ residential	Pollution of water bodies and Land	Promote safe disposal of waste Control development of urban centres, promote good hygiene and sanitation
Roads	Storm water diversions from roads to private properties	EIA should be done before road construction and enforcement of Environmental Management Plan
Forestry	Decline in forest produce Increased surface runoff Loss of habitat Encroachment in water catchment areas.	Promote alternative sources livelihood, Eviction of illegal settlers on forest land Boundary alignment and marking of gazetted forest areas Fast tracking formation and implementation of Community Forest Associations, Enforce relevant legislations on forest excision
Wildlife	Loss of species Economic losses	Installation and maintenance of wildlife barriers, Awareness creation, Problematic animal control, Reclaiming and securing of wildlife migratory corridors, Wildlife policy review on human-wildlife conflict,

2.3 Agriculture, Livestock and Fisheries

2.3.1 Agriculture

Compared to the rest of the districts in Kenya, Trans Nzoia is well endowed with one of the most favourable climatic conditions for agriculture. The district experiences bi-modal rainfall pattern. The long rains occur from April to June, while the short rains fall from July to October. It has a mean annual precipitation of 1,296.1mm. The mean temperature is 18.6^{o} C; however, temperatures vary between 10^{o}C to 37^{o}C. It is in a high potential area and therefore suitable for growing different food and cash crops (Table 16) as well as livestock production (Table 17). However, maize growing takes the largest acreage, which has popularly made the district to be called the granary of the district.

Table 16: **Types and Status of Land use Systems**

Type of farming system	**Extent (ha)**	**Distribution (% of the total)**	**Location**	**Agricultural products**	
Main Food crops	105,170	57.4	Cherangani Kwanza Saboti Kaplamai Central Endebess	Maize Beans Potatoes	Yield per unit area decreasing
Main Cash crops	78,063	42.6	Kwanza Cherangani Kaplamai Saboti Central Endebess	Wheat Coffee Tea Sunflower Horticultural crops	Yield per unit area declining

Source: District Agriculture Office, Kitale 1996

Agriculture and livestock industry brings about use of agro-chemicals, which comprise pesticides and fertilizers. Pesticides include insecticides, fungicides, herbicides, acaricides,

nematicides and fumigants/soil sterilants among others. Fertilizers include nitrogenous, phosphates, potassic and compound fertilizers, trace elements, foliar feeds and soil improvers. Agrochemicals have been extensively used for agricultural production without satisfactory management of their health and environmental impacts. These agrochemicals in areas where they have been poorly used they have negatively impacted fish industry. The main fish farming practice in the district is the construction of the fishponds.

The farming/cultivation practices involve the use of tractors mainly for land preparation. Hand and animal draught power (oxen) is used on a small scale. Weeding is mainly done by hand. However, some farmer's especially large scale is using herbicides for weeding. The use of chemical fertilizer is the order of the day as without it, very low yields are realized. This is due to the fact that mono cropping of maize and little or non use of organic fertilizers has led to a decline in soil fertility. In addition, a large amount of organic fertilizer required is not readily available.

The indigenous foods grown include sweet potatoes cassava and local vegetables e.g. *sucha* and *saga*. Also of the sub terenean types *White ants* is a real delicacy to the Luhya community.

While opening up more and more canals for cultivation to produce food for the growing population the environment is exposed to degradation every time. More vegetative cover is reduced even on hilly areas which have been encroached e.g. Milimani and Kapolet in Cherangani and Kaplamai Division respectively. Also poor agricultural practices have caused a lot of land degradation.

The ministry of agriculture extension personnel is still carrying out soil conservation efforts. Much of the recommendation now is more of biological measures such as grass strips, unploughed strips and trash-lines.

The major undoing is the failure by farmers to maintain the structure. Also subdivision of land into uneconomical sizes has put a lot of pressure on the existing laid terraces being destroyed. Rapid increase in the population has resulted in the encroachment onto the riverbanks. Pegging for riverbank protection is being done but the implementation by the farmers is still a problem hence posing a threat to water resources.

Biotechnology involves production and isolation of biosynthesis. This substance can be obtained from the micro organisms or their metabolic products as well as the plants and animals. The general public has been partially exposed to the technologies developed by this method. The case at hand is the tissue culture bananas, superior pyrethrum clones and the much publicized eucalyptus hybrid. The release of the BT maize is in the process and the bio-safety measures are still being considered. The main reason for low adaptation of the technology is the fear of environmental uncertainties. Otherwise once proven safe, it will be easily adopted as a way of improving food security and reducing poverty.

2.3.2 Livestock

Table 17: **Livestock Population trends in the District**

TYPES	**1990**	**1993**	**1996**	**1999**	**2002**	**2004**
Dairy cattle	105,000	109,407	99,150	99,570	98,245	102,668
Beef cattle (exotic\zebu)	23,523	16,300	19,968	18,380	30,242	24,978
Sheep	47,045	52,486	49,076	53,540	62,631	54,368
Goats	11,656	12,673	17,500	18,754	19,807	22,655
Poultry	Nr	Nr	371,7000	587,000	606,608	619,780
Pigs	Nr	Nr	1,560	3,217	2,859	3,116
Rabbits	Nr	3,400	4,200	5,200	5,250	5,340
Emerging livestock\bee keeping						
Lang troth hives	0	0	0	0	136	573
Kenya top bar hives	Nr	Nr	1,864	2,064	2,373	2,568
Log hive	Nr	Nr	450	501	1,545	1,598
Honey (kg)	Nr	Nr	18,500	30,050	27,750	36,650

Source: District Agricultural Office, 2004

plate 6 and plate 7: A well fed animal and a starving herd

Table 18: **Types and Status of Livestock Production Systems**

Type	Extent (ha)	% of the total area	Location	Livestock products	Status	
					Current production level	Potential production level
Dairy cattle	-	-	Low lands	Milk Beef Hide	102,668	
Beef cattle (exotic\zebu)	-	-	Low lands	Beef Hide	24,978	
Sheep	-	-	Low lands	Mutton Skin	54,368	
Goats	-	-	Low lands	Meat Skin	22,655	
Poultry	-	-	Low lands	Chicken Eggs Feathers	619,780	
Pigs	-	-	Low lands	Pork Bacon	3,116	
Rabbits	-	-	Low lands	Meat	5,340	
Bee keeping	-	-	Low and highlands	Honey Wax	36,650	

Source: District Agriculture Office, Kitale 1996

2.3.3 Fisheries Resources

The species that are mainly cultivated in this region are *Oreocromis niloticus (*Tilapia)*, Tilapia Zilli* (Tilapia) *and Clarius Gariepus* (Cat fish). The current number of fish farmers is 221 having 188 numbers of operating ponds (Table 19). Non-operational this is 7,280msq in area.

Fish Products

The fish that is offered on the market for sale within the district include:

- Tilapia – fried, smoked, fresh and sun dried
- Nile perch – sun dried and fillets
- Obambla– smoked
- Cat fish – smoked ands fresh
- Omena – sun dried
- Fulu-Smoked small fish.
- Mgongo wazi - fish filette

Table 19: **Types and Status of Fisheries Production Systems**

Type of production system	**Location**	**Area (ha)**		
			Current production level	**Potential production level**
Fish ponds	Wetlands	25,067	1,834	
Rivers	Streams and rivers	-	Unknown	

Source: District Agriculture Office, Kitale 1996

Marketing of fish and fishery products is done through gate sale and at the local markets. There are efforts towards sustainable utilization of fisheries. This is by transferring appropriate technologies to the farmers through front line extension worker, seminars, Workshops and collaborations. Poor road network is hampering the effective extension coverage. Fishing methods used for the ponds include the net seining of ponds, hooks and line method.

Impacts of Agriculture, livestock and fisheries production on the environment (Table 5.5).

Table 20: Summary of impact of agriculture, livestock and fisheries

Environmental Issues	**Environmental Impacts**	**Mitigation measures**
Improper use of agrochemicals	Environmental pollution including aquatic environment, decline in yield per unit area	Create awareness on safe use of agrochemicals, training, promote use of dips as opposed to hand sprays, promote integrated pest management, Crop rotation, discourage monocropping
Soil compaction	Decline in yield per unit area, Increased runoff	Encourage use of minimum tillage, Soil sub soiling, Promote organic farming,
Decline in land productivity	Decline in yield per unit area, Opening of marginal areas, Wetlands, steep slopes, river banks and forests for agriculture,	Promote appropriate agricultural practices and technologies, Appropriate training
Opening up new land for agriculture	Biodiversity loss, settlement in fragile ecosystems,	Diversification, Improve land productivity, Zone out fragile ecosystems for gazettment and protection, Environmental education and awareness
Land degradation	Decline in land productivity, Soil erosion,	Soil and water conservation structures, Appropriate agricultural practices
Overstocking/Overgrazing	Land degradation, Soil erosion and destruction of vegetation, water catchment degradation	Awareness and education on carrying capacity, Rehabilitation of degraded areas,
Frequent livestock disease outbreak	High livestock mortality, Decline in productivity	Appropriate chemical use, Animal movement controls, Promote use of Dips, improved breeds

2.4 Water Resources

Water is crucial in human and environmental health and significant in any development processes. Trans Nzoia is rich in both ground and surface water which includes rivers, springs, streams, dams and swamps.

The water sources (Table 21) have been observed to suffer from diminished flows, increased turbidity and drying of some rivers and streams. This is attributed to clearing of vegetation in the catchments; farming in riparian areas and draining of swamps. Planting of eucalyptus at water catchment areas, poor soil and conservation practices also impact on water quality.

The impact of pollution on water is manifested by water of poor quality, which gives rise to water toxicity life, loss of aesthetic value by becoming unsustainable for recreational activities, high cost of water supply as polluted water is expensive to treat, eutrophication, de-oxygenation and habitat modification.

Cases of water use conflict in swamp areas among communities have increased in the recent times in the district.

Surface water

This includes permanent rivers, springs, streams, dams and swamps. The water sources have been observed to suffer from diminished flows and increased turbidity. Clearing of vegetation on the catchment has resulted in the worsening of the situation in these wetlands. Sources of water that are Permanent Rivers include Nzoia River and its tributaries, which include: Losorua, Kaibei, Chepkaitit, Kamaina, Koitobos, Noigamet, Chebosani, Tongareni, Kabeyani, Kisawai, Rongai, Suam, Kaptega. Other sources of water are shallow wells and boreholes.

Dams within the District

Karara dam, Nyakinyua Dam, Karara II dam, Botwo dam, Alma farm twin dam, Kibuswa Dam, Chepsiro dam Bwake dam, Kaisaget dam Sarura dam, Maridadi Dam, Asega dam, Kibomet I&II dam, Kibomet III dam, Wamuini dam.

Ground Water

Groundwater is under utilized in the district with only few boreholes with limited water yields that have been drilled**.** Another way of ground water exploitation is the digging of shallow wells, which are used for domestic purpose. It has been observed that most shallow wells in rural areas have recorded low yields, reduced water table and sometimes drying up. It is thought to be a result of decreased soil water infiltration capacity as a result of population pressure. Quality has suffered due to seepage from the pit latrines and sewers. The result has been a salty taste or odour in the water in some areas.

There are 150 boreholes in the district. Groundwater (extracted through boreholes) belongs to various institutions and individuals.

Table 21: **Source and Status of Water Resources**

	Status		**Usage**	**Management system**	**Challenges/ Threats**
	Quantity	Quality			
Boreholes	150	Good	Domestic Industrial Livestock	Community level	Distribution could affect reserve
Wells	1000	Poor	Domestic Livestock	Individuals Community	Point pollution from pit latrines
Protected springs	200	Fair	Domestic Livestock Agriculture	Community	Clearing of vegetation Pollution from pit latrines
Dams	53	Fair	Domestic Livestock Agriculture	Individuals Community Ministry	Siltation Diminishing water levels Encroachment
Permanent rivers	20	Poor	Domestic Industrial Livestock Agriculture	Ministry	Siltation Pollution from farms Clearing of riverine vegetation Cultivation to the banks
Roof catchments	11,612	Good	Domestic	Individuals	Cost of establishment still high
Piped	272	Fair	Domestic Industrial Livestock Agriculture	Ministry Water company	Water quality Sustainability of the catchments

Source: District Water Office, 2004

Water Catchment and Drainage

- Mt. Elgon - This is covered by a forest that is managed by the KWS. The ecosystem forms one of the most important catchment areas in the country. Major rivers from the forest on this mountain include Kaiibei, Kamijong, Chepchinor, Labaa, Kibisi, Kimilili, Kapkateny, Chepkungwi, Kikuk and Chepbibey.
- Cherangany hills - this is a major catchment area for Lake Victoria, through Nzoia River. The hills reach an elevation of 3,371m above sea level. Vegetation cover of this hill is composed of indigenous forest, scattered bush land and grassland. Chepkaitit and Noigamet rivers drain the hill. Uncontrolled loss of forest cover such as Kapolet has increased the surface run off from the hill in the rainy season. This result in flashy or decreased flow of rivers that drain from this hill.

Key Environmental issues

- Destruction of water catchment areas
- Poor disposal of liquid and solid waste
- Decreased vegetation cover
- Destruction of swamps

Proposed interventions

- Rehabilitation of degraded catchments,
- Catchment protection and rehabilitation,
- Desiltation of water bodies,
- Public education and awareness,
- Involvement of community in water catchment management.
- *Delineation of water catchments for gazettment and protection*
- Promote safe disposal of waste
- *Control development of urban centres, promote good hygiene and sanitation*
- *Increased soil cover, Promote soil & water conservation covers*
- Gazettement and protection of main swamps, Preparation of participatory management plans,
- Promote alternative livelihoods,

- *Fast tract Wetland policy formulation*

2.5 Forestry and Wildlife Resources

2.5.1 Forestry

The Forest area under the jurisdiction of Forest department in Trans Nzoia district covers all those land parcels in Mt. Elgon region and parts of the greater Cherangani escarpments. Total forest area cover is 47,866ha in the district inclusive of the area that falls under Mt. Elgon National park. The area of forest that has been excised to date stands at 4,765 ha in Kitale and Kapolet forest.

Types of Forest and Area

Natural forests

These are protected forests compromising about 10,015.7ha and covering mostly Mt Elgon and Cherangani hills (Table 22). Such forests are protected for biodiversity and water catchment areas. A variety of tree species particularly the indigenous types are mainly protected in such natural forests so as not to be extinct. The Kenya Forest Service personnel have been put strategically in place to ensure that such forests are protected from illegal exploitation, fires or encroachment. Despite all this these forests are threatened by rampant destruction.

Table 22: **Types and Status of Forests**

Type of forest	Extent (ha)	District % of total	Location	Forest uses	Status				Proposed interventions
					Gazetted	Under trust land	Private land	% degradation	
Plantation forestry	8,681	18%	Mt. Elgon	Building and industrial	50% forest cover.	None	On increase	Minimal	To establish more.
			Mt. Elgon	Bio-diversity conservation					
Natural forests	32868.4	68.7%			Over 90% cover	None	Only along river courses	None	Enhance on protection
	1551.6	3.2%	Kapolet First.(Cherengani escarpment	Catchments protection	80% forest cover	None	Only along river courses	10%	Government to reclaim back 746 ha of Trust land
On farm	-	-	Whole district	Soil cons. poles firewood fodder A.F	-	-	Tree cover decreasing	On increase	Enhance on establishment of woodlots and A.F trees.

Source: District Forest Officer, 1996

Plantation Forest

Plantation forest areas remain commercial forests established for provision of sawn timber and pulpwood. In the 1990s this area was estimated at 3,091.8ha due to lack of felling plans that corresponded to the planting programmes.

Currently, the department has embarked on a serious tree planting activities to clear all the planting backlogs. To do this, the department has engaged other stakeholders such as Pan Paper Mills to assist in planting establishments. Provision of labour has also been increased to assist in raising of seedlings and consequent planting during the peak rainy season. The plantation forest cover now stands at about 8,425 Ha in the district.

Protected Forests

These are the forests protected for biodiversity as well as for wildlife habitat. The area is estimated to be 34,992ha mainly in Mt. Elgon region. All the protected forests are under the Kenya Wildlife Service.

Privately Protected Forests

These are individually based lands and their acreage is yet to be documented. These forests are now coming up due to the introduction of agro forestry technology and to the much demand of fuel wood and timber. They comprise of riverine forests and woodlots especially eucalyptus.

Status and Trends of Forest Resources

Plantation forestry practices have been completely ignored in the last ten years or more. It is a general rule that planting programmes and felling plans should be harmonized and be based on Management options such that the lands under such plantations are sustainably managed. All the merchantable plantations have been felled while very little planting has been done and where there was any planting done, those plantations established did not survive only large tracts of bushes or farmlands under maize can be seen. Where some plantations exist, low densities and poor trees forms and hygiene resulting from professional negligence of sivicultural practices characterize such plantations. To get a clear picture of the magnitude of negligence, one only needs to compare the forest estates with the neighbouring National park, which is a Natural forest reserve, managed by KWS. A big contrast exists between the two areas.

The General trend in the management of Forestry resources has been cycling around encroachment, land grabbing, political interference and Departmental transfers which are done not meant to improve performance but for individual selfish gains.

Cattle rustling have been the order of the day taking the lead in most of our forest areas particularly the Cherangani forest. Our forests have therefore turned down to be very insecure places to operate from in the recent past. All these ugly scenes have impacted negatively on sound forest conservation and management practices.

Regulatory and Management Arrangements

In the recent past, the following regulatory and management options have been put in place to safeguard against future forest mismanagement.

1. A New Forest Act (Forest Act 2005) has been passed by parliament and its commencement date is eagerly awaited. Together with New Forest policy, a new direction towards forest conservation and management will be put in place. There is a general swift from "the know it all" Departmental Forest management to community participatory approach. Sound and strict protection measures as spelt in the Act to be undertaken including stiff penalties for offender among others. Community forests/local government forests have been given good attention in the Act in the way to protect them. The forest Act 2005 is also meant to transform the forest department to a Forest Service spear headed by a board of management.
2. In the recent past too, we have had the following forest activities being regulated or completely curtailed.

   Grazing: Livestock grazing has been controlled completely in forest areas being controlled by land carrying capacity. In some forest areas, the activity has been abolished completely.

   Firewood collection: Collection of firewood is only to be done by institutions like schools, colleges hospitals etc. No individual firewood collection is allowed in the forest.

   Shamba cultivation: This has been abolished completely and so to village houses.

   Saw milling operations: This has also been abolished and only industries like Pan Paper Webuye and Rai Ply wood Eldoret have been left to operate under certain conditions.

Exploitation of Forest Resources both For Timber and Non-Timber Products.

Timber exploitation from the forest has been burnt and no saw milling is going on anywhere. Pan Paper Webuye and Rai ply are the only industries in operation in forest areas under some conditions. The timber merchants are only allowed to harvest trees from private farms.

Collection of non-timber products such as honey, Resins, gum, herbs, grass, stones, water etc by community bordering forest areas is going on but under a license/permission/fee with some regulations attached. Hunting is completely burnt and so to 'Shamba' cultivation.

Table 23: Illegal logging of forest trees

Key Environmental Issues

The occurrence environmental disasters like prolonged drought, soil erosion, landslide, drying of rivers, poor crop yields in certain years, global warming, low level of underground water and the like are simple indicators of forest depletion.

Forests play a leading role in the restoration of the above phenomena and therefore every nation, every person should be given a chance to participate globally towards afforestation programmes. Tree planting has no boundary just like the environment has no boundary and therefore every one MUST participate.

Illegal logging activities (Plate 23) in the forests have negatively contributed to forest cover decline. The most affected areas include Cherangani which is an important source to river Nzoia and therefore significant to livehoods; and Saboti forests where human activities are a threat to its existence. There is great need to intensify patrols and advocate for the on farm tree farming.

The KFS undertakes the management of the forest resources through:

1. Develop forests through forest addition as opposed to excision
2. Management to achieve sustained yield
3. Conservation of the resource for future prosperity

4. Protection of the resource against all forms of destruction including encroachment, settlement, pest and diseases, fire and other illegal activities

Proposed interventions

The Forest department need to mobilize the general public to hasten the tree planting efforts on both public and private lands. Community participation approach towards management of state forests should be received with applause and so to the transformation of the government forest department to Kenya forest service. All these measures will improve considerably the current low forest cover as well as good protective measures.

2.6 Wildlife

Wildlife is any non-domesticated fauna or flora life forms or creature living in either artificial; or natural habitat. There are numerous wildlife resources in nature with their distribution being influenced by the varying climatic conditions i.e. tropical or temperate climates.

Fauna is the invertebrate and vertebrate life forms found in the ecosystem. These are the reptiles, mammals, birds, amphibians, insects, and molluscs, which are the consumers. Of the importance here are the mammals and avian life forms. Earlier inventory showed 30 species of mammal existed, of which only 20 species exist now and 10 have disappeared from the ecosystem due to various reasons. Birds were recorded to be 240 species of which only 200 species exist due to habitat destruction among other factors. As a consumer, this component heavily relies on the floral component for survival.

Inventory of Major Wildlife Species- Their Distribution and Habitat

In the case of Mt. Elgon ecosystem, there are about 20-recorded mammal's species. These include *elephants*, *oribi*, *bushbuck*, and *buffalo*, *waterbuck*, *giant forest hog*, *red duiker*, *impala* and *rodents*. The primates include the *black colobus monkey*, *blue monkey*, *de'brazer monkey*, and *olive monkey*. The carnivores include the *leopards*, *spotted hyena*, *civet* and *genet cats*. There are also *porcupines*, *aardvark*, *groove-toothed mole*, *cave bats* and *the African hare*. These wildlife species are divided into three categories of key, threatened and species of special concern. Key species are those that bring about a remarkable change on the ecosyscause

of their feeding and the mode of their home range i.e. the species can transform a forest habitat into shrub land and open grassland. Or displace other species by out competing them.

Threatened species are those that face threats of human activities that both destroy them and their habitat e.g. the *elephant*, *giant forest hog*, *leopard* and the *oribi* that are threatened due to poaching and habitat loss. Species of special concern are those highly regarded by both conservationists and tourists. An example is the *elephant* due to its tourist value and habitat modification.

There is no clear distribution pattern of wildlife in Mt. Elgon National Park since the animals according to the forage availability use the entire ecosystem collectively. However, the grazers prefer the lower grassland like buffalo and the waterbuck. Elephant's use all habitats including the open wooded grassland, bamboo zone and the moor land. Primates are found in the gallery forest areas and sometimes-open grassland. The groove-toothed moles are restricted to the moor land. There is no preferred habitat specification for a particular species but it may be preferences due to assured security and availability of forage.

Key environmental issues and proposed interventions (Table 24)

Table 24 **: Summary of major issues in wildlife and forestry**

Environmental issues	Impact to the environment	Mitigation measures
Degradation of catchment areas	Increased Soil erosion Loss of biodiversity Decline in quality and quantity of water flows Siltation of water bodies	• Rehabilitation of degraded catchments, • Biodiversity enrichment, • Catchment protection and rehabilitation, • De-siltation of water bodies, • Public education and awareness, • Involvement of community in

		resource management.
Decrease of wildlife habitat	Decline in wildlife diversity Soil erosion	• Enforcement of Wildlife Act, • Enhance Public awareness and Education, • Protection of wildlife habitat, • Control of Invasive species (Lantana camara & Elephant grass)
Excision and encroachment of forest areas	Decline in forest produce Increased surface runoff Loss of habitat Encroachment in water catchment areas	• Promote alternative sources livelihood, • Eviction of illegal settlers on forest land • Boundary alignment and marking of gazetted forest areas • Fast tracking formation and implementation of Community Forest Associations, • Enforce relevant legislations on forest excision
Human-Wildlife Conflict (Poaching, human deaths, Crop destruction)	Loss of species Economic losses	• Installation and maintenance of wildlife barriers, • Awareness creation, • Problematic animal control, • Reclaiming and securing of wildlife migratory corridors, • Wildlife policy review on human-wildlife conflict,

2.7 Biodiversity Conservation

2.7.1 Biodiversity Data and Information

The present state of the environment and Outlook - Wild Life Resources

A lot has been achieved in terms of environmental management and conservation particularly when it comes to wild life conservation and management. The wild life department has over time changed its management strategies to meet the ever-changing environmental challenges. Policies have had to be appraised over time through amendments of Acts like the Wildlife (conservation and Management) Act of 1989 where the wildlife policies had to be changed to meet the ever-emerging challenges. The application of this together with other environment management Acts has brought about proper conservation of wildlife industry in the country. The current state of the environment in the wildlife areas can be termed as good since most of the activities that caused negative impacts to the environment have curtailed for sustainable environment conservation.

There have been a lot of constrains and challenges that require a lot of inputs in terms of resources like finances, material and manpower. The major constrain has been finance to support conservation activities. A lot of resources had to be mobilized to achieve the set conservation targets like provision of adequate security use of skilled manpower and infrastructure. Donor funding is important to supplement government funding allocated for environmental conservation.

Sustained development goes with proper environmental management. Proper conservation and management of wildlife resources is a stimulus to the sustained development of other sectors of the economy. For example, it stimulates the tourism and transport industries which keep many people in the wage employment whose earnings goes a long way in sustaining other development activities. These activities can only be sustained through sustained environment conservation, as the tourism industry is one of the leading foreign exchange earners for this country. In doing this, all areas of critical environmental concern must be addressed.

The Present State of the environment and Outlook - Forest Resources

During the year 2004, only industrial forest exploitation was allowed to continue mainly by Pan African Paper Mills - Webuye for pulp manufacture. A total of 550Ha were harvested mainly pine and cypress trees. During the same period the department managed to establish 670.7Ha of plantation dispersed throughout the forest stations. At

the same time, a thorough zonation exercise was conducted which generally increased land to be put under natural vegetation to 5025.6Ha and for forest plantation vegetation to 8425.6Ha. Hence the current forestland under Forest Department in Trans Nzoia District is 13,452 Ha, which represents 29% of the total forest land area in the district. Forest cover under the same department is 4,425Ha.

About 34,000Ha of indigenous vegetation is being managed by KWS within Mt. Elgon Forest Reserve.

Table 25: **Types and Status of Biological Resources**

Ecosystems		**Location & Size**	**Key species**	**Threats**	**Status**		
					Rare	**Threatened**	**Vulnerable**
Gazetted forests	**Indigenous**	√					
	Plantation						
County forests		-	-	-	-	-	-
Community forests		-	-	-	-	-	-
Private forests		Unknown	Eucalyptus Cypress	Over-harvesting	√		
Agricultural		183,233	Cash, horticultural and food crops	Loss of soil nutrients and acidity	-	Wetlands	Protected forests and wetlands
Wildlife areas		Mt. Elgon 39,992	Elephants Buffaloes Antelopes Primates Giant forest hog	Poaching Habitat loss	De'Braza Some Bird Species	Giant forest hog Elephants Oribi Leopard	-

		Birds Cave bats Cats				
Dry lands	-	-	-	-	-	-
Wet lands	Kaisgat/Lokichar	Birds, and wild animals and indigenous trees	Degradation of the wet through draining if the wetland for crop production.			

Table 26: **Types, Status and Impact of Invasive Species**

No.	Name of invasive species (Scientific/English/Local Name)	Ecosystem affected	Size of area affected	Environmental impacts
1	Maize weevil	Maize	Whole district	Loss of grains
2	Greater Grain Borer (GGB)	Maize	Whole district	Loss of grains
3	Lantana camara	Mt Elgon	Part of the district	Colonizes and displaces grass and shrubs
4.	Elephant Grass	Saiwa swamp	Part of the park	Colonizes leading loss of other favourable grass species for Sitatungas

Source: District Agriculture Office, 2004

Key environmental issues

- Encroachment/Settlement
- Poaching
- Invasive species
- Monoculture
- Crossbreeding/Hybridization

Proposed interventions

- Restriction of settlement,
- Stop encroachment,
- Eviction of illegal settlers from ecologically important areas
- Law enforcement
- Management of the invasive species in affected areas,
- Diversification of crop production
- Gene bank establishment

CHAPTER THREE

Human settlement and infrastructure

3.1 Human Settlement and Planning

Human settlements are characterized by urban and rural settlements, housing and associated infrastructure. Rapid population growth and urbanization, coupled with low incomes and inefficient physical planning legislation has resulted in a shortage of appropriate housing, inadequate water and sanitation services, deteriorating road and transport system as well as shortage of energy supplies. The proportion of the district population has a steady increase of 3.8% mainly due immigration and rural population growth. A large proportion has ended up in Kitale town and other upcoming urban centres. The impacts are falling living standards, polluted air and water, unsanitary living conditions, increasing informal settlements and slums, wood fuel depletion, increased soil erosion and land degradation.

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. Most of the population in Trans Nzoia is concentrated around the urban areas where the size of land is generally small while many settlement schemes and farmers companies are mainly less densely populated due to the large sizes of such farms.

The trends are significantly changing, as most of the former large-scale farms are being sub divided into smaller holdings as the district experiences the influx of people. The district has seen a continued steady influx of great numbers of people who buy land, subdivide such land and settle on it (Plates 8 and 9). This has often had a negative impact on the environment.

The most significant form of settlement is the informal settlement of people in the catchments, wetlands and riverbanks. The affected catchment areas include Milimani, Kapolet and Saboti. This kind of encroachment has seen some encroachers validating their illegal existence over time. Cases of revising boundaries neighbouring wetland is an emerging critical environmental concern in the district. This is done by 'squatters' and people who just want to put more under agricultural activities. In fact the hilltops and wetlands are public utilities. However, these natural resources have always been there with little or no attention from relevant authorities and while the communities seeing no direct benefits from them. This conflict of land use between conservation, landlessness and need for increased agricultural productivity and demand for land for settlement is a worrying trend in Trans Nzoia.

Land use planning is carried out under the Physical Planning Act1996The purpose of land use Planning is to ensure harmonious Land uses compatibility and forestall conflicts in land uses and generation of negative externalities by the other users. It is also aimed at ensuring an ambient environment. This has not always been the case, as the laid down plans are ignored in favour of the short-term goals of most of the prospective developers.

Most industrial and commercial development requires Environmental Impact Assessment (EIA), a legal requirement that should not be ignored. The basic assumption

is that if proper EIA is carried out, then the safety of the environment can be properly managed during the project's implementation, commissioning, operation, and decommissioning.


plate 8and plate 9: Opening up of land for agriculture and settlement in Trans Nzoia District

Categories of land uses:

1. Residential areas (Estates)
2. Industrial (Major industrial areas and light industrial areas)
3. Educational facilities (schools, recreational facilities)
4. Recreational areas (urban, estate, community, road reserves levels)
5. Public purposes (Health services, administrative areas, Law and order, community centres, religious institutions, fire stations, library and post office)
6. Commercial services (Town centre, Local centres, intermediate centres, Major centres, Market categories)
7. Public utilities (water supply, sewerage system, garbage collection and disposal, electricity power line, telephone and cemeteries)
8. Transport (rural road networks, urban road networks, urban road reserves, display of adverts)
9. Deferred
10. Agricultural

The urban centres are usually built of permanent structures made of rock chipping and bricks. Recently however, construction has been done without proper planning, thus sanitation and infrastructure facilities are haphazard. The public utility areas have been most abused both in urban and rural set ups. The growing demand for building materials

has left many mining sites un-rehabilitated e.g. Saboti rock chipping mines, murram mining at Matunda, Koi quarry in Saboti e.t.c. The district has only one well developed planned urban area. Other urban areas such as Kiminini, Endebess, Kwanza, Maili Saba, Sibanga and Kachibora have been planned but not developed. Although the Kitale town development plan does exist, its implementation has raised many questions than answers. The industrial development section has been the most affected. The parks and gardens have been ignored to favour the transport sector and commercial purposes.

3.2 Impact of human settlement and infrastructure to the environment

Population Pressure

Trans Nzoia district has experienced a high population growth with no commensurate growth of the infrastructure to support the ever growing needs that comes with it. This has witnessed a greater percentage of the urban dwellers settling in slums. The unplanned settlements (Plate 10) that have emerged include Matisi, Kipsongo, Folkland, Shanty, Bondeni and Gitwamba.

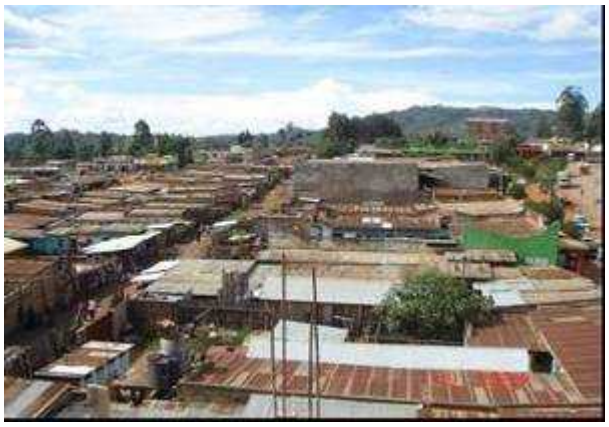


plate 10: Unplanned congested urban settlement

The inhabitants of these areas are more often exposed to poor living conditions. Waste generation is always high, poor housing with poor ventilation always characterise these areas. These conditions predispose people to disease causing agents. In the rural setup people have settled on marginal areas such as steep slopes of Milimani, Cherangani and Mt. Elgon regions, wetlands have been opened up for settlement and farming. The direct impacts of this are the decline in water volumes in rivers, floods, drying of springs and increased soil loss.

Land subdivision

Search for land with high agricultural potential has always been the driving force behind the high population growth in Trans Nzoia. Since the total land size is constant, the land has always been subdivided to accommodate the growing population. The subdivision sometimes to uneconomical units has had negative impact to the environment.

Landlessness

The people or families without land, also, referred to as squatters have contributed negatively to the degradation of the environment. These people always pursue short term goals to enable them survive at the expense of the long term conservation goals. These people occupy marginal lands and since they do not have title deeds for security and ownership, they carry out unsustainable activities such as charcoal burning and brick making in the catchments.

Weak enforcement of existing legislation

Planning is a very important tool necessary to address all developmental and environmental challenges. However this aspect of development process has always been ignored and reduced to a mere formality. Where plans exist, many developers have been applying for change of user leading to sprouting of structures at the places they were not earlier designated. This complicates the efforts of planners and managers of the environment for instance laying down the infrastructure for waste management.

3.3 Human and Environmental Health

HIV/AIDS Status

The prevalence rate for the disease has reduced from 14% in 2003 to less than 10% in the 2005 survey. The study showed that HIV/AIDS cases were more in urban dwellings than in rural environments. In 2003 figures showed that 9% of the rural population and 10% of the urban population were infected. Bed occupancy for these cases makes 50%. The most affected of the age groups is between 15-49 years. The number of reported deaths to date is approximately 10,000. Constituency Aids Control Council (CACC) is

doing community mobilisation work. The main activity done by this group is home-based care for the victims.

HIV/AIDS has been identified as one of the factors that contribute towards environmental degradation besides population pressure and poverty in the rural areas. The loss of family breadwinner compels the affected widows and orphans to entirely depend the natural resources as their main sources of income.

Water Borne Diseases

The main cause of water borne diseases in Trans Nzoia is the faecal contamination/pollution of water systems. Hence, these diseases are caused by consumption of contaminated water. Reports indicate that pit latrines are the most commonly used while in some places like rural and slum areas there are no toilets making it the likely source of pollution. Lack of waste management infrastructure is also a potential source of contamination. Septic tanks are widely preferred in estates and in upcoming urban settlements.

The prevalence of the disease in the district is as follows:

- Diarrhoea diseases 4,215
- Typhoid 1,610
- Amoebic dysentery 243
- Skin diseases 2,509

Chlorination is widely used bacteriological water treatment in the district. However, this form of treatment has not effectively worked for the ambitious Kiminini water project. The bacteriological levels remain high to levels not fit for consumption even after chlorination procedure. The logical explanation to this persistent contamination is that since the Kitale sewage treatment plant and ponds lies in the proximity of Kiminini River from which the Kiminini water project intake is, therefore this could be the source of contamination unless proved otherwise. Other methods of water treatment practised in the District include solar disinfection (SORDIS), boiling and filtration.

Vector Borne Diseases

Malaria is the main vector borne disease within Trans Nzoia district. A total of 160,000 cases were reported in the year 2004 of which 60,047 were malaria cases. These diseases

have a high mortality rate in children under the age of 5 years and among the expectant women.

The flood prone areas, water in abandoned quarries, degraded dams and the wetlands are the breading grounds of mosquitoes that cause malaria. People who have encroached to these areas fall easy prey to the disease-causing vector. The climate change has provided favourable conditions for the vectors to breed and multiply hence contributing immensely to vector borne diseases. Measures taken to contain the disease include use of residual spraying and the use of treated nets.

Respiratory Diseases

This consists of mainly upper respiratory tract infections (URTI's). It doubles as the second highest diseases after Malaria. The number of reported cases for the year was totalling to 130,000 (Table 27).

Table 27: ***Incidence (Number of Cases) of Common Environmental Diseases***

No.	Disease	Prevalence
1	HIV/AIDS	93,820
2	Water born	8,577
3	Vector borne	160,000
4	Respiratory (URTIs)	130,000

Source: District Public Health Office, 2004

3.4 Pollution and waste Generated from Human Settlement

The volume of waste generation especially in the urban environment has by far overstretched the existing waste management infrastructure. The councils lack the capacity (technical and physical) to effectively collect, transport and dispose off the waste. This coupled by the ever increasing urban population in Kitale town and other upcoming centres has further complicate the already worse situation due to increased waste generation generally and the mushrooming of slum settlement were waste management is a problem in particular.

The Kitale Municipal Council is the principal authority with the mandate to offer services to the residents within its jurisdiction. These services include waste collection, transportation and safe disposal among many other services. The council however is insufficiently equipped to tackle this task. The facilities the councils have include waste collection chambers and a few hands equipment. The council lacks the waste transportation machinery and the current disposal site is not gazetted not to mention that it is poorly sited.

Nzoia County Council on the other hand is charged with the responsibilities of waste management in towns and centres outside the municipality. They also lack both the technical and physical capacities to effectively manage the waste.

There is no documentation on the volume of the waste generated in Kitale town and other subsidiary urban centres leaving the information gap necessary in planning and addressing the challenges of waste management.

The other service provider in Kitale town is Nzoia Water and Sewerage Service Company (NZOWASCO) which has the sole responsibility of managing sewage and supplying piped water to the households. The company has the Bidii maturation ponds and the Machinjoni sewerage treatment plant that acts as the receptacles of the sewage from Kitale town. The company and by extension Kitale town still relies on the sewage system laid down during the colonial period hence few households are connected to the system. This is also due to the fact that few households are connected to piped water supply. Many households widely use the septic tanks as the mode of disposing waste while relying of council's exhauster for emptying whenever they are full. The common mode of disposing human waste in informal settlement in urban and rural setup is pit latrines. Still some do not have the latrines hence opt to go to the bush or use what is unconventionally known as flying toilets.

Main of pollution sources in the district include:

- Agrochemicals from farms,Domestic (estates, rural)
- Municipal/commercial (markets, Hotels, transport, shops, supermarkets, salons, (Kinyozi), Slaughter houses, Transport, Garages and Jua kali

- Industrial/Factory wastes, Sewage, Storm water
- Hospitals, dispensaries and clinics, Offices

Types of Wastes

Most wastes generated are disposed into the environment (Plates 11 and 12). Major wastes identified in the district include organic/degradable garbage; polythene papers/ plastics; agrochemicals; hospital/medical wastes (hazardous waste); industrial effluent; Sewage and washouts; blood and animal carcasses; scrap metals; oil and grease; papers; electronic; gases and smoke; and glasses.

Picture: Poor waste management infrastructure a challenge to solid waste management in Kitale town

Plate 11and 12: Waste collection and waste dumped in the environment

Key environmental issues and proposed interventions table 28

*Table 28**: Impact of Waste to the environment***

Type of waste	Impact to the environment	Mitigation measures
Liquid waste	Water pollution, Increased incidences of water-borne diseases	Water treatment Enforcement of water quality standards

Type of waste	Impact to the environment	Mitigation measures
		Recycling Construction and expansion of effluent treatment plants in settled areas, Controlled urban development
Organic/degradable waste	Odour smell, Attract vectors, Makes a place unsightly Pollutes water way through runoff, Pollutes underground water	Compost manure production, Minimise wastage, Proper disposal, Recycling
Plastics waste	Death of animals, Make place looks unsightly, Pollution of soils	Reuse, Reduce, Recycle
Agrochemicals	Water pollution, Aquatic poisoning, Soil pollution	Use correct levels, proper soil and conservation structure, Reduced use, creation of awareness
Hazardous waste	Environmental degradation, Harmful to life	Safe disposal as per regulations

Box 3.1: Case Study of Impacts of Pollutants

Kiminini Water Project is a CDF/G.O.K sponsored scheme aimed at serving Kiminini Township- the divisional headquarters of Kiminini in Trans Nzoia district. The Township is 22km south of Kitale town on $0^0$34' Northings and $30^0$50' Eastings and 2 km away from Ewaso Rongai River intake point of the water supply.

The initial constructions had started way back in 1982/83 but stalled. It was intended to serve a population of 34,600 persons during its initial design at that time. This design has been overtaken by events since the current population to be served is in excess of 40,000 persons with an ultimate water demand of 1888.9m^3/day in the year 2004 (Water department).

Records indicate that Kshs.16.8 million has already been spent with an outstanding cost for the pending at Kshs.42 million. The water pumping is done by diesel engine consuming 100litres to fill the 320m^3 Tank. The raw water in the tank is treated by

simple chlorination. The total running cost per 8hour operation is at Kshs.7, 000. The sustainability mechanism needs to be factored in for long-term achievement.

Further complication sets in when the studies indicate that Ewaso Rongai River that flows 20km downstream of Kitale town Sewage works is highly polluted. The industrial effluent, garages, pit latrines and absence of toilets, and petrol stations in Kitale town, compounds the problem. The analysis reports further shows that the water in the storage tank is still polluted even after chlorination treatment. The Water quality section, Kakamega and Public Health department in Trans Nzoia did the analysis separately and came up with corroborative results. The water quality reports conclude by stating that the water is unsuitable for human consumption at this stage. To overcome this, full conventional treatment plant as per the design is recommended.

3.5 Communication Network

The district is fairly covered by road network. The all weather roads include Kitale - Webuye, Kitale - Endebess, Kitale - Kapenguria, Kitale - Eldoret and Kitale - Ziwa. The rest are murram roads. The district is not adequately covered by electricity. Only 2% of the district has electricity. Telephone services do not cover all parts of the district; and where available they are poorly maintained. The district has one railway line which is generally under-utilized. There is also one airstrip in Kitale that handles only light aircraft's. However, Eldoret handles large commercial planes.

3.6 Socio-Economic Services and Infrastructure

Water is an important resource that directly influences the livelihoods of the people yet most of the people have no access to clean water. Clean water for domestic use is a scarce resource. The water resources currently face serious threat arising from intensive human activities in the catchment areas, wetlands, farms and industrial processes. Pollution from the non point sources such as agricultural activities in the farm lands contributes immensely to the degradation of the water resources. Clean water that is an important resource in supporting livelihood is now a rare commodity.

Table 29: ***Number of Household with Access to Water***

Source	No.
Number of house holds with access to piped water	18,411
Number of households with access to portable water	34,836
Number of households with roof catchments	11,612

Sanitation

Wastes collection and disposal is the preferred system in the Kitale Municipal council. Outside the Municipal council, crude means are used to dispose the wastes involving the use of composite pits. This is used by 95% of the population in this region. There are various methods of wastes collection that include: - Dustbins within the Central Business District but not in all areas, Bulk containers in markets and schools. Refuse chambers are used in market s only, Trailers were two but one is currently grounded. Only one tractor is available with the Municipal council and one with the county council. There was one exhauster vehicle belonging to the municipal council but it is currently grounded.

The street food vending is on the rise and could be the potential cause of diseases due to contamination. The district has scare water supply to the residents making practising good hygiene difficult.

The worst hit area with poor sanitation is in the Slums and unplanned settlement. The inhabitants are predisposed to unhygienic conditions which occur as a result of overcrowding and high waste generation which is poorly management. Poverty and unemployment has been singled out as the driving force to the emergency of the unplanned settlement.

Table 30: **Number of Health Facilities in the District**

Type	**Category**	**Number**
Hospital	Public	1
	Private	2
Nursing homes	Private	4
Health centres	Public	6
Dispensaries	Public	18
	Private	9
Clinics		

Table 31 Impact of major diseases to the environment

Disease	Impact	Mitigation measures
HIV/Aids	Loss of breadwinner leads to poverty which leads to environmental degradation.	Public awareness on prevention and management of HIV/AIDS
Water borne diseases	High mortality	Promote the practise of hygienic practises
Vector borne diseases	High mortality from malaria Health risks caused by use of chemicals/sprays to prevent mosquitoes	Educate public on prevention measures to curb malaria Discriminate use of chemicals/sprays used.

Education Facilities (Table 32)

Table 32: Number of Education Facilities

		Municipality	Private
Primary	248	26	17
Secondary	58	-	15
Tertiary	1	-	7

3.7 Energy Sector

Energy Supply and impact on environment

The main source of energy in Trans Nzoia is wood fuel with a smaller proportion using and/or complimenting with gas, paraffin, electricity, solar and generators. With the expanding population more is now exerted on the wood fuel. If the households can access alternatives sources of energy which is affordable then as a result there will be an increase in tree cover.

Over 95% of the rural population and 85% of the urban population use wood energy respectively.

Wood Fuel

Over 95 percent of the rural population entirely depend on fuel wood as the source of energy. Whereas over 85 percent of the urban population also used wood fuel directly as firewood or charcoal as their source of energy.

The over-dependency on the wood fuel puts pressure on the existing forest resources in farms and government forests. Charcoal burning and illegal logging for fuel wood have been going on with little interventions to generate more trees. The most affected is the Saboti and *Kapolet* forests. The forest cover has significantly reduced and the rivers are under threat due to catchment degradation.

Electricity

The Kitale region parts of; Trans Nzoia, and Uasin Gishu districts, has 10,000 consumers at a connection rate of 50 customers per month. The number of customers depends on the electrification program. The impact of electricity supply to the environment occurs when it requires that trees be cut to pave way for new lines. When the transmission is through a forest, a wide tract of trees are cut to provide safe passage of transmission line. The transmission line too consumes poles, which are tree products. Supply of electricity to an area attracts settlement of people who later impact on the environment through their activities.

Factors Determining Types of Energy Used

In our community set up, the following factors broadly determine the type of energy used at household level:

- Family financial status – the rich goes for gas.
- Family size – the bigger families opt for fuel wood
- Family locality – rural setting families generally prefer to use fuel wood due to its availability as compared to the town dwellers.
- Types of meals prepared – most of this community prefer to prepare *Ugali*, maize and beans mixture, which uses a lot of fuel. Fuel wood is therefore the cheapest in this category.
- Energy supply and availability – fuel wood is readily available within the community setting than electricity and other forms of energy, so the demand for its use quite high. The community also supplement maize stalks as fuel wood during the harvesting period.

Trends in Demand and Supply

Due to the ever-increasing population, size of our communities, the demand for fuel and charcoal has been on the increase year after year as the supply for the same comes down. Land sizes have been reduced over the years contributing further to the dwindling supply of fuel wood at farm level.

Clearing of forests for agriculture and construction purpose leads to desertification; this is feared to be advancing at an alarming rate of 75 km per annum

In our community set up, the following factors broadly determine the type of energy used at household level:

- Family financial status – the rich goes for gas.
- Family size – the bigger families opt for fuel wood
- Family locality – rural setting families generally prefer to use fuel wood due to its availability as compared to the town dwellers.
- Types of meals prepared – most of this community prefer to prepare *Ugali*, maize and beans mixture, which uses a lot of fuel. Fuel wood is therefore the cheapest in this category.
- Energy supply and availability – fuel wood is actually available within the community setting so the demand for its use as opposed to gas or electricity. The community also supplement maize stalks as fuel wood during the harvesting period.

Table 33: Trends in Energy Production and Projection

No.	Source of energy produced in the district	1990	2000	2005	Projections for 2010	Remarks
1	Wood fuel		11,500 ton	11,500 ton	-	Over-dependence results in loss of vegetation
2	Solar					
3	paraffin					
4	Gas					
5	Charcoal					

Trends in Energy Production, Consumption, Cost and Projections

Due to the ever-increasing population, the demand for fuel and charcoal has been on the increase year after year (Table 33) as the supply for the same comes down. Land sizes have been reduced over the years contributing further to the dwindling supply of fuel wood at farm level. Clearing of forests for agriculture and construction purpose leads to desertification which is feared to be advancing at an alarming rate of 75 km per annum.

Since Kenya is an agricultural country that relies heavily on farming for its rapidly growing population, it would be very difficult for a farmer to think about conserving forests when he has nothing to feed on. This is where the concept of sustainable development comes in. People have to develop in terms of food productivity but this development should not be at the expense of environment conservation.

Based on the fact that wood fuel is the energy source for over 90% and 85% of rural and urban household, respectively, the demand for the same is generally set to skyrocket annually (Table 34 and Plate 12). Fuel wood demand in the 1990s amounted to 20.3million tonnes with only 15.1 million tonnes being drawn from sustainable yields. This means that 30% of the total wood fuel supply was obtained via the depletion of stocks. Charcoal consumption totalled 0.73million tonnes in 1990s, which is equivalent to 6.1 metric tonnes of fuel wood. By the year 2002, standing stocks were estimated to

have reduced by 25%. This situation sets Kenya on a dangerous road if measures are not taken to counter act and eventually reverse the current trend in this area. With deforestation on a massive scale, grave ecological, economic and social consequences everywhere will be inevitable.

Table 34: **Energy Consumption and Cost**

No.	Source of energy	Point of production	Point of consumption	Per capita consumption	Unit cost (Kshs)	Environmental impacts
1	Wood fuel	Farm	Household	1,368kg/year	12	Forest degradation
2	Solar	Farms	Household	Unknown	-	Reduced pollution
3	Paraffin	Petrol station	Household	unknown	-	Reduced pollution
4	Gas		household	unknown		Reduced pollution.
5	Charcoal	Farms/forests	House hold and hotels		-	Forest degradation, Soil Erosion, Decline in tree cover

plate 12: Stack of Fuel wood - a major source of energy

Solar energy is fast being adopted as an alternative source of energy especially in the rural areas. Solar energy production and consumption has not been quantified.
Electricity as a source of energy is accessible to only 2% of the population in the district. This is further restricted to the urban areas of Kitale town and Kiminini centre. Rural electrification was only effected in some parts of Cherangani and Kaplamai.

Petroleum is another source of energy though it is exclusively imported from outside the country. It is mainly consumed in the household for lighting, cooking and in fuelling vehicles. Consumption is expected to be on an upward trend considering the rate at which the population is growing and people acquiring vehicles.

Key environmental issues

- Overdependence on wood fuel as source of energy
- High cost of alternative sources of energy
- Conversion of land for wood fuel production into other uses
- Limited access to alternative energy sources

Proposed interventions

- Promote alternative sources of energy e.g. biogas, solar
- Increase tree cover
- Promote energy saving devises
- Promote agro forestry
- Re-afforestation and afforestation,
- Education and awareness t
- Set aside land for wood fuel production
- Waive taxes on alternative energy devises e.g. solar panel, electricity
- Infrastructural development and expansion of energy sources

CHAPTER FOUR

4.0 Trade, industry and services

4.1 Industrial Sector

Trans Nzoia district has industries based on agro-processing and Jua kali (Table 35). Most of these industries are of the meagre scale rating. However, the potential for medium and large-scale industries exist. Some of the existing industries include the Nyota Dairies, Swami, Labh, Krishna, Trans Nzoia and Mini bakeries, Kenya seed Company, Western Seed Company, Kitale Industries, Some Arap Tuwei Garage, Gian Sighn Bansal, Mt. Elgon Bottlers, Khetia Drapers, Kitale Timber Saw Meals, and Feed Mill Co.

Table 35: **Types and trends in Industrial Development**

No.	Type of industry	1991-1995	1996-2000	2001-2005	Projections for 2010
1	Manufacturing				
2	Mining	-	-	-	-
3	Building	-	-	-	-
4	Jua kali		6	8	-

Source: District Trade Office, 2004

Small Scale Industries and the Informal Sector

Jua Kali activities dominate small-scale industries and the informal sector. The activities include metal fabrication, welding, motor vehicle repair, bicycle repair, furniture making tailoring and cloth making. Informal sector activities include barbershops, shoe and radio repair, retail trading of various commodities, second hand clothes business and hawking of household commodities.

Small-scale industries and the informal sector create self-employment to 30,000 people in the district. This activities supports agriculture by supplying farm implements and services including Jembes, pangas, Tractor, and vehicle repair as well as market for farm produce including vegetable, maize and beans. Through employment creation and income generation, the sector helps significantly in poverty alleviation in the district.

Table 36: **Types and Impact of Industries on Environment**

No.	Type of industry	Raw materials	Products	No. of people employed	Wastes	Key environmental impacts
1	Manufacturing	Agricultural produce Water Livestock produce	Flour, Feeds, Drinks, Milk, Meat, Compost manure	1,200	Effluent Solid waste	Environmental pollution
2	Mining	Sand Murram Rocks	Construction materials	-	Dust, Noise	Abandoned used quarries Increased incidences of water-borne diseases and malaria
3	Construction	Sand, Gravel, Cement Metallic materials Water	Roads Residential and commercial buildings	1,500	Solid Gases Metallic Dust	Respiratory diseases,
4	Informal sector	Metals Wood Waste oil	Furniture Fabricated goods	30,000	Liquid Solid Gases	Environmental pollution

Source: District Trade Office, 2004

4.2 Trade Sector

Since agriculture and livestock production is the main occupation of over 60% of the population in the district, the growth of trade and services sub-sector is highly dependent on them. Most traders are mainly involved in the sale of either consumer goods or farm inputs, while others are involved in hotel and catering services. Wholesale traders are concentrated in Kitale Town and a few market centres like Kiminini, Kachibora and Maili Saba. Retailing of consumer goods and general provision is prominent in Kitale

town and all market centres in the district. It is estimated that about 25,000 people are currently engaged in formal trade and services sub-sector in the district.

Table 37: **Types and Impact of Trade on Environment**

No.	Type of trade	Raw materials	Products	No. of people employed	Wastes (solid, liquid and gaseous)	Key environmental impacts
1	Distributors/ Wholesale	Industrial Agricultural	Household Food items Hardware Vehicle parts Textiles Electronics	-	Solid	Pollution from solid waste
2	Retail	Agricultural Industrial Fish	Household Food items Hardware Vehicle parts Textiles Electronics	-	Solid Liquid	Pollution
3	Informal sector (Hawking)	Agricultural Industrial Fish	Foodstuffs Textiles Hardware Electronics	-	Solid Liquid	Pollution from waste, Disrupting urban planning

Table 38: **Types of Trade and Impact on Environment**

No.	Type of trade	Linkages (impact) to environmental degradation
1.	Distributors/ Wholesale	Unorthodox way of waste disposal in their operation i.e. disposal of plastics
2.	Retail	Lack of dustbins allows for reckless dumping of waste especially plastics
3.	Hawkers	Occupy non-designated sites thus disrupting the urban plan Difficult to control their operations due to their large number

Source: District Trade Office, 2004

4.3 Service Sector

Trans Nzoia district has nine commercial banks that provide financial services to traders and industrialists in the district. These are Barclays, National, Cooperative, Oriental, Standard, Kenya commercial, Family bank, Equity and K-Rep banks. All these banks have full-fledged branches in Kitale Town. The banks provide secured loans to entrepreneurs with tangible collateral in the district. K-Rep is the only financial institution that specializes in micro finance by providing loans and saving services to small business commonly referred to as Jua kali. No collateral is required on small loans of up to KShs.250, 000. The bank relies on the group and the Trust pressure model as in Grameen bank of Bangladesh. It is believed that providing banking services to the small income earners and the informal sector is commercially viable and important development intervention for poverty eradication. As a result, the bank plans to provide loans to small, medium and large-scale entrepreneurs in the district.

Table 39: **Service sector Linkages to Environmental Degradation**

No.	Service sector	Linkages (impact) to environmental degradation
1	Transport	Noise pollution Air pollution through smoke due to poor vehicle servicing and dust, Pollution from waste oils and greases while servicing
2	Hotels	Poor dumping of waste food and Effluent
3	Telecommunication	Impact of cellular phones not yet determined Disposal of used scratch cards, batteries and phone parts
4	Energy	Carbon emissions, deforestation
5	Banking /insurance	Paper waste
6	Medical	

Key environmental issues

- Abandoned used quarries
- Increased incidences of water-borne diseases and malaria
- Respiratory diseases
- Pollution from solid waste
- Poor urban planning
- Noise pollution
- Air pollution through smoke due to poor vehicle servicing and dust,
- Pollution from waste oils and greases while servicing
- Poor disposal of Solid waste and Medical wastes
- Impact of cellular phones not yet determined
- Disposal of used scratch cards, batteries and phone parts
- Carbon emissions, deforestation

Proposed interventions

- Rehabilitation of quarries
- Improve drainage and hygiene and use of mosquito treated nets
- Enhance waste collection
- Update urban development plans

- Enforce relevant regulations to control waste, air and noise pollution
- Enhance afforestation

4.4 Tourism

Types of Tourism, Attraction and Potential

The district has not fully exploited its potential for the development of the tourism industry. There are three tourist attraction sites in the district. These are: Kitale Museum, Mt. Elgon National Park, Saiwa Swamp National reserve (Table 40 and Plate 13). Although the number of visitors to the three attraction sites has earned substantial revenue for the district, there is still potential for more. Although wildlife is an attraction to tourists in the district, the conflict between farming and wild life has had an adverse effect on the economy due to damage on crops by wild animals. About 1,500 people are either directly or indirectly employed in tourism related activities. Kenya Wild life Service (KWS), which has an office in Kitale, has embarked on the improvement of infrastructure within the catchment area of the parks. There exist a few tourist class hotels in the district. One of them is located in Mt. Elgon National Park while four are located in Kitale town. The improvement of Kitale airstrip to an airport and development of better infrastructure during the plan period is expected to boost the number of tourist visiting the district.

Table 40: **Types of Tourism Attraction**

No.	Type of tourism	Attraction	No. of facilities	Geographical location	Environmental impacts
1	Wildlife	Game viewing Nature trail Caves Camping sites Bandas Photography	2	Mt. Elgon Saiwa Swamp	Wastes generation from the Bandas and camping sites
		Game viewing Horse riding Boarding facilities	2	Delta Crescent Kitale Nature Conservancy	Wastes generation from the Bandas and camping sites
2	Cultural /Historical	Museum	2	Town centre	Positive impacts through promotion of proper waste management and environmental conservation and Cultural preservation (Artefacts)
3	Sports	Golf course Swimming pool Stadium	1	Towns outskirts	Positive by encouraging good environmental practices
4	Educational	Game viewing Nature trail conference facilities and	1	Towns outskirts	Positive by encouraging environmental conservation and protection.

No.	Type of tourism	Attraction	No. of facilities	Geographical location	Environmental impacts
		Education centre			

plate 13: Kitale Nature Conservancy, a major tourist attraction in Trans Nzoia District

Key environmental issues

- Human-wildlife conflict
- Reduced tourists numbers due to negative publicity
- Insecurity
- Poor infrastructure reduces income from the sector

Proposed interventions

- Enhance community wildlife programmes
- Market the district as a tourist destination
- Improve security
- Improve the infrastructure

4.5 Mining and Quarrying

4.5.1 Mining

The District has no mining activity. However, rocks containing graphite have been reported on the southern slopes of Cherangani hills within the basement rocks. The quantity has not yet been determined to allow for exploitation. Stone quarries that produce good building stones exist in Saboti and Endebess divisions (Table 41). The quarries are run either by individuals or cooperative societies. However, they are not optimally exploited. The market for the expanded exploitation exists in the construction industry within Kitale Municipality and also in the rural areas and even the surrounding districts.

4.5.2 Quarrying

Table 41: **Types of Stone and Method of Extraction**

Type of quarry	Method of quarrying and purification	Ecosystem	Geographical location /name of quarry	Quantity extracted annually	Regulatory agency	Environmental impacts
Stone	Open	Modified Grassland	Endebess Saboti	-	-	Land degradation
Murram	Open	Modified Grassland	Kapomboi	Backfilled	Public works	
			Maridadi	Backfilled	Public works	
			Kipsaina	On use	Public works	Land degradation
			Amuka	On use	Public works	Land degradation
			ADC Katuke	Backfilled	Public works	
			Twiga farm	Backfilled	Public works	
			Molem	Dam (not backfilled)	Public works	Land degradation
			Endebess-Gumo	Backfilled	Public works	
			Kobos	Backfilled	Public works	

			Bwayi	Backfilled	Public works	
			Kolongolo (Kapkoi Pri.)	Backfilled	Public works	
			Kesse primary	Backfilled	Public works	
			Kapkoi (Bondeni Pri.)	Backfilled	Public works	
			Chepchoina ADC	Backfilled	Public works	
			Kapomboi Cyprus	Backfilled	Public works	
			Olngatongo	Not Backfilled	Public works	
			Endebess	Backfilled	Public works	
			Sirende	Backfilled	Public works	
			Wekhoya	Not backfilled	Public works	
			Waitaluk	Backfilled	Public works	
			Mitoni tatu	Backfilled	Public works	
			Big tree	Not backfilled	Public works	
			Birunda	Not backfilled	Public works	

4.5.3 Sand Harvesting

Sand harvesting activities have had a direct impact on the river flows and arable land in the district. This is due to poor harvesting techniques and lack of sand harvesting regulations. The most affected areas falls along river Nzoia around Mois bridge, Moiben River, Ainomaget River and Sabwani (Table 42). Other affected areas are found in Kwanza. There is urgent need to formulate the National regulations to govern exploitation of sand resources.

Table 42: **Method of Extraction**

No.	Source of sand	Method of sand harvesting	Geographical location /name of site	Size of site Ha	Quantity extracted annually	Regulatory agency	Environmental impacts
1	Rivers bank	Extraction of deposits	Mois bridge Noigamet river	Not Known	Unknown	County council	River bank erosion

Key environmental issues

- Land degradation
- River bank erosion
- Open pit/quarries

Proposed interventions

- Rehabilitation of open pits and quarries
- Protection of riverbanks

CHAPTER FIVE

*5.*0 Environmental hazards and disasters

Disasters are unexpected, unplanned and unpredictable occurrences, which cause damage to both human and the natural environment often causing immense negative impacts on the environment.

Most environmental disasters (table 43) in the district are climate /weather related. Disasters can be natural or man made which may lead to destruction of environment (land degradation, life epidemics) and property.
Extend and Trends Of Environmental Disasters and Hazards

Table 43*: Type and Occurrence Trends of Environmental Disasters*

Disaster types	**2000 - 2005**	**Remarks**
Floods	-Namanjalala, Central	High impact
	Waitaluk	Medium impact
	Kipsaina	Medium impact
	Sabwani river banks(Zea)	High impact
	Mitoni Tatu	Low impact
	Nzoia River Bank - Kapsara	Medium impact
Civil Conflict (cattle rustling, land conflict and pasture conflict)	District wide, Kwanza Division Chepchoina, Kapolet, Makutano Location, Kaisagat location, Kaboroa Location	High impact
Land conflict	-Milimani, Kiboroa forest, Kwanza-Endebess Squatters	High impact
	-Wehoya Farm, Chamkei farm, Mucharage Farm, Sinoko farm, Bikeke farm, Gatua Farm, Bwake farm, Kanyarkwat	Medium impact
Human Wildlife Conflict	Areas near forests reserves. Mt Elgon National Park and Saiwa Swamp National Park.	Medium Impact

Pasture conflict	Border locations (Suam, Kimothon, Kapkoi, Sikhendu)	Low impact
Water use conflict	Sibanga, Tuigoin Matumaini, Kachibora	Low impact
Lightening	District wide	Medium impact
Street Children	Kitale Town Centre	High impact
Street families	Kitale Town Centre and Kipsongo	High impact
Illegal brews	Slum pockets, town centres, forest areas, slims,	High impact
	District wide, poorly planned estates	Medium impact
	Industries and factories	Low impact
Transport (Road Accidents)	St. Josephs, Kwa Muthoni, Matunda-Toll-Sikhendu	High impact
	- Line moja (Raia Street), Bikeke, Kesogon Centre	Medium to low Impact
Drought	Kwanza Location, Chepchoina Location	Low impact
Land slides	Milimani, Slopes of Mt. Elgon	High impact
Terrorism	Kitale town	High impact
Oil and Industrial Waste	Eldoret Express Car wash, Jua Kali Shades, Kipsongo, Gas refilling, KCC, Kitale industries, Kenya Seed	High impact
HIV/Aids Disease and orphans	Slums of Trans Nzoia, Kapkoi, Kolongolo, Namanjalala (Falklands), Bosnia, Kitale Town Centre, Gitwamba, Market Centres, Kipsongo, Shimo La Tewa, Tuwan, Matisi, Kibomet	High impact
	Makoy (Mukuyu), Saboti, Maili Saba (Sirende),	Medium Impact
Epidemics (typhoid, Malaria, Measles, meningitis)	Whole district	Medium impact
Livestock (Wild diseases, Rift Valley fever, Rinderpest, Foot and	Whole district	Medium impact

Mouth)		
Pest infestation (GGB/Scania, Worm-ret DAO, Locusts)	Whole district	Medium impact
Wheat's Quail Birds	Sikhendu forest	Medium impact
Deforestation	Mt. Elgon Forest, Kabolet Forest,	Medium impact
	Saboti forest	High impact

plate 14*: A river during flooding season*

Table 44***: Sector Specific Disaster Occurrences and Severity***

Sector	Year 1960 to date	Type of disaster	Number of deaths/ injured		Property damaged	Infrastructure damage	Environmental damage	Severity	Intervention
			People	Animals					
Agriculture	1997	Floods	-	-	Houses, Crops, Livestock	Bridges Roads Telecommunication facilities	Pollution, Erosion, Siltation	Low	Promote appropriate agricultural practices, Regeneration of degraded sites, De-silting of dams, Dyke construction
		Invasive species	-	-	Loss of grazing sites, loss of animal habitats, loss of crop land	-	Colonization, Loss of biodiversity	Medium	Management of invasive species
		Cattle rustling	-	-	Houses torched	-	No peace	High	Conflict resolution, Strengthen security
	1980s	HIV/Aids	-	-	-	-	Loss of human resource,	High	Awareness campaigns
Forestry	-	Frequent	-	-	Vegetation loss,	-	Loss of	Medium	Creation of forest

Sector	Year 1960	Type of disaster	Number of deaths/ injured		Property damaged	Infrastructure damage	Environmental damage	Severity	Intervention
		forest fire outbreaks			habitat destruction, Animal deaths, destruction of property		biodiversity, land degradation		buffer zones, Enhance fire fighting equipment, Discourage burning crop residues during land preparation, Construction of forest fire breaks
Transport	-	Accidents	-	-	-	Slippery roads	Environmental pollution	Low	Proper road maintenance, sensitisation of road users, encourage other modes of transport

Key environmental issues

- Floods
- Civil conflict
- Human- wildlife conflict
- Drought
- Landslides
- HIV/AIDs-Leads to poverty which leads to environment degradation

Proposed interventions

- Reforestation at the catchment areas and along the riparian
- Law enforcement
- Involving communities in wildlife management
- Development of early warning systems
- Promote rain water harvesting technologies
- Fast maturing crops
- Promote drought tolerant crops and livestock
- Promote irrigation
- Increase vegetation cover Development of early warning systems
- Discourage settlements and farming in landslide prone areas
- Relocation to safe sites
- Enhance awareness creation and education
- Promotion of hygienic practices
- Creating awareness
- Enhance afforestation programmes

CHAPTER SIX

6.0 Environmental education and technologies

6.1 Status of Environmental Education

Environmental education plays a significant role to attaining environmental sustainability. Formal institutions in the district have not yet integrated environmental education into their curricula but instead they have aligned their day-to-day programmes in addressing environmental concerns through school going children (Table 45 & Plate 15).

Table 45: **Status of Environmental Programmes in Schools**

No.	No. of schools		Type of environmental programmes	Remarks
	Total	Registered		
1. Primary	156	104	4K Club	Maize Vegetables Beans Cotton Tree nursery Dairy project
2. Secondary	32	-	Young farmers Environmental clubs Geography clubs Wildlife clubs	Maize Beans Vegetables
3.Tertiary	-	-	-	-
4. Out Of School	1,164	-	-	Maize Beans Vegetables Dip management Tree nurseries

Source: District Environment Office, 2005

plate 15: Students during a public clean-up activity

In addition, environmental awareness initiative has been an ongoing initiative (Table 46 & Plate 16)

Table 46: **Status of Environmental Programmes in the District**

Environmental programme	**Key players**	**Challenges**	**Proposed interventions**
Wildlife conservation	CBOs Groups DEO	Fitting into the school programmes Finance	Strengthen Club activities, Field visits
Sustainable agriculture	Teachers CBOs Groups MOA	Lack of capacity Finance Tight school programmes	Encouraging better practices through relevant ministries
Environment and Waste management	MOH DEO SNV	Making the youth to be responsible in a non-committal society Quantity of plastic material produced	Introduce awards Commit relevant authorities
Nile Trans-boundary Environmental Action Project	NBI, DEO, Schools	Still in its inception phase	Support school conservation projects that can be used as teaching aid
Tree planting	Vi Agro forestry project	Poverty, Low farmer income, HIV/AIDS	Home tree nurseries, Group approach, Capacity building
Mt. Elgon Regional Ecosystem Conservation Program	IUCN, EAC, Forest, Agriculture, Livestock and Environment departments	In its inception phase	Community involvement during implementation paramount

plate 16: Members of the public during a public clean-up activity

6.2 Public Awareness and Participation

Table 47: **Status of Environmental Awareness in the District**

Programmes	Key players	Sector	Environmental benefit	Opportunities	Challenges
Waste management	NMK NEMA DPHO KMC SNV	Environment	Cleaner streets and backyards	Younger generation playing a pivotal role Business community support	Eliminating the use of polythene Attitude change
Catchment protection	CBOs NEMA	Social services	Conserved water resources, clean water for community	Indigenous knowledge, Formal groups	Inadequate funds,
Polythene free movement	Public Health department, Schools	Environmental health	Managed polythene and its effects	Level of awareness up, public-CBO participation, Technologies	Inadequate equipment, Inappropriate technology, Inadequate funds
Healthy Environment of Children	Public Health department, Schools,	Environmental health	Disease free environment	Schools and community participation,	Inadequate funds

Programmes	Key players	Sector	Environmental benefit	Opportunities	Challenges
Alliance (HECA)	Community			Technical support	
Clean up programs	NEMA, KMC, Business community, CBOs, Schools	Environmental health	Clean and safe environment	Private community support, Public participation, Technical support	Attitude change, Awareness and Education low
Tree planting campaign	NEMA, DFO, Schools, Scouts, CBOs, NMK, Business community	Environmental conservation	Beautification, Tree cover increase, catchment conservation	Public participation, Tree seedlings available, Trees as source of income	Over reliance on wood fuel, Trees take long to realise benefits

Technologies

There are various technologies being applied to manage the environment in the district. They are in most cases cheap technologies that are easy to apply and be adopted by the potential users. They include the following:

- Recycling of waste – this is in the form of either reuse of plastic waste in producing reusable items or use of bi-products such as charcoal dust in making briquettes to supplement use of pure charcoal.
- Agro forestry is being promoted as an appropriate means to increase farm income and at the same time protect or improve the environment with trees being a basic component.
- Organic farming – in this case, farmers use organically produced fertilizers and crop protection substances in their farming exercise. This is in form of use of organic fertilizers and use of crop-derived chemicals in the control of pests.

6.3 Environmental Information Systems

Types and sources of Environmental Information

The main sources of environmental data and information include international organizations, United Nations bodies, public institutions, civil society, private institutions, government departments, research and academic institutions, established individuals and companies.

The main issues of concern include data sourcing, quality, storage and management, access, dissemination and funding. The major constrains identified include inadequate capacities for access restrictions, collection, analysis, storage facilities, networking and funding.

The district is in the process of developing a database for environmental information through the district environment office. The available information is spread in the various sectors and departments (Table 48, Plates 17 and 18).

Table 48: **Information and Data Types in the District**

Sector	Information types	Form (GIS/-maps/reports/-Electronic/Books)	Institution	Access condition	Users	System of updating
Environment	SoE	Reports	NEMA	Accessible	Developers, students, researchers,	Yearly
	Forest cover	GIS	NEMA, SCC-VI Agro forestry project	Accessible	Students	-
	Wildlife	Reports Maps Books Electronic	KWS Conservancies	Accessible	General	Yearly
Planning	District Development Plans	Books	District Development and Planning office	Accessible	Developers	Every 5 years.
Agriculture	Agricultural, Livestock	Reports	District Agriculture Office	Accessible	Farmers	-
Cultural	Cultural and historical	Artefacts, brochures, exhibitions	National Museums of Kenya (NMK)	Restricted	General public Researchers Students	

Status of Environmental Information Management Systems

Currently, there is no sharing of information between lead agencies. Task forces on various issues are formed for that purpose in order to get some specific information. This includes State of Environment and a task force on other contentious issues in the district.

There is no archive of documentation centre or a library in the district. Some kind of information can be retrieved from various libraries for institutions.

plate 17and plate 18: Public exhibitions on environmental information

There are three daily Newspapers that circulate in the district. Others are monthly or gutter press. The major news dailies include *Nation, Standard, Times* and *People.* The *East African* and *the Leader* are published weekly.

6.4 Indigenous Knowledge

Trans Nzoia being a cosmopolitan district, much of the IK has been lost as many people adopt various cultures from different communities that live in this region. Besides this the younger generation is fast adopting the western culture thus making the IK go with the bearer. Currently, there is no effort towards the conservation or protecting the IK in the district. This is due to the fact that there are many communities that live together in the same locality. In some cases the IK is considered inferior practice and this could be a serous threat to its continuity.

Key environmental issues

- **Poor disposal of polythene papers**
- Inappropriate technology for information dissemination,
- Inadequate funds for programmes
- Attitude change, Awareness and Education low
- Over reliance on wood fuel, Trees take long to realise benefits

Proposed interventions

- Procurement of equipment to facilitate information dissemination
- Fundraise and allocate adequate resources for awareness programmes
- Enhance Collaboration with other stake holders
- Enhance awareness to change peoples attitude towards environmental conservation

Educate the public on multiple use tree species and benefits

CHAPTER SEVEN

7.0 Environmental governance and institutional frameworks

7.1 Status of Governance and Institutional Arrangements

Environmental governance policies and legislations have evolved from important global events such as the United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro, Brazil in 1992. This Conference adopted Agenda 21, a global plan of action to achieve sustainable development. At the National level, the National Environment Action Plan (NEAP) was adopted in 1994 and this led to the enactment of EMCA, 1999.

Implementation of different sectoral acts has an impact on the environment (Table 49)

Table 49: **Policy That Impact on the Environment**

Title of policy	Year of formulation	Aspects of environment addressed by the policy	Implementing agency	Coordinating mechanism	Challenges in the enforcement	Areas of overlap and conflict with EMCA
The physical planning Act Cap 286		Site location	Ministry of Local authority			
The Registration of titles Act Cap 281		Site location	Ministry of lands			
Local Authority By-Laws		Operational licences	Ministry of Local authority			
Water Act 2002		Operational licences	Ministry of Water			
The land control Act Cap 302		Building Code	Ministry of Local Authority			
The public heath Act Cap		Heath and safety	Ministry of Heath			

Title of policy	Year of formulation	Aspects of environment addressed by the policy	Implementing agency	Coordinating mechanism	Challenges in the enforcement	Areas of overlap and conflict with EMCA
242						
Factory and other places of work Act Cap 514		Heath and safety	Ministry of labour			
Company quality and Environment policies.		Health and safety	Ministry of Labour			
Agriculture Act.		Natural resource use	Ministry of Agriculture			
International Labour Organisation Quality standards		Noise	MEMRt/ NEMA			
World Heath organisation quality standards		Radioactive	Ministry of Heath/Radiation Protection Board			

7.2 Regulatory and management Tools

The Kenyan Environmental Law consists of the legislation, standards, regulation, institutions and administration adopted to control activities on environmental management. These include the framework environmental legislation (EMCA 1999), and sectoral legislations. EMCA, 1999 has provided institutional framework for the management of the environment from the national to the district level. At the district there is established the District Environment Committee (DEC) whose function is to responsible for the proper management of the environment and other functions prescribed in EMCA within the district.

Regulatory and Management Arrangements

In the recent past, the following regulatory and management options have been put in place to safeguard against environmental degradation.

1. Environmental Management & Coordination Act, 1999. (EMCA, 1999)

The act provides an appropriate legal and institutional framework for the management of the environment.

2. Environmental Impact Assessment (EIA) Technical Advisory Committee

The Technical Advisory Committee on Environmental Impact Assessment (EIA-TAC) was appointed in may2003. TAC is composed of technical experts from lead agencies and other stakeholders and assists NEMA in the review of EIA and EA reports.TAC was also involved in the preparation of regulation, guidelines and procedures of EIA and EA.

3. State of Environment Report (SoE), 2003

The State of Environment (SoE) 2003 report was the first annual report produced by the Authority. The report provides very important baseline information on the status and condition of the environment throughout Kenya. It also highlights critical issues and concerns within the various environmental sectors. The 2003 SoE report serves as a benchmark for the future assessments. The 2006 SoE report is underway.

4. EIA and Audit Regulations

The Environmental (Impact Assessment and Audit) Regulations were gazetted in June 2003. These Regulations have guided NEMA in reviewing and licensing development activities. The Authority has been receiving and processing applications for EIA licenses since mid 2002.

5. Environmental Impact Assessment/Environmental Audit Experts

As of October 2004, NEMA has already registered more than 200 EIA/EA experts, and the experts were in the process of formulating their code of practice. The Experts Register is available at NEMA.

6. Environmental Standards and Regulations.

At the time of releasing this plan, the Authority was in the process of finalising the formulation environmental standards, regulation and guidelines for the following

thematic areas: water quality; waste management; chemicals, pesticides, toxic substances, ozone layer and radiation; land-use; conservation of biological resources; environmentally significant areas; and environmental economic instruments.

7. Provincial and District Environment committee

The Provincial and District Environment Committees (PECs and DECs) were appointed in 2002 under the chairmanship of provincial and District Commissioners respectively. The committee are responsible for proper management of the environmental in the provinces and district for which they are appointed.

8. Standards and Enforcement Review Committee (SERC)

The Standards and Enforcement Review Committee (SERC) was inaugurated in 2001. SERC us chaired by the Permanent Secretary, Ministry of Environment and Natural Resources and the membership is provided in the first schedule of EMCA. The functions of SERC are to advise the Authority on how to establish criteria, procedures and standards for discharge of effluents into the environment; guidelines and /or regulations for the preservation of fishing areas, aquatic areas, water resources, and reservoirs and other areas where water may need special protection; and to collect, maintain and interpret data from industries and local authorities on the pre-treatment, nature and levels of effluents.

9. National Environment Action Plan Committee

The National Environment Action Plan Committee (NEAPC) was inaugurated in September 2003. The permanent Secretary, Ministry of Planning and National Development chairs NEAPC; membership is listed in the first and third schedules of EMCA The committee is mandated to prepare a national environment action plan every five years for consideration and adoption by parliament.

10. Forest Act 2005, alongside the New Forest policy

A new direction towards forest conservation and management has been put in place. There is a general swift from "the know it all" Departmental Forest management to community participatory approach. Sound and strict protection measures as spelt in the Act to be undertaken including stiff penalties for offender among others. Community forests/local government forests have been given good attention in the Act in the way to

protect them. The forest Act 2005 is also meant to transform the forest department to a Forest Service spear headed by a board of management.

In the recent past too, we have had the following forest activities being regulated or completely curtailed.

- Grazing: Livestock grazing has been controlled completely in forest areas being controlled by land carrying capacity. In some forest areas, the activity has been abolished completely.
- Firewood collection: Collection of firewood is only to be done by institutions like schools, colleges, hospitals etc. No individual firewood collection is allowed in the forest.
- Shamba cultivation: This has been abolished completely and so to village houses.
- Saw milling operations: this has also been abolished and only industries like Pan Paper Webuye and Rai Ply wood Eldoret have been left to operate under certain conditions.

7.3 Multilateral Environmental Agreements (MEAs)

Kenya is a signatory to several multilateral environmental agreements (MEAs) that address several sectors of the environment. Some of the MEAs Kenya has ratified include the Convention on Biodiversity (CBD), UN Convention to Combat Desertification (UNCCD) and the UN Framework Convention on Climate Change (UNFCCC). Other important MEAs include Ramsar Convention, the Montreal Protocol on Substances that Deplete the Ozone Layer, Convention on International Trade on Endangered Species (CITES), Rotterdam Convention on Prior Informed Consent (PIC) and the Stockholm Convention on Persistent Organic Pollutants (POPs). In 2001, a new African initiative on a recovery plan forming part of a New Partnership for African Development (NEPAD) was agreed to by the African Union (AU) Heads of States. This contains an Environmental component. Compliance to these agreements and their prompt domestication determines the extent to which the country benefits from the MEAs.

CHAPTER EIGHT

8.0 Implementation strategy

8.1 Stakeholder involvement

The successful implementation of this plan so as to achieve the desired objectives will entirely depend on the level of participation of the stakeholders (Plate 17.1). It calls for teamwork to achieve the desired results. The stakeholders will ensure that sector specific proposed activities are effectively implemented. In this plan the stakeholders make commitments and are assigned responsibilities on the basis of their respective mandates.

There is need to identify areas of overlap in order to build synergies based on existing programs/projects to bring about environmental sustainability. The list of the stakeholders might not be exhaustive. But the list provided below will give us the picture of the stakeholders working in the district at a glance.

This document may be used to source funds from strategic partners who may have funding provisions in order to implement some of the proposed activities. Some of the potential donors have been listed below.

Identified Stakeholders

- Research institutions (e.g. KARI etc), Lead Agencies, Kitale Museum
- KWS (Kenya Wildlife Services), Kenya Forest Service (KFS)
- KEPHIS, Local Authorities
- Non Governmental Organizations (e.g. SCC/Vi Agro forestry Project, SNV, ITDG etc)
- Kenya Seed Co ltd,ICRAF
- Community Based Organizations (e.g. Kipsaina Cranes Conservation group)
- Local community

plate 19: A stakeholders (involving community representatives, *GoK agencies and NGOs) meeting on the management of Kaisagat Wetlands*

*8.*2 Resource Requirement

To achieve the desired goal, all the relevant implementing institutions shall be required to deliberately allocate adequate resources to various proposed interventions. In areas where funding may be limited, the lead institutions may outsource the funds from relevant institutions. Below are the potential areas these funds may be sourced:

Identified sources of Resources

- Community based resources
- LATF, CDF
- Govt budgetary allocations,
- Donor support (e.g. World Bank, European Union, UNDP)
- Support from NGOs, CBOs, Religious organisations and Private sector
- Nile Basin Initiative, Revenue collection

Table 50: Implementation Plan

No.	Objectives	Activities
1.	To conserve gazetted forest areas	Identify excised and encroached areas Conduct boundary alignment and marking Evict illegal forest settlers Rehabilitate of degraded areas Promote alternative sources of livelihood Environmental education
2.	To have sustainable water resources	Identify and zone out degraded water catchments Gazette Water catchment's areas outside public land Develop and implement participatory management plans Rehabilitate degraded water catchments Protect water catchments Fast tracking formation and implementation of Community Forest Associations, Plant trees in selected areas to increase the forest cover
3.	To minimize human-wildlife conflicts	Conduct awareness campaigns Install and maintain wildlife barriers Identify closed wildlife migratory corridors Reclaim closed migratory corridors

No.	Objectives	Activities
		Promote eco-tourism ventures Problematic animal control Wildlife policy review on human-wildlife conflict
4.	To enhance wildlife habitat	Enhance security patrols in parks Conduct Public awareness and Education Fence off wildlife protected areas Mechanical removal of Invasive species (Lantana camara & Elephant grass
5.	To improve land productivity	Identify & disseminate appropriate agricultural practices and technologies Carry out Field demonstrations on best practices Train farmers and extension officers Conduct exchange visits Create awareness on the use of quality farm input
6.	To minimise land degradation	Construct soil and water conservation structures Introduce minimum tillage on selected farms Introduce appropriate agricultural practices Such as organic farming Plant cover crops
7.	To promote sustainable	Create awareness on safe use of agrochemicals

No.	Objectives	Activities
	agriculture	Soil sampling and classification Train on proper use of chemicals Construct and equip dips as opposed to hand sprays Promote integrated pest management, Crop rotation Promote diversification
No.	**Objectives**	**Activities**
8.	To conserve marginal areas against unsustainable agriculture Improve land fertility	Zone and gazette fragile ecosystems for protection Initiate and support income generating activities Environmental education and awareness programme
9.	To promote good animal husbandry	Train farmers on identified areas e.g. carrying capacity, Rehabilitate degraded areas
10	To enhance livestock health	Train community extension workers Support community veterinary shops Develop early warning system and disease surveillance

No.	Objectives	Activities
		Promote use of Dips Improve livestock breeds
11.	To improve waste management in settled areas	Support recycling, reuse, reduce initiatives Develop and implement council bye-laws Gazette and construct modern solid waste disposal site Construct and expand effluent treatment plants in settled areas Develop and implement physical development plans Train on waste management Support plastic recycling initiatives Supervise disposal hazardous waste EIA for new projects
12.	To minimize disease outbreak due to pollution Water treatment	Support community hygiene and sanitation initiatives Form and train health clubs
13.	To mitigate against the impacts of catchment degradation	Rehabilitate degraded catchments Desilt water bodies (Dams) Public education and awareness, Develop and implement Participatory Catchment Management Plans

No.	Objectives	Activities
		Delineate important water catchments for gazettement and protection
14.	To safeguard the integrity of water systems	Protect Riverbanks of selected rivers through tree planting Gazette and protect main swamps Develop Participatory Wetlands Management Plans Support alternative livelihoods sources Formulate and implement sand harvesting guidelines Fast tract Wetland policy formulation
15.	To minimise environmental pollution from industrial processes	Conduct EIAs & EAs Conduct environmental inspections Conduct environmental education and awareness
16.	To promote alternative sources of clean energy Support and promote alternative sources of energy e.g. biogas, solar, wind	Plant tees to increase cover Support and promote energy saving devises Seek tax waive on alternative energy devises e.g. solar panel, gas, electricity Establish agro forestry farms Re-afforestation and afforestation Education and awareness Establish woodlots for wood fuel

No.	Objectives	Activities
		Develop infrastructure and expand energy sources
17.	To develop mechanisms in detecting disasters and mitigation	Map and document environmental disaster prone areas Develop early warning and rapid response systems
18.	To enhance environmental education in formal and informal institutions	Conduct environmental education in schools and community Conduct environmental exhibitions of best practices Document and disseminate best practices Conduct awareness campaign by participating in environmental events Construct and equip District Environmental Resource centre
19.	To develop a working strategy in enforcing environmental legislation	Train and support the district environment committee Conduct workshops to popularise EMCA, 1999 and related legislation

Table 51: Implementation Matrix

Sector	Priority issues	Objectives	Output	Activities	Time frame	Stakeholders	Budget KShs (Millions)	Responsible institutions
Forestry	Excision and encroachment of forest areas	To conserve gazetted forest areas	Sustainable forest management	Identify excised and encroached areas Conduct boundary alignment and marking Evict illegal forest settlers Rehabilitate of degraded areas Promote alternative sources of livelihood Environmental education	2009-2013	DEC, DAO KWS, Provincial Administration, Police, SCC/Vi AFP NGOs, CBOs Community Forest Users Association	40.0	KFS

Sector	Priority issues	Objectives	Output	Activities	Time frame	Stakeholders	Budget KShs (Millions)	Responsible institutions
	Degradation of water catchment areas	To have sustainable water resources	Conserved water catchments	Identify and zone out degraded water catchments Gazette Water catchment areas outside public land Develop and implement participatory management plans Rehabilitate degraded water catchments Protect water catchments Fast tracking formation and implementation of Community Forest Associations, Plant trees in selected areas to increase the forest cover	2009-2013	DEC KWS, SCC/Vi AFP NGOs, CBOs Community Forest Users Association, Water resource users association, Local authorities	30.0	WRMA, KFS

Sector	Priority issues	Objectives	Output	Activities	Time frame	Stakeholders	Budget KShs (Millions)	Responsible institutions
Wildlife	Human-Wildlife Conflict (Poaching, human deaths, Crop destruction)	To minimize human-wildlife conflicts	Reduced incidences of human-wildlife conflict	Conduct awareness campaigns Install and maintain wildlife barriers Identify closed wildlife migratory corridors Reclaim closed migratory corridors Promote eco-tourism ventures Problematic animal control, Wildlife policy review on human-wildlife conflict,	2009-2013	Wildlife Clubs of Kenya (North Rift), Ministry of Tourism (regional office) DEC, NGOs, CBOs, Local Community,	15.0	KWS Private conservancies

Sector	Priority issues	Objectives	Output	Activities	Time frame	Stakeholders	Budget KShs (Millions)	Responsible institutions
	Decrease of wildlife habitat	To enhance wildlife habitat	Increased wildlife habitat	Enhance security patrols in parks Conduct Public awareness and Education, Fence off wildlife protected areas, Mechanical removal of Invasive species (Lantana camara & Elephant grass)	2009-2013	Wildlife Clubs of Kenya (North Rift), Ministry of Tourism (regional office) DEC, NGOs, CBOs, Local Community	25.0	KWS Private conservancies

Sector	Priority issues	Objectives	Output	Activities	Time frame	Stakeholders	Budget KShs (Millions)	Responsible institutions

Sector	Priority issues	Objectives	Output	Activities	Time frame	Stakeholders	Budget KShs (Millions)	Responsible institutions
Agriculture	Decline in land productivity	To improve land productivity	Increased yield per unit area	Identify & disseminate appropriate agricultural practices and technologies, Carry out Field demonstrations on best practices Train farmers and extension officers Conduct exchange visits Create awareness on the use of quality farm input	2009-2013	KARI, KEPHIS, Moi Universities, Farmers, Seed companies, NEMA, DEC	15.0	DAO
	Land degradation	To minimise land degradation	Conserved land resources	Construct soil and water conservation structures, Introduce minimum tillage on selected farms Introduce appropriate agricultural practices Such as organic farming, Plant cover crops	2009-2013	DEC, Farmers, NGOs, CBOs,	67.0	DAO

Sector	Priority issues	Objectives	Output	Activities	Time frame	Stakeholders	Budget KShs (Millions)	Responsible institutions
	Pollution from agrochemicals	To promote sustainable agriculture	Optimal use of agrochemicals	Create awareness on safe use of agrochemicals, Soil sampling and classification Train on proper use of chemicals, Construct and equip dips as opposed to hand sprays, Promote integrated pest management, Crop rotation, Promote diversification	2009-2013	KARI, KEPHIS, Moi University, Farmers, Seed companies, WRMA, Fertiliser companies,	13.0	DAO
	Opening up new land for agriculture	To conserve marginal areas against unsustainable agriculture	Secured fragile land resources	Improve land fertility, Zone and gazette fragile ecosystems for protection, Initiate and support income generating activities, Environmental education and awareness program	2009-2013	Farmers, CBOs, NGOs, Nzoia County Council, DEC,	10.0	DAO, WRMA

Sector	Priority issues	Objectives	Output	Activities	Time frame	Stakeholders	Budget KShs (Millions)	Responsible institutions
Livestock	Overstocking/ Overgrazing	To promote good animal husbandry	Productive livestock	Train farmers on identified areas e.g. carrying capacity, Rehabilitate degraded areas,	2009-2013	Livestock Farmers, NGOs, DEC	5.0	DLPO
	Frequent livestock disease outbreak	To enhance livestock health	Healthy livestock	Train community extension workers Support community veterinary shops Develop early warning system and disease surveillance, Promote use of Dips and other pest control methods, Improve livestock breeds	2009-2013	KARI, Moi Universities, Farmers, DLPO	7.9	DVO

Sector	Priority issues	Objectives	Output	Activities	Time frame	Stakeholders	Budget KShs (Millions)	Responsible institutions
Human settlement and infrastructure	Poor waste management in settled areas	To improve waste management in settled areas	Improved waste management	Support recycling, reuse, reduce initiatives Develop and implement council bye-laws Gazette and construct modern solid waste disposal site, Construct and expand effluent treatment plants in settled areas, Develop and implement physical development plans, Train on waste management Support plastic recycling initiatives Supervise disposal hazardous waste EIA for new projects	2009-2013	Business community, Private companies, Chamber of Commerce, CBOs, NGOs, Research institutions, Schools, Manor house training institute, Kitale Technical, DEC, NEMA	35.0	Kitale Municipal Council & Nzoia County Council,

Sector	Priority issues	Objectives	Output	Activities	Time frame	Stakeholders	Budget KShs (Millions)	Responsible institutions
		To minimize disease outbreak due to pollution	Reduced incidences of disease outbreak due to pollution	Water treatment and supply, Support community hygiene and sanitation initiatives Form and train health clubs	2009-2013	NZOWASCO, DEC, NGOs, School & Middle level colleges,	4.0	DPHO

Sector	Priority issues	Objectives	Output	Activities	Time frame	Stakeholders	Budget KShs (Millions)	Responsible institutions
Water resources	Destruction of water catchment areas	To mitigate against the impacts of catchment degradation	Improved water catchments	Rehabilitate degraded catchments, Desilt water bodies (Dams), Public education and awareness, Develop and implement Participatory Catchment Management Plans Delineate important water catchments for gazettement and protection	2009-2013	CBOs, NGOs, Local community, DEC, NEMA	56.0	WRMA & KFS

Sector	Priority issues	Objectives	Output	Activities	Time frame	Stakeholders	Budget KShs (Millions)	Responsible institutions
	Destruction of swamps and riverbanks	To safeguard the integrity of water systems	Protected and well managed wetlands	Protect Riverbanks of selected rivers through tree planting, Gazette and protect main swamps, Develop Participatory Wetlands Management Plans, Support alternative livelihoods sources, Formulate and implement sand harvesting guidelines Fast tract Wetland policy formulation	2009-2013	DEC, CBOs, NGOs, Farmers, KFS, Lands department, Surveyors	15.0	WRMA & NEMA

Sector	Priority issues	Objectives	Output	Activities	Time frame	Stakeholders	Budget KShs (Millions)	Responsible institutions
Industry, Trade & Services	Pollution from industrial processes	To minimise environmental pollution from industrial processes	Reduced industrial pollution	Conduct EIAs & EAs Conduct environmental inspections Conduct environmental education and awareness	2009-2013	District Industrial Development Office, Chamber of Commerce, Business community, registered consultants	5.0	NEMA

Sector	Priority issues	Objectives	Output	Activities	Time frame	Stakeholders	Budget KShs (Millions)	Responsible institutions
Energy	Overdependence on wood fuel as source of energy	To promote alternative sources of clean energy	Reduced pressure on wood fuel	Support and promote alternative sources of energy e.g. biogas, solar, wind Plant tees to increase cover Support and promote energy saving devises Seek tax waive on alternative energy devises e.g. solar panel, gas, electricity Establish agro forestry farms Re-afforestation and afforestation, Education and awareness Establish woodlots for wood fuel Develop infrastructure and expand energy	2009-2013	DEC, NGOs, CBOs, SCC-Vi Agro forestry project, Cycle of Light, Business community,	15.0	KFS

Sector	Priority issues	Objectives	Output	Activities	Time frame	Stakeholders	Budget KShs (Millions)	Responsible institutions
Disasters and Hazards	Environmental disaster preparedness and management	To develop mechanisms in detecting disasters and mitigation	Disaster preparedness and management mechanism	Map and document environmental disaster prone areas Develop early warning and rapid response systems	2009-2013	Masinde Muliro University, DEC, NGOs, CBOs, Red Cross, Faith Based Organizations, Local Community	23.0	Disaster Management Committee, NEMA

Sector	Priority issues	Objectives	Output	Activities	Time frame	Stakeholders	Budget KShs (Millions)	Responsible institutions
Environmental Education, Information and Public Participation	Inadequate environmental information and awareness	To enhance environmental education in formal and informal institutions	Increased participation in environmental protection and management initiatives	Conduct environmental education in schools and community, Conduct environmental exhibitions of best practices, Document and disseminate best practices, Conduct awareness campaign by participating in environmental events, Construct and equip District Environmental Resource centre,	2009-2013	Formal Institutions (Schools), CBOs, NGOs, Farmers, DEC	5.0	NEMA

Sector	Priority issues	Objectives	Output	Activities	Time frame	Stakeholders	Budget KShs (Millions)	Responsible institutions
Environmental Governance	Conflicting sectoral legislations	To develop a working strategy in enforcing environmental legislation	Improved environmental governance	Train and support the District Environment Committee, Formation of environment committees and environment clubs Conduct workshops to popularise EMCA, 1999 and related legislations	2009-2013	DEC, CBOs, Business Community, NGOs, Local Community	4.0	NEMA

Table 52: Monitoring and Evaluation

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
Forestry	Excision and encroachment of forest areas	Identify excised and encroached areas	List of excised & encroached areas	Reports, sketch maps, Photos	Quarterly	DFO	KFS
		Conduct boundary alignment and marking	Distance of forest boundary aligned and marked	Reports, Sketch maps	Quarterly	DFO	KFS
		Evict illegal forest settlers	Size of land reclaimed	Reports, Sketch maps, Photos	Half-year	DFO	KFS
		Rehabilitate degraded areas	Acreage rehabilitated	Reports	Yearly	DFO, Sub regional Manager-WRMA, DEO	KFS, NEMA, WRMA
	Degradation of water catchment areas	Identify and zone out degraded water catchments	List of degraded catchment areas identified	Reports, sketch maps, Photos	Quarterly	Sub-regional manager-WRMA, DFO, DEO	KFS, NEMA, WRMA

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
		Gazette Water catchment areas outside public land	Gazetted water catchment areas	Gazette notices, Reports	Yearly	Sub-regional manager-WRMA, DEO, DFO	KFS, NEMA, WRMA
		Develop and implement participatory management plans	Developed participatory Management Plans	Management plans documents, Reports	yearly	Sub-regional manager-WRMA, DEO, DFO	KFS, NEMA, WRMA
		Rehabilitate degraded water catchments	Acreage of area rehabilitated	Reports, Photos	Yearly	DFO, Sub-regional - WRMA	KFS, WRMA
		Protect water catchments	Protected acreage of water catchments	Reports, Photos	Quarterly	Sub-regional Manager – WRMA, DAO, DFO	KFS, WRMA, Min. Agric
		Fast tracking formation and implementation of Community Forest Associations	Formed Community Forest Associations	Reports, Functional Associations	Yearly	DFO, CBOs, Community	KFS
Wildlife	Human-Wildlife Conflict	Conduct awareness campaigns	Awareness forums conducted	Reports,	Quarterly	DEC, KWS, NGOs, CBOs	KWS

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
	(Poaching, human deaths, Crop destruction)	Install and maintain wildlife barriers	Length of barriers installed	Reports	Yearly	KWS, Community	KWS
		Identify closed wildlife migratory corridors	List of closed migratory corridors	Report	Yearly	KWS, Community	KWS
		Reclaim closed migratory corridors	Reclaimed migratory corridors	Reports	Yearly	KWS, Community	KWS
		Promote eco-tourism ventures	Eco-tourism ventures established	Reports,	Yearly	KWS, Community	KWS
		Problematic animal control	Problematic animal controls established	Reports	Quarterly	KWS, Community	KWS
		Wildlife policy review on human-wildlife conflict	Reviewed Wild-life policy in place	Reviewed Policy document	When review is gazetted	KWS	KWS
	Decrease of wildlife habitat	Enhance security patrols in parks	Improved wildlife habitat	Reports	Yearly	KWS, DFO, Community	KWS

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
		Conduct Public awareness and Education,	Awareness and Education forums	Reports	Quarterly	KWS, DFO, DEC	KWS
		Fence off wildlife protected areas	Distance fenced	Reports	Yearly	KWS,	KWS
		Mechanical removal of Invasive species (Lantana camara & Elephant grass)	Acreage rehabilitated	Reports	Yearly	KWS, KFS, Community, DEC	KWS
Agriculture	Decline in land productivity	Identify & disseminate appropriate agricultural practices and technologies,	Dissemination forums	Reports	Quarterly	DEC, DAO, DFO	DAO
		Carry out Field demonstrations on best practices	Field Days	Reports	Quarterly	DEC, CBOs, NGOs, Farmers	DAO

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
		Train farmers and extension officers	Training forums	Reports	Quarterly	DAO, Training institutes	DAO
		Conduct exchange visits	Exchange visits conducted	Reports	Yearly	DAO, Farmers	DAO
		Create awareness on the use of quality farm inputs,	Awareness forums conducted	Reports	Quarterly	DEC, CBOs, NGOs, Farmers	DAO
	Land degradation	Construct soil and water conservation structures,	Soil and water conservation structures constructed	Reports	quarterly	NGOs, CBOs, DAO	DAO
		Introduce minimum tillage on selected farms	No. of farms Introduced	Reports	Quarterly	DAO, NGOs, CBOs, Farmers	DAO

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
		Introduce appropriate agricultural practices such as organic farming,	Appropriate Agricultural Practices in place	Report	Quarterly	NGOs, CBOs Farmers. DAO	DAO
		Plant cover crops	Cover Crops Planted	Reports	quarterly	Farmers	DAO
	Pollution from agrochemicals	Create awareness on safe use of agrochemicals,	Awareness forums conducted	Reports	Quarterly	DAO, Farmers, Agrochemicals industries,	DAO
		Soil sampling and classification	Sampled results of soils	Reports	Annual	DAO, KEPHIS, KARI, Research institutions, Farmers	KARI, KEPHIS

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
		Train on proper use of chemicals,	Training forums held	Reports	Annual	DAO, KEPHIS, KARI, Research institutions, NGOs, CBOs, Farmers	DAO
Agriculture	Pollution from agrochemicals	Construct and equip dips as opposed to hand sprays,	Dip facilities built	Reports	Bi-annual	DVO, DLPO, Farmers, NGOs, CBOs	DVO

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
		Promote integrated pest management, Crop rotation,	Integrated pest management in place	Reports	Annual	DAO, Farmers, Research institutions, KEPHIS, KARI, NGOs, CBOs,	KARI/KEPHIS
	Opening up new land for agriculture	Promote diversification	Increased Diversification	Reports	Annual	DAO, Farmers, NGOs, CBOs,	DAO
		Improve land fertility,	Improved soils/Improved yields	Reports	Annual	DAO, Farmers, CBOs, NGOs	DAO

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
		Zone and gazette fragile ecosystems for protection,	Gazetted areas	Reports	Bi-annual	KFS, WRMA, DEC, CBOs, Farmers	DEC
		Initiate and support income generating activities,	Established income enterprises	Reports	Annual	DAO, DLPO, DSDO, Farmers, Youth groups, Women groups, NGOs, CBOs, Schools	DDO

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
		Environmental education and awareness program	Education and Awareness forums/programs held	Reports, Publicity materials developed, Training manuals developed	Annual	DEC, NGOs, CBOs, Schools, Farmers	NEMA
Livestock	Overstocking/ Overgrazing	Train farmers on identified areas e.g. carrying capacity,	Training forums held	Reports, Publicity materials developed, Training manuals developed	Annual	DAO,NEMA,NGOs CBOs	DAO
		Rehabilitate degraded areas,	Acreage of areas rehabilitated	Reports	Quarterly	DLPO, NGOs, CBOs, Farmers	DLPO

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
Livestock Contd.	Frequent livestock disease outbreak	Train community extension workers	Training forums held	Reports, Publicity materials developed, Training manuals developed	Annual	DLPC, NGOs, CBOs, Schools, Farmers	DLPO
		Support community veterinary shops	No. of veterinary Shops Supported	Reports	Annually	DAO, NGOs, CBOs, Farmers	DVO
		Develop early warning system and disease surveillance,	Early warning systems in place	Reports	yearly	DVO, NGOs, DLPO CBOs, PHO	DVO

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
		Promote use of Dips,	No. of Dips in place	Reports	Yearly	DVO, NGOs, CBOs DLPO	DVO
		Improve livestock breeds	AI services in place	Reports	yearly	DVO, NGOs, CBOs, DPLO	DVO
Human settlement & Infrastructure	Poor waste management in settled areas	Support recycling, reuse, reduce initiatives	Supported Initiatives in place	Reports	Quarterly	DSO, NGOs, CBOs,	DSO
		Develop and implement council bye-laws	By-Law in place	Reports	Quarterly	Nzoia County council and Kitale Municipal council	Nzoia County council and Kitale Municipal council

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
		Gazette and construct modern solid waste disposal sites,	Modern solid waste constructed	Reports	Bi-Annually	Kitale Municipal council and Nzoia County council, Constituency development committees	Kitale Municipal Council, Nzoia County council,

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
		Construct and expand effluent treatment plants in settled areas,	Treatment plant in place	Reports	Quarterly	Kitale Municipal council and Nzoia County council, Constituency Development Water & sewerage companies committees,	Kitale Municipal Council, Nzoia County council, Water & sewerage companies

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
Human settlement & Infrastructure contd.	Poor waste management in settled areas contd.	Develop and implement physical development plans,	Town/urban Development plans in place and implemented	Reports, Plans	Annual	DPPO, Nzoia County council and Kitale Municipal council	DPPO

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
		Train on waste management	Training forums	Reports	Quarterly	NEMA, Nzoia County council and Kitale Municipal council, NGOs, CBOs, Schools, Business community, Private sector	NEMA

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
		Support plastic recycling initiatives	Initiatives supported	Reports	Annual	Schools, CBOs, NGOs, Nzoia County council and Kitale Municipal council, Private sector, Donors	DEC

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
		Supervise disposal hazardous waste	Supervised disposals	Reports	Annual	NEMA, Nzoia County council and Kitale Municipal council, Private sector, Business community	DEC
		EIA for new projects	No. of EIAs conducted	Report	Quarterly	NEMA	NEMA

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
		Water treatment	Treatment plant constructed	Report	Annually	NZOWASCO, LVNWSB, NGOs, CBOs, Nzoia County council and Kitale Municipal council	Lake Victoria North Water services Board
Human settlement & Infrastructure contd.	Poor waste management in settled areas contd.	Support community hygiene and sanitation initiatives	Initiatives supported	Reports	Annually	DPHO, MOH, Religious Based Organizations, CBOs,	DPHO

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
		Form and train health clubs	Health clubs formed and trained	Reports	Annually	DPHO, MOH, Religious Based Organizations, CBOs,	DPHO
Water resources	Destruction of water catchment areas	Rehabilitate degraded catchments	Degraded catchments rehabilitated	Report, photos	Annually	NEMA, NGOs, WRMA	WRMA
		Desilt water bodies (Dams)	Water Bodies Desilted	Reports	Annually	WRMA, NEMA, NGOs	WRMA.
		Public education and awareness	Awareness and Education forums	Reports	Quarterly	KWS, DFO, DEC	WRMA
		Develop and implement Participatory Catchment Management Plans	Participatory management plans developed	Reports	Quarterly	WRMA, NEMA, DEC	WRMA & NEMA

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
		Delineate important water catchments for gazettement and protection	Important catchment Delineated	Reports	Quarterly	WRMA, NEMA, DEC	WRMA & NEMA
Industry, Trade & Services	Pollution from industrial processes	Conduct EIAs & EAs	EIAs and EAs conducted	Reports	Quarterly	DEC, NEMA, Proponents	NEMA
		Conduct environmental inspections	Environmental inspections conducted	Reports	Quarterly	NEMA	NEMA
		Conduct environmental education and awareness	Awareness And Education Forums Conducted	Reports	Quarterly	DFO, NEMA, KWS, NGOs,	NEMA

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
Energy	Overdependence on wood fuel as source of energy	Support and promote alternative sources of energy e.g. biogas, solar, wind	Alternative Source Of Fuel introduced	Reports, photos	Annually	DFO, NEMA, KWS, NGOs,	NEMA
		Plant trees to increase cover	Acreages planted	Reports, photos	Annually	DFO, NEMA, NGOS, CBOs, Schools, Groups	DFO
		Support and promote energy saving devises	Energy saving devises promoted	Report	Annually	DFO, NEMA, NGOS, CBOs, Schools, Groups	DFO

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
		Seek tax waive on alternative energy devises e.g. solar panel, gas, electricity	Tax Waived for alternative energy devices	Reports	Annually		
		Establish agro forestry farms	Agro forestry farms established	Reports	Annually	NGOs, DAO,	DAO
		Re-afforestation and afforestation,	Acreages of Afforested and re-afforested lands	Reports	Annually	DFO, NGOs, NEMA, CBOs, Schools	DFO
		Education and awareness	Awareness and Education forums	Reports	Quarterly	KWS, DFO, DEC	NEMA
		Establish woodlots for wood fuel	Woodlots established	Reports	Quarterly	KWS, DFO, DEC,NGOs	DFO

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
		Develop infrastructure and expand energy sources	Infrastructures developed	Reports	Quarterly	KWS, DFO, DEC,NGOs	DFO
Disasters and Hazards	Environmental disaster preparedness and management	Map and document environmental disaster prone areas	maps and documentation for environmental disaster prone areas	Reports, photos	Annually	NEMA, NGOs, district disaster management	District disaster management
		Develop early warning and rapid response systems	Early warning and response developed	report	Annually	NEMA, district disaster management committee, DEC	District disaster management committee

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
Environmental Education, Information and Public Participation	Inadequate environmental information and awareness	Conduct environmental education in schools and community,	Education And Awareness Forums/Programs Held For Schools And Communities	Reports	Quarterly	NEMA, NGOs, CBOs, PHO	NEMA
		Conduct environmental exhibitions of best practices	No. of Exhibitions held	Reports	Quarterly	NEMA, NGOs, CBOs	NEMA
		Document and disseminate best practices	Established environmental resource centre	Reports	Annually	NEMA, NGOs, CBOs, DAO, DFO, DPHO,	NEMA

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
		Conduct awareness campaign by participating in environmental events	Environmental Events Participated	Report, Photos	Annually	NEMA, NGOs, CBOs, Schools, Groups	NEMA
		Construct and equip District Environmental Resource centre	District Environmental Resource centre built and equipped	Report	Bi-annual	DEC, NGOs, Donors, CDF,	NEMA
Environmental Governance	Conflicting sectoral legislations	Train and support the District Environment Committee,	Training Conducted	Reports	Quarterly	NEMA	NEMA

Sector	Priority issues	Activity	OVIs (Objectively Verifiable Indicators)	MoVs (Means of Verification)	Reporting Schedule	Implementers	Responsible institution
		Formation of environment committees and environment clubs	Local Environment Committees formed Environment clubs formed.	Names of the committee members, number of clubs formed in schools.	Annual	DEC	NEMA
		Conduct workshops to popularise EMCA, 1999 and related legislations	Workshops conducted	Reports	Quarterly	NEMA, DEC	NEMA

ANNEX

DISTRICT ENVIRONMENT ACTION PLAN STEERING COMMITTEE

1. Betty Nzioka – Deputy Director NEMA

Kodia D. Bisia – Provincial Director of Environment nema

2. Francis Mutie- District Commissioner and chairman to the District Environment Committee
3. Dan K. Abasa-District Development Officer and chairman to the DEAP steering Committee
4. Robert R. Kibii- Public Health Officer (member)
5. David Mwangi Ngigi- World Agro forestry centre (member)
6. Peter N'gan'ga Kinyanjui- Kenya Forest Service (member)
7. Maurice Wanjala – Kipsaina Crane/Wetland conservation initiative (member)
8. Isaac M. Mutanyi –Water Resources Management Authority (member)
9. Hebert Were- Ministry of Lands (member)
10. Godfrey W Wafula-NEMA Trans-Nzoia (secretary)
11. Mayama Musala- Ministry of agriculture (member)
12. Felicia W. Ndung'u. Ministry of agriculture (member)
13. Dickson K. Ritan – KWS Mt Elgon
14. David K. Rono – NEMA
15. Anthony Waswa – NEMA