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

SAMBURU DISTRICT ENVIRONMENT ACTION PLAN 2009-2013

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EXECUTIVE SUMMARY

Economic growth and environment are closely intertwined in Kenya. Environmental Action Planning is a tool that aims at enhancing the integration of environment into development planning. Samburu District is not an exception and has to contend with these challenges with some being unique to the District. The DEAP covers 3 Districts Samburu Central, Samburu East and Samburu North curved out of the original Samburu District.

Challenges experienced in the District include poverty that has lead to the over-use and destruction of environment. Continued reliance on trees for fuel has lead to deforestation. Annual flooding continues to destroy lives, property and frustrate livelihood activities.

The DEAP highlights priority themes and activities for the District towards achieving sustainable development. The report is divided into 8 Chapters. Chapter one gives the challenges of sustainable development and also describes the rationale for and preparatory process of the DEAP and presents the district's main profile covering the physical features, demographic, agro-ecological zones, and main environmental issues.

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

Chapter three details the Human settlements and infrastructure in Samburu 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. Chapter four addresses environmental aspects in trade, industry and services sectors. Tourism mining and quarrying is also covered under the chapter. 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, human and livestock diseases, wildfires and invasive species.

Environmental information, networking and technology are discussed in chapter six. It emerges that environmental information and networking technology are not well developed in the district. 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.

Chapter eight describes the implementation matrix for the district. And the element of the implementation matrix gives issue category, problem statement, action needed, stakeholders involved and the time frame.

FOREWORD

The international community recognized the importance of Environmental Action Planning during the Earth summit that was held in Rio de Janeiro in 1992. One of the outcomes of the summit was Agenda 21, a global Environmental Action Plan. The government of Kenya embraced this novel idea when it developed the first National Environment Action Plan (NEAP) in 1994 and anchored its provisions by enacting the Environmental Management and Coordination Act (EMCA) No. 8 of 1999. EMCA provides for the integration of Environmental concerns in national policies, plans, programmes and projects.

In this regard, EMCA, 1999 provides for the formulation of National, Provincial and District Environment Action plans every five years. Environmental Action planning aims at integrating environmental concerns into national development and planning processes. The linkages between environment and development are intertwined and it is only logical to plan for both at the same time. In this respective the Samburu districts DEAP was prepared by DEC in a participatory manner as development and environment planning are not only mutually dependent but complement each other.

Key environmental issues in the district *inter alia* are Deforestation, Soil erosion and overgrazing. Mitigation of these issues requires participatory, multi-sectoral and multi-disciplinaly approaches in aversion of environmental degradation afflicting the district. Re-vegetation of our degraded environments is a priority and a viable solution to these issues.

As 77.5% of the district is classified as a low potential rangeland mainly suitable for (and is under) nomadic pastoralism and is under communal land tenure. Poverty and environment based disasters and resource use conflicts in the district are clear indicators of the dwindling natural resource base.

Diversifications of sources of income which are environment friendly are good options in ensuring a productive environment for sustainable development.

The DEC should devote more of its resources in ensuring this and in particular support the establishment of community conservancies in utilization of natural resource base tourism for maximum benefits given the aridity of the district.

Therefore, it is our sincere hope that the DEAP has captured all environmental issues in the district and developed an implementation, monitoring and evaluation matrix that will guide environmental management in the district for sustainable development.

Dr Ayub Macharia,
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ACKNOWLEDGEMENT

Environment Action Planning is a multi-disciplinary, multi-stakeholder and multi-sectoral participatory process. In this connection, many institutions and individuals have contributed immensely to the preparation of Samburu District DEAP, 2007 – 2011.

I take this opportunity therefore to acknowledge all those who contributed directly or indirectly to the preparation of the DEAP. In particular, I wish to acknowledge the support of the District Environment Committee Samburu and NEMA for financial and material support they accorded in preparation of the Action plan.

The process benefited immensely from the support and guidance of DEC under the chairmanship of District Commissioner – Samburu. In particular, the process gained immensely from the accumulated experience of officers from Lead Agencies, NGO's and other organizations in the district. They gave both technical and hands on support throughout the process.

Further, I wish to express my gratitude to the Samburu DEAP Technical Committee under the chairmanship of District Development Officer for their tireless efforts in the preparation of the plan. Special thanks to Resource Projects Kenya – Samburu for financial support they accorded. Indeed Resource Project Kenya – Samburu sponsored a consultative workshop on prioritization and ranking of identified issues and in development of an implementation, monitoring and evaluation matrix.

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LIST OF ACRONYMS

AEZs	Agro Ecological Zones
AIDS	Acquired Immuno Deficiency Syndrome
ALRMPII	Arid Land Resource Management Project II
ASAL	Arid and Semi Arid Lands
AWF	African wildlife foundation
Cap	Chapter (Laws)
C^{O}	Degrees Celsius
CBOs	Community Based Organization
CCF	Christian Children Fund
CFA	Community Forest Associations
CITES	Convention on International Trade of Endangered Species
CSOs	Civil Society Organizations
DAO	District Agriculture Office
DAP	Di-Ammonium Phosphate
DDP	District Development Plan
DEAP	District Environment Action Plan
DEC	District Environment Committee
DEO	District Education Office
DEO-NEMA	District Environment Officer
DEWS	Drought Early Warning Systems
DFO	District Forestry Office
DLMC	District Livestock Marketing Council
DLPO	District Livestock Production Office
DPHO	District Public Health Office
DSDO	District Social Development Office
DSO	District Statistical Office
DVO	District Veterinary Office
EA	Environmental Audit
EAPs	Environmental Action Plans

EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
ENNDA	Ewaso Ngiro North Development Authority
EW	Earth Watch
EWS	Early Warning Systems
FBOs	Faith Based Organizations
GDP	Gross Domestic Product
GEAP	Global Environmental Action Plan
GOK	Government of Kenya
Ha	Hectares
HIV	Human Immuno Virus
IBA	Important Bird Area
ICIPE	International Centre of Insect Physiology and Ecology
IGAs	Income Generating Activities
IK	Indigenous Knowledge
IL	Intermediate Lowlands
IPR	Intellectual property Rights
ITDG	Intermediate Technology Development Group
IWSP	Interim Water Service Providers
IZ	Indistinct Zones
KEFRI	Kenya Forestry Research Institute
KG	Kilogram
KFS	Kenya Forest Service
KVDA	Kerio Valley Development Authority
KWS	Kenya Wildlife Service
LA	Lead Agencies
LEWS	Livestock Early Warning Systems
LH	Lower Highlands
LM	Lower Midlands
LTS	Liters
MDGs	Millennium Development Goals
M&E	Monitoring and Evaluation

MEAs	Multilateral Environment Agreements
MM	Millimeters
MOA	Ministry of Agriculture
MOH	Ministry of Health
MTC	Maralal Town Council
ND	No Data
NDP	National Development Plan
NEAP	National Environment Action Plan
NEAPC	National Environment Action Plan Committee
NEC	National Environment Council
NEMA	National Environment Management Authority
NEPAD	New Partnership for Africa Development
NES	National Environment Secrétariat
NET	National Environment Tribunal
NGOs	Non-Governmental Organizations
NMK	National Museums of Kenya
NRT	Northern Rangelands Trust
OP	Office of the President
PA	Provincial Administration
P.a	Per annum
PAC	Problem Animal Control
PCC	Public complaints committees
PEAP	Provincial Environment Action Plan
PEC	Provincial Environment Committee
PDE	Provincial Director of Environment
PH	Potential Hydrogen
PRSP	Poverty Reduction Strategy Paper
SERC	Standard and Enforcement Review Committee
RPK	Resource Project Kenya
SCC	Samburu County Council
SD	Sustainable Development
SNR	Samburu National Reserve

SoE	State of Environment Report
SOFEM	Social Forestry Extension Model
SQ	Square
STE	Save The Elephants
SWF	Samburu Wildlife Forum
TDS	Total Dissolved Solids
TZ	Transitional Zones
UM	Upper Midlands
UNCED	United Nations Conference on Environment and Development
WC	Water Closet
WRMA	Water Resource Management Authority
WSB	Water Service Board
WSSD	World Summit on Sustainable Development

CHAPTER ONE

1.0. INTRODUCTION

1.1 Preamble

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

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

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

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.

1.2 The Environmental Action Planning Process

DEAP Methodology

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

Objectives of District Environment Action Plans

The objectives of District Environment Action Planning include the following:

To determine the major environmental issues and challenges facing the districts

To identify environmental management opportunities

To create synergy and harmony in environmental planning

To integrate environmental concerns into social, economic planning and development of the district.

To formulate appropriate environmental management strategies specific to the district

1.3 Challenges of Sustainable Development

Kenya's economy primarily depend on natural resources where over 68% of the population live in rural areas and derive their livelihoods mainly from these resources. Economic

activities derived from the natural resources include agriculture, industry, tourism, energy, water, trade, and mining. The environment and natural resources have in the recent years been under threat due to increased dependence on natural resources to meet basic needs. The situation is aggravated by the rising poverty levels from 42% in 1994 to 56% in 2002 and is currently estimated to be over 62%. The situation is even worse within the rural population. The population growth rate has over time become higher than the economic growth rate hence the pressure on these resources. This has also led to increased in-migration and over-utilization of fragile ecosystems. The immigration into marginal areas from high potential areas has contributed to unsustainable land use practices often resulting to resource use conflicts especially water and pasture.

Poverty often leads to over-use and destruction of the environment where short term development goals and practices are pursued at the expense of long term environmental sustainability. Once the resource base is degraded, poverty is aggravated because the capacity of the resource base to support the same population even with unchanged demand will have diminished. Therefore, there exist a close link between poverty and environment.

Rapid urbanization coupled with increased slum settlements due to rural-urban migration have resulted in urban decay, loss of environmental quality and health deterioration, water pollution, loss of biodiversity and encroachment of fragile ecosystems. In both rural and urban areas, access to safe drinking water and basic sanitation is a critical environmental and health concern. The widespread accumulation of solid wastes and poor disposal of effluents in urban areas is also an environmental hazard culminating in the air and water pollution and increased incidences of respiratory and water borne diseases.

About 88% of Kenya's land area is classified as arid and semi-arid lands (ASALs) which supports over 50% of livestock, about 30% of the population and most wildlife. Climate viability has reduced the capacity of ASALS to support existing and emerging livelihoods thus further aggravating environmental degradation. This is evidenced by increased soil erosion, reduction in pasture and vegetation cover, food insecurity, increased conflicts and insecurity-all contributing to increased poverty.

Prior to the enactment of EMCA 1999, environment management in Kenya mainly focused on administrative boundaries with little regard to trans-boundary and shared resource issues. Consequently, management of these resources has not been adequately addressed, including watersheds, wildlife and mountain ecosystems among others. The challenge is to develop integrated management plans for inter- and intra-district, provinces, regional, national and international boundaries.

Indigenous management systems that are sustainable have largely been disregarded in the recent past leading to environmental deterioration. Sectoral regulatory instruments, which have been used to manage the environment before enactment of EMCA 1999, did not achieve the desired outcomes. This is largely attributed to lack of linkages, sectoral conflicts/ overlaps, resource limitations, inadequate stakeholder involvement hence weak compliance and enforcement.

The challenge of managing environmental resources sustainably calls for the development of integrated management plans and their implementation. Integrated planning enables harmonization of sectoral priorities, stakeholders' involvement and participation, proper programming and budget system.

Section 38 of EMCA, 1999 provides for the preparation of the District, Provincial and National Environment Action plans for every five years.

The Environmental Management and Coordination Act (EMCA) of 1999 provides for the integration of the environment concerns into the national development process. The 9th National Development Plan (2002-2008) states that "The full integration of environmental concerns in development planning process at all levels of decision making remains a challenge to the country, the need to integrate environmental concerns in development activities should be given high priority".

NEMA's Strategic Plan also prioritizes integration of environmental issues into planning process. This is also the flagship of NEMA's performance contracts.

Integrating environmental and social aspects of development into our country's planning process is one of the many challenges that we face today. We must all act now as a matter of urgency to reverse the escalating threats to our environment. This is crucial because poverty reduction is primarily dependent on proper environmental and natural resources management. Food security, energy production, industrial raw materials, tourism, shelter, e.t.c. are dependent on environmental resources.

Agenda 21 covers the broad field of sustainable development, offers objectives, targets, strategies and activities that, if implemented would make our world a better place to live in. During the World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa in September 2002, Governments reaffirmed their commitments to the principles of sustainable development as a priority concern in the international agenda by focusing on reducing the incidences of poverty, unsustainable consumption and production patterns and enhancing environmental protection.

The Government of Kenya is committed to the achievement of the broader goals of sustainable development stated in Agenda 21, the millennium Development Declaration and the World Summit on Sustainable Development (WSSD). The Government's commitment to environmental protection and sustainable use of natural resources is well articulated in the economic strategy paper on wealth and employment creation (2003-2007) and the current National Development Plan (2002-2005).

Poverty is a major challenge to the goals of sustainable development. Sound environmental and natural resources management should contribute to poverty reduction, food security ad sustainable livelihoods, enhanced environmental quality and health, promotion of sustainable energy production, minimization of pollution and waste, improvement of shelter and habitats, promotion of eco-tourism and improved standards of living.

The country is currently implementing the MDGs, which are commitments that the country has made at the international level.

The objectives of MDGs have been integral parts of independent Kenya's development agenda. The MDG's aim is to enhance people's daily livelihoods. They focus on renewed commitment to improve the well being of our people. It is on this basis that MDG's need to be mainstreamed within the planning framework at all levels. The MDG No.7: Ensuring environmental sustainability is indeed relevant in the environmental action plan process. This goal has three targets viz;

a) Integrate principles of SD into the country's policies and programmes.
b) Reverse the loss of environmental resources and the proportion of people without sustainable access to safe drinking water.
c) Achieve significant improvement in the lives of at least 10 million slum dwellers by 2020.

The targets of this goal are to halve by the year 2015. These targets have seven corresponding indicators:

a) Proportion of the land area covered by forest
b) Land area protected to maintain biological diversity
c) GDP per unit energy use
d) Carbon dioxide emissions (per capita)
e) Proportion of people with access to an improved water source.
f) Proportion of people with access to improved water sanitation.
g) Proportion of people with access to secure tenure

Generally there exist pertinent linkages between Environmental Action Planning and other national processes such as the State of Environment reporting; Economic Recovery Strategy for Wealth creation and Employment; Vision 2030/ MTP; National Development planning; District Development planning; Poverty Reduction Strategy Paper; sectoral strategies and plans; Multilateral Environment Agreements and their domestication processes; Millennium Development Goals; New Partnership for Africa Development (NEPAD); Regional Corporation; International Conferences; Johannesburg plan of implementation; Agenda 21; commission for sustainable Development; Sustainable development Indicators.

Environmental protection, conservation and management is key to these processes and their highlights on integration of environmental concerns to planning and development endeavor's in all these process whether at District or national level is the recognition of the role environment plays in sustained lives/ livelihoods thus sustainable development.

1.4 District Profile

Geographical Location, Size and Administrative Units

Samburu District is situated in the northern half of the Rift valley Province. Five (5) districts in the Rift Valley and Eastern Province border it. To the northwest is Turkana, south west is Baringo and south is Laikipia. Marsabit district is to the northeast and Isiolo to the east. The district lies between latitudes 0^0 40' north and 2^0 50' north of the Equator and longitude 36^0 20' east and 38^0 10' east of the prime meridian. It lies within the semi-arid areas of the country. The total area of the District is approximately 21, 126.5 km^2 (including 3,288 $km^{2)}$ of Government gazetted forests and 170 km^2 under game reserves and sanctuary and 1.8 km^2 under surface water (Table 1).

Table 1: Administrative units by division

Division	Area (km^2)	No. of locations	No. of sub- locations
Wamba	5,143.40	8	19
Baragoi	4,078.40	7	17
Loroki	1,351.2	6	17
Nyiro	2,927.6	6	16
Waso	4,998.3	4	10
Kirisia	2,627.90	8	29
Total	**21,126.50**	**39**	**108**

Source: *DDP, 2002-2008, Samburu*

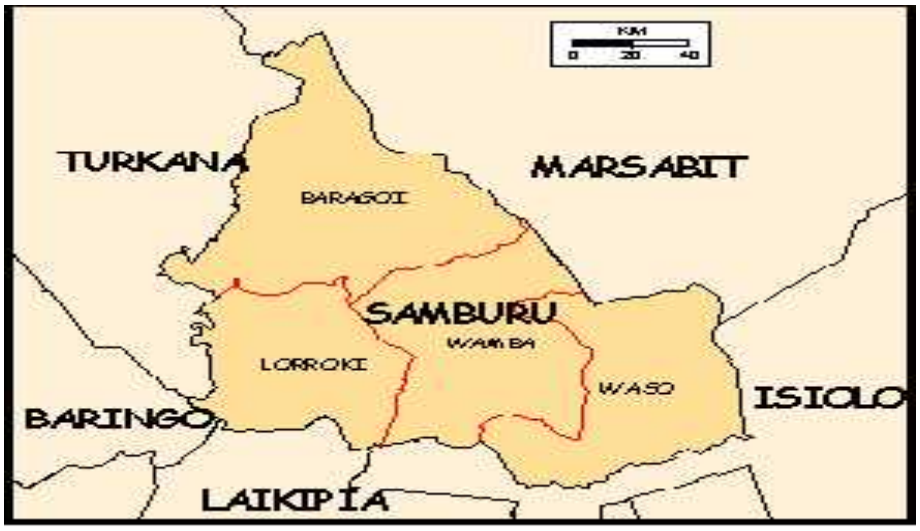
There are two (2) local Authorities in the district-Maralal Town Council and Samburu County Council. Further the district is divided into two constituencies namely: Samburu West and Samburu East (Figure 2.1).

Climate and Physical Features

Samburu District lies on the northern interface between highlands and lowlands. To extreme west is Suguta Valley which is bounded on both sides by fault escarpments and floored by red clays, boulders and gravel fans. Valley floor frequently flooded during the rainy season but occupied and affected by wind action during the dry season. The valley was originally part of Lake Turkana as evidenced by beach terraces. East of Suguta Valley, the district is characterized by repeated extensive high level plateaus which have been built by repeated floods of lava from the Rift valley. The highest parts of these plateaus are the kirisia hill, rising to 2000m above sea level. The erosion of lava fields has produced only a thin mantle of soils, the lava flow remaining as rough sheets with boulders sheets devoid of vegetation and useless for any imaginable agricultural activities, in the near future.

North of Baragoi and between Tuum and South –Horr, the area rises to Mt Nyiro tapers northwards and falls steeply southwards. South and west of Mt Nyiro are peneplains which have been eroded to plains of lower levels ranging from 1000-1,350 m above sea level. These are noticeable at Kawap and the area between Lodungokwe and Wamba continuing eastwards and southwards. These plains are covered by red soils and sands derived from the adjacent slopes by sheet erosion.

Figure 1: Samburu District Administrative Boundaries



Source: *www.aridlands.go.ke*

East of the central plains are the Mathew Ranges and the Ndoto mountains forming discontinuous ranges tending nearly north-south on the eastern side of the district. Apart from the Lorroki plateau and the mountain ranges of Nyiro and Mathews, the rest of the district is a continuous basin which slopes northwards to L.Turkana and east of Mathew Ranges. The high altitude of the plateau and the mountain ranges has resulted in indigenous forests which are all gazetted and preserved for rain catchments. Apart from occasional and controlled grazing during droughts periods, no commercial exploitation is permitted. The slopes on the plateau and mountain ranges have been reduced into gravel or shallow stony soils with conspicuous rocky outcrops.

The surface run off from the slopes has created numerous dry river beds in the central basin which are quite dangerous to transportation during rains. The central basin has therefore been subjected to severe erosion and the area has only been able to support savannah type of vegetation dominated by acacia trees and tuffs of grass.

Soils: The district is predominantly covered by sandy loam soils. The distribution and development is influenced by topography, rock types and vegetation cover among other factors. The volcanic hills on Lorroki plateau are covered by shallow dark to dark brown rocky and stony soils especially to the north. In the south west and high altitude areas where rainfall is above 600mm per annum the soils are comparatively deep.
Kirisia Division is predominantly covered by sandy loam and sandy clay soils, mostly lithosol (shall stoney soils) and cambisols. In the areas covered by lithosols water run-off is common and erosion quite prevalent.

Lorroki Division is predominantly covered by sandy loam soils. The soils are mostly well-drained phaezems. However some parts of the Division is covered by shallow lithosols, including the surrounding of Suguta Marmar where the risk of flooding is classified as medium. The lithic phase of the soils encourages run-off during periods of high precipitation.

Baragoi division and Nyiro are predominantly covered by boulders cambisols and lithosol. The soils are particularly more stony and rocky on the southern slopes of Mt Nyiro and Ndoto mountains. These soils are shallow and have a lithic (stony) phase, a characteristics that makes the soils prone to run off.

The eastern parts of the district which covers Wamba and Waso divisions is predominantly covered by weakly developed soils, mostly sandy and low in organic matter and in some places in Waso Division the soils are saline and sodic (mostly cambisols and solonetz).

Ecological zones: Lower Highlands (LH2-LH4) , lower highlands zone V(LH5,upper midland (UM4-UM6) ,lower midlands zone V-VI (LM5-LM6), lower midland zone VII (LM7) , intermediate lowlands (IL7) and indistinct zones/transitional zones.

Major drainage: The district fall in drainage areas No2 (Kerio Valley) and No 5 (Ewaso Nyiro). Main water sources in the district constitute surface and ground water. It shares one permanent river-Ewaso Nyiro, with other districts and other rivers/streams are seasonal. 1.8km^2 of the district is under surface water.

Vegetation types: Evergreen forests, evergreen bush land, evergreen to semi-deciduous bush land/thicket, evergreen shrub land, semi-deciduous grassland, deciduous bush land , deciduous bush grassland, deciduous shrub land, deciduous shrub grassland, deciduous shrub annual grasslands, dwarf shrub grassland and grassland.

Table 2: Land Areas Covered by Forests and Protected to Maintain Biological Diversity

Land area	Ha	Sq km	Remarks
Gazetted forest	328,806.50	3,288	Grazing pressure
Game reserve	16,500.00	165	Degraded/Human activities
Animal sanctuary	500.00	5	Degraded/human activities
Total	**345,806.50**	**3458**	

Source: *DFO, MTC, SCC records, 2006*

Climate: Tropical. Temperature are 24^0c (minimum), 33^0c (maximum) and 29^0c (mean), rains are bimodal-April-June (long rains), October –December (short rains) and range from 250mm-1250mm p.a.

Population Size and Distribution

Table 3: Population Projection by Sex and Age

	1999		2001		2003		2005	
Age cohorts	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
0-4	13,513	13,821	14,713	14,323	15,669	15,225	16,688	16,248
5-9	11,503	11,782	12,524	12,211	13,339	13,004	14,206	13,850
10-14	9,909	9,760	10,789	10,105	11,491	10,762	12,238	11,462
15-19	8,177	8,166	8,903	8,457	9,482	9,007	10,098	9,594
20-24	5,059	6,411	5,508	6,782	5,866	7,224	6,247	7,165
25-29	4,782	6,111	5,206	6,316	5,545	6,727	5,905	7,165
30-34	3,049	3,648	3,320	3,747	3,536	3,991	3,766	4,249
35-39	2,564	3,410	2,792	3,507	2,973	3,735	3,167	3,978
40-44	2,495	3,189	2,716	3,276	2,893	3,488	3,081	3,715
45-49	1,940	2,009	2,113	2,035	2,250	2,168	2,396	2,309
50-54	1,732	1,928	1,886	1,955	2,009	2,082	2,140	2,217
55-59	1,455	1,337	1,584	1,336	1,687	1,422	1,797	1,514
60-64	970	954	1,056	941	1,125	1,002	1,198	1,067
65-69	832	948	905	939	964	999	1,027	1,064
70-74	485	716	528	855	562	911	599	969
75-79	277	491	302	620	321	661	342	704
80 and over	554	649	604	779	643	830	685	883
Totals	**69,296**	**75,329**	**75,449**	**78,184**	**80,355**	**83,268**	**85,580**	**88,682**

Source: *Samburu District PRSP Consultation Report (2001 – 2004)*

Table 4: Population Size and Distribution

Division	1979		1989		1999		2005	
	No	Density	No	Density	No	Density	No	Density
Kirisia	18,780	7	29,865	11	48,072	18	56, 734	22
Lorroki	15,973	12	19,695	15	25,571	19	30,179	22
Nyiro	2,899	4	10,384	4	15,551	5	18,353	6
Baragoi	10,492	3	20,497	5	19,884	5	23,467	6
Wamba	15,143	3	20,387	4	24,155	5	28,507	6
Waso	3,621	1	8,056	2	10,314	2	12,173	2
Samburu (total)	**76,908**	**4**	**108,884**	**5**	**143,547**	**7**	**169,413**	**8**

Source: *District Statistical Office –Samburu, 2006*

Table 5: Population Distribution by Gender (District)

1979		**1989**		**1999**		**2005**	
Males	Females	Males	Females	Males	Females	Males	Females
36,992	39,916	53,472	55,412	69,378	74,169	81,898	87,535

Source: *District Statistical Office –Samburu, 2006*

Table 6: Mortality Trends (1989-1999 census)

Infant mortality rate		50.8/1000
Under 5 years mortality rate		92/1000
Crude birth rate		52.1/1000
Crude death rate		9.3/1000
Life expectancy	Males	58.9
	Females	63.4
Average		60.7

Source: *DSO –Samburu*

Table 7: Populations in Towns (1999)

Town	Population
Maralal	24,502
Baragoi	4,345
Archers Post	3,966
Wamba	3,950
Suguta Marmar	1,367
Kisima	580

Source: *District Statistical Office-Samburu*

Social ,Cultural and Economic Characteristics

Poverty levels: Samburu east 40%; Samburu west, 50%

Poverty Distribution: Urban, rural. Cattle rustling and drought, gender, educational attainment affecting distribution

Main types of livelihoods: Livestock, agriculture and trade

Cultural artifacts and traits: Blacksmiths (Tools and spear making), shelter (wood and bark, grass, mud made), fencing (branches), bead works and wood carving. Indicative of natural resources exploitations, tourism and defence (hunting mechanisms)

Language: Multi-ethnic, dominant is Samburu coupled with Kiswahili and English

Religion: Christianity, Islam, and Traditional

Institutions: formal and informal (Traditional)

Indigenous Knowledge: Ethno botany –herbal medicine: for human and livestock, astronomy in weather and disaster forecast.

Land use types: Nomadic pastoralism (77.7%),

Agriculture: (7%) and conservation forestry (15.5%)

Tourism: In all the three land use types.

Main economic activities: Livestock keeping, crop growing and trade.

Key impacts are environmental degradation, wastes and pollution.

Poverty and environment: The poor over-exploit natural resources to meet their needs for instance charcoal burning, sand harvesting, illegal logging and quarrying for hardcore and ballast are activities commonly engaged by the poor, cattle rustling and drought as causal

factors of poverty and leads to migrations to protected areas increasing pressure on the available resources.

CHAPTER TWO

2.0 ENVIRONMENT AND NATURAL RESOURCES

2.1 Soils and Land Use

Land is the basic natural resource as it forms the basis for the country's socio-economic development. It supports agriculture, livestock, forestry and wildlife.

With increasing population, poverty levels and demand for the resources, instances of over exploitation and degradation of natural resources are common.

Soils

Soil is one of the most important non-renewable natural resource that supports life on earth. In Kenya, soil resources are especially significant because of the importance of agriculture to the country and the mounting pressures upon land constantly making this resource even more valuable. Soils in Kenya are classified based on their inherent fertility.

The district is predominantly covered by sandy loam soils. The distribution and development is influenced by topography, rock types and vegetation cover among other factors. The volcanic hills on the Lorroki plateau are covered by shallow dark to dark brown rocky and stoney soils especially to the North. In the South west and high altitude areas where rainfall is above 600mm per annum the soils are comparatively deep.

Kirisia Division is predominantly covered by sandy loam and sandy clay soils, mostly lithosols (shallow stoney soils) and cambisols. In areas covered by lithosols water run-off is common and erosion quite prevalent.

Lorroki division is predominantly covered by sandy loam soils. The soils are mostly well-drained phaezems. However, some parts of the Division is covered by shallow lithosols, including the surrounding of Suguta Marmar where the risk of flooding is classified as medium. The lithic phase of the soils encourages run-off during periods of high precipitation.

Baragoi division and Nyiro are predominantly covered by bouldery cambisols and lithosols. The soils are particularly more stoney and rocky on the southern slopes of Mt. Nyiro and

Ndoto mountains. These soils are shallow and have a lithic (stoney) phase, a characteristic that makes the soils prone to run off. The eastern parts of the district which covers Wamba and Waso divisions is predominantly covered by weakly developed soils, mostly sandy and low in organic matter and in some places in Waso Division the soils are saline and sodic (mostly cambisols and solonetz).

Uses of Soils

The soils in the district have varying levels of fertility, depth and drainage and generally support a fragile ecosystem, except for the Lorroki plateau where the soils are relatively deep and well-drained suitable for farming. This area is classified as medium to high potential agricultural area.

Soil Management

Many parts of the district is covered by undulating slopes, with shallow soils that are prone to degradation through erosion. Soil management aimed at conserving the natural resources targets through control of gullies created by run-off from the slopes of land and erosion in cultivated farms.

The Ministry of Agriculture has a component on conservation of natural resource base for Agriculture; likewise the Arid Lands Resource Management project has a component on natural resource management. Facilitation of the two needs to be improved and sustained.

Key Environmental Issues

- Development of gullies in many hot spots in the district resulting in serious soil and water movement.
- Run off quite common during the rainy season and in some cases resulting in flooding particularly in Maralal town and Suguta Marmar.
- Environmental degradation arising from overgrazing of the rangelands.

Proposed Interventions

- Proper soil and water conservation in erosion hot spots.
- Community empowerment through community natural resource management committees needs be strengthened and sustained.

- Areas highly prone to flooding need focused interventions to manage the flood water through check-dams, cut-off drains and water pans need to be designed as appropriate. This needs stakeholders' participation in order to harness all the available local resources.
- Rehabilitation efforts in overgrazed rangelands through reseeding, re-vegetation and communities constant awareness on the need to observe proper stocking rates for all groups of livestock.

Table 8: Distribution, use and Degradation Status of the major soil Types

Types of soil	Characteristics	Distribution km^2	% coverage	Potential use	Current use	Degradation hazard	Proposed interventions
1: sandy loams lithosols, cambisols, xerosol	Shallow depths (rock underneath	2,980	14	Food crops dairy	Some food crops Free range grazing	Run off High erosion	Run off catching techniques
2:sandy clay loams (luvisols, solonelz)	Sandy soils with some clay portion, fully developed soil	5030	24	Food crops Cash crops Dairy Sheep	Food crops free range grazing	High	Intensive sustainable agriculture including agro forestry and water harvesting
3: sandy soil low in organic matter	Sand coarse low in organic matter	9500	45	Rangeland for browsing	Free range livestock grazing	Very high	Proper stocking rates
4:Bouldery cambisols and nitosols	Poorly developed stoney soils	3600	17	Goat rearing wildlife	Goat Rearing Wildlife	High	Grazing management schemes

Source: *District Agriculture office-Samburu, 2006*

2.2 Land and Land Use Changes

Extent of Land Surface

Samburu district covers a total land surface of 21,126.5 km^2 (21,127km^2) and more than three quarters (77.5%) is a low potential rangeland receiving between 250-600mm of rainfall per annum.

Types and Status of Land Use

Land use: Low potential rangelands, covering 77.5% of total land surface is largely found in Waso, Wamba and Nyiro Divisions where land is held under communal tenure and group ranch tenure systems. In this rangelands land use is dominated by nomadic pastoralism. The district has about 140,900Ha (7%) medium to high potential land suitable for agriculture. This land is in Kirisia and Lorroki divisions which receive between 600-900mm of rainfall per annum. 6,000 Ha is currently cultivated and put under wheat, barley, maize, beans, some fruits and vegetables. Gazzeted indigenous forests cover 15.5% (3,288km^2)

Trends in Land Use

Land-use low potential rangelands, covering 77.5% of total land surfaces is largely found in Waso, Wamba and Nyiro divisions where land is held under communal tenure and ranch tenure systems. In this rangelands land use is dominated by nomadic pastoralism. The district has about 140,900Ha (7%) medium to potential land suitable for agriculture. This land is in Kirisia and Lorroki divisions which receive between 600-900 mm of rainfall per annum 6,000 Ha is currently cultivated and put under wheat, barley, maize, beans, some fruits and vegetables. Land use in the lowland rangelands which form about 77.5% of the district area is under nomadic pastoralism. In the rangelands, land is owned by group ranches /communally and will continue to be so for quite some time. The zone under cultivation is slowly expanding and dairy farming is also picking up.

Impacts of Land Use Changes

Communal land ownership in the rangelands presents the challenge of overgrazing and its resultant environmental degradation effects.

In the highland areas, as more land is put under cultivation, vegetation cover is reduced and soils exposed to erosion agents. This shift necessitates deliberate efforts to encourage agro forestry and other soil and water conservation measures.

Land Administration

Most of the land in the district is held under group ranches where each ranch elects its leaders. Individual land parcels in the district are very few.

Environmental Issues on Land and Land Use

- Increasing population, leading to an increased demand for utilization of natural resources such as timber, fuel wood and charcoal
- Overgrazing of the rangelands resulting in environmental degradation
- Encroachment for grazing of gazetted forests.

Agro-ecological zone	Potential land use	Current land use	Location (Divisions)	Extent (HA)	Constraints	Interventions
1: lower highlands (LH2-LH4)	Wheat Maize Barley Pyrethrum Cattle Sheep	Wheat maize barley Cattle sheep	Kirisia Lorroki Parts of Nyiro and Baragoi	272,431	Erratic rains	Drought tolerant crops water harvesting techniques
2:Lower highland zone V	Ranching Wildlife	Nomadic Pastoralism	Kirisia Lorroki	69,076	Human wildlife conflicts	Wildlife conservancy groups
3:upper midlands (UM4-UM6)	Maize Sunflower Livestock Sorghum	Maize Livestock	Kirisia Lorroki Parts of Baragoi	184,416	Erratic rains Human wildlife conflicts	-Drought tolerant crops. - Soil & water conservation -wildlife conservancy
4:Lower midlands zone V-VI(LM5-LM6)	Livestock Millet Ranching wildlife Forestry	Livestock Wildlife Forestry	Baragoi Nyiro Wamba	884,933	Erratic rains	Protection of springs and catchments areas
5: Lower Midland Zone VIII(LM7)	Pastoral nomadism (beef cattle)	Nomadic pastoralism	Parts of Baragoi and Nyiro	106,111	Water deficit	Protection of springs Underground water abstractions
6:Intermediate lowland (IL7)	Nomadic pastoralism Wildlife	Nomadic pastoralism wildlife	Nyiro Waso	511,280	-do-	-do-
7: Indistinct zones/transitional zones	-	-	-	84,453	-	-

Table 9: Land Use Potentials (*Source:* ***DAO –Samburu, 2006)***

Table 10: Extent and Distribution of Soil Erosion

State	Extent (HA)	% of total district area	Geographical Areas of Occurrence	Proposed interventions
Severely damaged	430,500	20	Hilly areas low potential areas	Afforestation reseeding Resting leading to natural regeneration controlled grazing Forest fires prevention
Moderate	177,720	8	Farming areas of the plateau low lands	Conservation measures when opening up new land Gulley control measures
Less severe	177,120	8.4	In the highlands and forest areas	Controlled tree harvesting Controlled grazing

Source: *DAO –Samburu, 2006*

Key Environmental Issues

- Erratic rainfall
- Soil erosion
- Human-wildlife conflicts
- Water deficit
- Land degradation, Overgrazing
- Forest fires
- Illegal logging
- Run off and floods
- Encroachment of gazetted forests and game reserves/sanctuary for grazing

Proposed interventions

- Reforestation
- Enhance soil and water conservation structures
- Protection of forest areas
- Equip the forest stations with fire fighting equipment
- Controlled logging

2.3 Dry lands

Samburu district as a whole is classified as being semi-arid to arid, though it has very small pockets of dry sub- humid conditions in the ecological zones LH2 to LH4. Small scale and large scale farming is found in the sub-humid areas found in the highlands –LH2 to LH4.

Livestock production is the main economic activity in the district. Animals kept include beef cattle, camels, sheep and goats. There is potential for commercial fishing at Lake Turkana not yet exploited mainly because Samburu customs discourage fish eating.

Forest exploitation in the district is mainly confined to collection of firewood, poles and timber and the main tree species include: *Juniperus procera* (red pencil cedar), *Podocarpus falcantus* (podo) and *Olea africana* (Elgon Olive).

Wildlife is also one of the districts most important resources. The district has one of the highest wildlife populations outside protected areas in the country, with an estimated 350 species of birds and 79 species of mammals.

Land classification

Samburu district can be broadly classified into four distinct ecological zones (Table 11)

Table 11: Ecological zones and area in Km^2

No.	Zone	Area (Km^2)
1	Lower Highlands (LH2-LH5)	3,215 .6
2	Upper Midlands (UM4-7)	2,218.5
3	Lower Midlands (LM5-7)	13,736.02
4	Intermediate Lowlands (IL7)	1,956.9
	Total	21,127.0

Source: *DAO-Samburu, 2006*

Status of land use

Currently 77.5%of the total land area of 21,126.5 km^2 is utilized as rangelands for livestock and wildlife. Gazetted indigenous forests cover 15.5% (3,288 km^2) of the district. Small scale and large scale farming is practiced in the highland areas of Kirisia and Lorroki division in an area of about 60km^2 (6,000Ha)out of the 1,400km^2(140,900Ha) of arable land.

Land Tenure System

Most of the land in the district is communally owned except for a few land parcels in Kirisia and Lorroki where individuals have leasehold titles.

Major Causes of Land Degradation

- Overgrazing of rangelands
- Exploitation of forests for wood and non-wood products
- Sand mining and open cast mining of precious stones
- Occasional forest fires
- Unchecked erosion creating gullies and floods in some pockets
- Un-terraced farms in the highlands

Table 12: Land Use Systems

Ecological Zone	Land Tenure	Land Type	Use	% of District Area	Constraints	Proposed Intervention
1. Lower highlands (LH2-LH5)	-Mainly communal -small portion -individual land	Arable Highlands	-food crops -cash crops Livestock keeping	15	-Erratic rains -overgrazing	-water conservation harvesting -proper stocking rates
2. Upper Midland (UM4-UM7)	Mostly communal small portion with individual land parcels	Midland, some parts arable	Cereals (maize livestock keeping) Cattle Sheep Goats	10.5	Overgrazing human-wildlife conflicts Erratic rains	-advocacy on proper stocking rates Conservancy Water and soil conservation
3. Lower midlands (LM5-LM7)	communal	Non-arable midlands	Pastoral nomadism Wildlife forestry	65	Overgrazing water deficit	-do-
4.intermidiate Lowlands (IL 7)	Group ranches	Non-arable lowlands	Pastoral nomadism wildlife	9.5	Low precipitation Humans wildlife conflicts	Wildlife conservancy

Source: *DAO-Samburu, 2006*

The ecologically fragile ecosystems are mostly found in the lower midland zones where existing institutions on natural resource management have in the past formed natural

resource management committees in order to build the capacity of the locals in the management of this fragile ecosystem.

Key environmental issues

- Environmental degradation due to overgrazing
- Huge gullies in ecologically fragile spots
- Chemical pollution of water and soils
- Deforestation of private/community forests

Proposed interventions

- Advocacy on proper stocking rates
- Destocking
- Conservation of catchments areas.
- rerouting water to natural water ways
- Dams construction
- Capacity building of communities on safety in chemical use
- Reafforestation
- Advocacy on energy saving devices

2.4 Agriculture, Livestock and Fisheries

2.4.1 Agriculture

Samburu district has a total land area of 140, 900Ha (1400km^2) medium to high potentials land which receive 600mm – 900mm of rainfall per annum. The land is under group ranches with only a few people owning individual parcels with title deeds. About 6, 000 ha (60km2) of land is currently being cultivated half of which cereals (wheat, barley and maize) are produced under mono cropping systems. The rest of the cultivated land is utilized for mixed farming and inter cropping (maize/beans, potatoes, vegetables, fruits).

The remaining land of the vast district is utilized predominantly for free-range nomadic pastoralism (77.5%) where cattle, camels, sheep and goats are reared.

Types of Agriculture Systems

There are various systems of agriculture according to the existing Agro-ecological zones in the district. These include:

- Medium scale farmers that grow wheat, barley and maize mainly for cash found in the LH2 – LH4, AEZS.
- Subsistence mixed farming whereby farmers grow maize for home consumption and at the same time keeps livestock UM4 –UM6, AEZ.
- Nomadic pastoralism whereby farmers keep moving with the animals in search of pastures.

Area Coverage (HA)

The area covered by the above agricultural activities totals to 525, 923 ha.

Status and Trends of Agricultural Development

The district has about 140, 900 Ha medium to high potential land suitable for agriculture. These areas receive 600mm – 900mm of rainfall per annum. Currently about 6, 000 ha is under cultivation of wheat, barley, maize, beans and a few horticultural crops.

The forest cover totals to 15.5% of the district land surface, while 77.5% is under nomadic pastoralism and is mostly rangelands owned by group ranches or communally. This will remain so for a long period since there are no plans of subdivisions of the same.

Regulatory and Management Arrangements

Most of the land is owned communally or under group ranches whereby they have a management committee or council of elders, which makes decisions on the use, and regulations of the land under their jurisdiction.

Key Environmental Issues

- Severe soil erosion due to overgrazing of the rangelands leading to decreased vegetation cover and hence environmental degradation.
- Lack of willingness by farmers to practice soil conservation measures and water harvesting technologies and agro – forestry aggravates the issue.
- Increased demand for utilization of natural resources e.g. timber, fuel wood, charcoal, sand and stones due to increase in human population.
- Deep, wide gulley.

Proposed Interventions

- Empower the communities to control overgrazing and deforestation through community Natural Resource Management Committees
- Capacity building and facilitation.
- Alternative construction and fencing materials to be used instead of Cedar and Podo to curb tree felling.
- Intensive sustainable agriculture and proper tillage methods to avoid soil erosion.
- Issuance of title deeds to the agro pastoralist farmers in the District in order to encourage farmers adopt appropriate technologies

Table 13: Types and Status of Farming Systems

Types of farming systems	Extent (Ha)	Distribution % of total	Location division	Agriculture production	Kg/ha status	Challenge	Proposed intervention
1: large scale farming	272, 431	15	Kirisia Lorroki Parts of Baragoi Nyiro	Wheat Barley Maize	3600 3600 1620	Erratic rains	Drought tolerant crops Water harvesting
2: Small scale mixed farming	69, 076	10.5	Kirisia Lorroki	Maize Beans Horticultural crops	1620 360 8mt/ha	Over grazing Conflicts Crops - animals Erratic rains	Proper stocking Water conservation
3: Nomadic pastoralism	Above 983, 000	62	Baragoi Nyiro Wamba	Beef animals		Over grazing Human wildlife conflict	Wildlife conservancy

***Source**: DAO-SAMBURU,2006*

2.4.2 Pollutions, Wastes and Degradation Associated With Agriculture

Types of pollutants

1. Herbicides – used to control broad-leafed weeds at a rate of 1.4 liters per hectare in the wheat/barley farms in Lorroki plateau.
2. Fertilizers – DAP commonly used in the planting of wheat and barley at a rate of 150kg/ha.

3. Fungicides and insecticides – are other agrochemicals used in the wheat/barley production at an average rate of 1.5 litres/ha.
4. All these are obtained from stocks in Laikipia and Nakuru district

Agro-chemicals pollution occurs as a result of some residues of the chemicals being washed away through run-off into water reservoirs or grazing land.

Status and Trends

Fertilizers and agro-chemicals which are the major sources of agro-based waste and pollution have been mainly used in the highlands of Lorroki and Kirisia where wheat and barley is grown in large scale. However, the area under these crops especially wheat has declined in the recent past due to the withdrawal by one of the major large scale farmers who moved out of the district consequently the use of the agrochemicals and fertilizers have reduced marketing problems due to poor infrastructure and lack of machinery exacerbates the decline. Area under barley has slightly improved due to ready markets provided by Kenya Breweries Limited (KBL) that is currently contracting some farmers to grow the crop.

Impacts of Pollutants and Wastes

These were mainly realized in water pollution though to a very small extent and land pollution which was to a bigger extent as vegetation cover is still very minimal even after the land lying fallow for a couple of years.

Regulatory and Institutional Arrangements

Enforcement and capacity building on safe and effective use of agro-chemicals. Enhanced soil and water conservation in enhancement of seepage rather than runoff (terracing).

Key Environmental Issues

- Land and water pollution-chemical pollution
- Invasive weeds/pests
- Land degradation

Proposed Interventions/Mitigations

- Safe and effective use of agro-chemicals to be enforced through trainings.
- Terracing and maintaining the soil conservation structures in the farms to avoid runoff hence encourage seepage
- Proper agronomic practices.

2.5 Livestock

Types of Livestock Production Systems

Livestock kept in the district are mainly cattle, sheep, goats, camels and beekeeping.

- Pastoral nomadism
- Sedentary agro-pastoralism
- Beekeeping

Area Coverage (Ha)

Ninety per cent of the district is under range land where pastoralism is practiced approximately 19,014km^2 (1,901,400Ha).

Key Environmental Issues

- Land degradation due to overgrazing
- Bushfires arising from honey hunting/gathering
- Soil erosion as a result of overgrazing.

Proposed Interventions

- Controlled grazing
- Off-takes to reduce herd size
- Modern beekeeping technologies

Table 14: Types and Status of Livestock Production Systems

Types	Extent (Ha)	Distribution % of total	Location	Livestock products	Current production level	Potential production level	Challenge	Proposed intervention
Cattle	Free range	Free range	Whole district	Meat milk hides	170,362kg 1440910 Liters	1,857,289kg 189,125Ltrs	Diseases marketing value of products small mature size	Up grading streamlining marketing. adding value to milk and hides
Sheep	Free range	Free range	Whole district	Mutton Skins	78957 232999	754564 45740	-do-	-do-
Goat	Free range	Free range	Whole district	Chevon Skins	222633 39928	867317 52565	-do-	-do-
Camels	-do-	-do-	-do-	Meat	60300	243585	-do-	Improve and utilize the draught power. Increase production
Bee keeping	3150	15	-do-	Crude Honey Refined honey wax	172,104kg	710496kg 497348 kg 21315kg	Marketing value addition production system	Modern bee keeping. Streamline marketing

Source: *District Livestock Production Office, 2006*

2.5.1 Pollution and Wastes in Livestock Production

Livestock pollutants are mainly from acaricides and so dipping waste is drained to water sources. Pastoralists often use hand pumps and the spraying of livestock is normally done near water sources. Dips remain the only way out because health hazard are taken care of when building them.

Table 15**: Priority Issues and Interventions**

Issue	**Current intervention**	**Proposed intervention 2006-2010**	**Responsible institutions**	**Remarks**
Land degradation	Off take through livestock marketing controlled grazing	Improvement of market, natural resource conservation	Ministry of livestock production, forest department, NGOs	
Bush fires	Natural resource management, modern beekeeping, awareness creation	Improving natural resource management, modern beekeeping	Ministry of livestock production, forest department, NGOs	
Chemicals pollution	Awareness creation on chemical handling	Livestock production, management, enhanced revitalization of dipping methods	Livestock Ministry Veterinary department	

Source: *DLPO, 2005*

2.6 Fisheries Resources

There is potential for commercial fishing at Lake Turkana not yet exploited mainly because Samburu customs discourage fish eating.

2.7 Water Resources

Kenya has been classified as a water deficit area yet water is vital for the sustenance of all life. Adequate quantity and quality of water is recognized as a basic requirement for economic growth.

Water is a major limiting factor in the district. This is mainly due to:

- Poor and unreliable rainfall distribution
- District undulating topography
- High evaporation rate and type of soil which compact forming hard pans that encourage heavy run-off i.e. sealing effect during rains

The district fall in drainage areas No.2 –Kerio Valley and No. 5-EwasoNyiro. For river water quality, total dissolved solid (TDS) is high while PH is around neutral.

Key Water Sources

- Ground water reservoirs-Low potential thus borehole
- Average Yield is 4-8m3/hr,3 boreholes have yields of more than 14m3/hr.
- Spring sources-Available only in the mountains/hills of Ngiro, Ndoto/Mathew. Also in wetlands of Suguta Marmar and Kirimun in Lorroki Division.
- Shallow wells-are spread in laggas mainly in low lands, however points have not been method developed, communities dig shallow wells that are not installed with hand pumps.
- Rainwater-Harvest of rainwater is not well endowed as the district is in ASAL where rains are sparse/ erratic.
- Rivers and lakes-2 perennial rivers though not resourceful. Lake Logipi and Turkana in the northern tip of the district and have little impact on our water resources though mainly used by livestock.
- Wetlands are 3 in number

Status and Trends of Water Resources

The district is water scarce. Laggas and boreholes are recharged during wet season. During dry seasons these sources recedes drastically and a few potential water points get crowded.

Main Water uses

Domestic use for human and livestock. Wildlife, fishing and micro-irrigation in South-Horr and Tuum using spring water.

Regulatory and management arrangement

Use of Ministry of water and irrigation law and subsidiaries (water Act, 2002) and water supplies management by laws and regulation.

Access: 35% of the population has access to safe drinking potable water. Impact of water use and demand on the environment and natural resources is high, i.e.

- Soil erosion precipitates high siltation.
- Degradation of water catchments by livestock in search of water.
- Water resources are highly depleted and polluted by influx of nomadic pastoral communities into water points especially during dry spell.
- Digging up shallow wells along potential laggas during dry spells leaves gapping holes during rain seasons.

Key Environmental issues in management and utilization of water resources

- Conflicts on water points are common especially in pasture areas.
- Community's capacity to purchase water is low and thus heightens use of unclean water.
- Despondency by communities on management of water resources is notable.

Proposed Interventions

- Ground water exploration and drilling more boreholes
- Improving potential shallow wells and installation of hand pump

- Construction of sufficient cattle troughs and providing communal water points for human needs.
- Improving floodwater harvesting by constructing conservation structures.

2.8 Biodiversity Conservation

Both forests and wildlife as key components of biodiversity are under immense pressure from human activities coupled with escalating levels of land degradation. Destruction and deforestation of hill tops, hill slopes and wet lands are endangering the remnant biological diversity of these areas. Major vegetation type: Evergreen forest, bush land, semi deciduous bush land/thickets, grassland, and shrubs.

Table 16: Species Conservation Status

Sector	Species	Conservation Status
Forest	*Juniperus procera* (cedar)	• Threatened in trust land • Vulnerable in gazetted
	Podocarpus falcatus(podo)	• Threatened in trust land • Vulnerable in gazetted
	Olea Africana (African Olive)	• Rare in trust lands • Threatened in gazetted
Wildlife	Grevy zebra	Threatened /endangered
	Cheetah	Threatened
	Lion	Rare
	Wild dog	Rare
	Leopard	Rare
	Somali Ostrich	Vulnerable
	Elephant	Threatened
	Buffalo	Threatened
	Hyena	Rare
	Birds	Vulnerable
	Kudus	Endangered
	Giraffe	Rare

Source: *DFO, KWS, Samburu - 2005*

Key Environmental Issues

- Threats to endangered and rare species
- Dwindling biological base
- Land degradation

Proposed interventions

Increased surveillance to protect rare species

Protection of habitat and ecosystem

Enhance land conservation and proper land management

Table 17**: Types and Status of Biological Resources**

Ecosystem	**Location and size**	**Key species**	**Threats**	**Rare**	**Threatened or endangered**	**Vulnerable**	**Proposed intervention**
Gazetted forest	Whole district 3,288 sqkm	*Juniperus procera*	Die back / biological rotation, Illegal logging		X	X	Prohibiting human activities
		Olea Africana	Lopping, Pollarding, fuel wood exploitation		X		Prohibiting human activities
		Podocarpus falcatus	Illegal logging		X	X	Prohibiting human activities
Private community district	Whole district	*Juniperus procera*	Die back, Illegal logging	X	X		Awareness creation
		Olea Africana	Lopping, Pollarding, fuel, logging	X			Awareness creation
		Podocarpus falcatus	Illegal logging	X	X		Awareness creation
Wildlife areas	Various conservancies	Grey Zebra	Disease		x		Grey Zebra research
		Cheetah	Diminishing range	x			Reopen safeguard dispersal areas

Source: *DFO, KWS, Samburu, 2005*

Table 18: Prioritized Issues and Intervention

Issues /challenges	**Current intervention**	**Proposed intervention**	**Responsible institution**	**Remarks**
1.Threat to endangered species	Research treatment Law enforcement	-Implementation of research finding/treatment -Law enforcement	KWS Earth watch AWF Forest department	
Threat to rare species	Law enforcement	-Legislation to restore dispersal areas, land use planning, Document policy	KWS Local authorities Physical planning Forest department	
Deforestation	Law enforcement awareness	Law enforcement Tree planting awareness	KWS Local authorities Forest department communities	

Source: *KWS, 2005*

Table 19: Type, Status and Impact of Invasive Species

Name Scientific	Common / English	Local	Ecosystem affected	Size (HA)	Environmental impact	Proposed intervention
(a)Exotics 1.*Prosopis juliflora* (shrub to tree)	Mesquite	Mathenge	Whole district Rivers/streams Water Reservoirs Urban areas		Loss of biodiversity Water and soil depletion Injuries	Eradication Alternative species mapping
2.*Opuntia exultata* (fencing) succulent shrub	Chola	Lkurasi	Urban areas Roads		Loss of biodiversity Encroachment Spiny hence injurious	Eradication Alternative species Mapping By laws
3.*Caeselpinia decapetala* (fencing) (Climber)	Mauritius thorn		Rivers		Suppresses other plant Spreads and block water ways	Eradication Alternative species
(b)indigenous 1.*Duosperma elemophilum*(herb)		Lkuryanto	Whole district pasture land	20% of district	Out competes other pastures (indicator of land degradation)	Range reseeding Range Rehabilitation
2.*Sanseveria* species succulent herb colonizer of		Ndupai	Whole district degraded areas			Range rehabilitation

degraded areas						
3. *Acacia reficien* (bush encroacher)		Lchurai Lnyeperuai	Whole district semi-desert			Eradication Range rehabilitation

Source: SoE, 2004, SAMBURU

2.9 Forestry and Wildlife Resources

2.9. 1 Forestry

There are two types of forests in the district, namely:

- Gazetted forest all indigenous covering 328,806.5 HA (15.5% of the total district area)
- Trust land.

Status and trends of forest resources: The status of the forest in the gazetted forest is good though illegal cutting and removal of Cedar for posts and Olea for firewood has taken place in some spots. Grazing pressure is also notable.

In the trust land, most Cedar, Olea and Podo have been cut and removed due to the high demand for firewood and timber. Pollarding and lopping is also a problem.

Regulatory and management arrangement Cap 385 of the laws of Kenya exploitation is not allowed as the forests are indigenous and acts as water/rain catchments. However, in trust land, group ranches and private farms conservation strategies have to be put in place so as the communities can have sustainable use of their forests.

Exploitation of Forest Resources

- Timber-none save for illegal logging for cedar posts in gazetted forest but more in trust lands / group ranches.
- Excessive lopping of Olea species is also notable.
- Non timber-Aloe used to be collected by the local people but at present it is under ban.

- Gum Arabica, frankincense collected by the local is in a significant scale along with medicinal herbs/nuts/resins/gums.

Table 20: Types and Status of Forest

Type	Extent (Ha)	Distribution % of total	Location	Forest uses	Gazetted	Under trust land	Private land	% Degradation	Intervention
Natural (Gazetted)	3288 06.5	15.5	Whole district	Various	Good	-	-	10 - 30	-Tree planting -Awareness creation -Forest patrol
County (Trustland)	-	-	Whole district	Various	-	Good	-	40	-Tree planting -Management committee
Individual	-	-	Whole district	Various	-	-	Good	30	-Tree planting -Management committee

Source: *DFO, Local Authorities' Records, 2005*

Key Environmental Issues

- Fires-Highly dangerous agent of forest destruction caused by human either with or without the knowledge of the person setting the fires.
- Illegal grazing. These cause overgrazing leading to degradation of the land.
- Herders lop or pollard trees to feed their livestock leading to deforestation
- Illegal settlements
- Forestry – wildlife conflicts in Wamba and Samburu National Reserve.

Proposed Interventions

- Enrichment planting.
- Awareness creation and rising.
- Forest patrol.
- Protect *Acacia elatoir* and other Acacia species.

2.9.2 Wildlife Resources

Types of wildlife and areas under wildlife

The district is home to the following wildlife, Elephants, grevy/common Zebra, buffaloes, impala, Thompsons/grants gazelle, giraffe, lion, leopard, hyena, wild dogs, Somali ostrich and beisa Oryx.

Birds include sand grouse, yellow necked spur fowl, helmeted guinea fowl, vulturine guinea fowl, partridges, pigeons and doves.

Most wildlife concentration are found in Samburu east and parts of Samburu west primarily in areas around Kirisia forest, Maralal and area adjacent to Laikipia boundary.

Status and Trends

Wildlife within the district has increasingly been put under pressure over the years. The effects of this are that there are fewer animals today than five years ago .This decline cuts across the board and affects all species of wildlife.

Areas such as Barsaloi, Baragoi, Latakweny, Morijo, Masikita and South Horr species are now depleted of any kind of wildlife. In other areas where animals are still found have been drastically reduced.

Regulatory and Management Arrangements

The wildlife found in the district are free ranging and not confined by fences. Most are migratory, making use of corridors and dispersal area seasonally. Management inputs are therefore almost nil although KWS as the organ mandated with conservation of wildlife undertakes disease control and treatment and also census and translocation when necessary.

In cases of human/wildlife conflicts PAC is used as a mitigating tool. Activities involving all wildlife species are governed by CAP376 (revised)of the wildlife Act. A wildlife policy is in the pipeline and when completed will offer further guideline on wildlife management.

Table 21: Types and Status of Wildlife Areas

Type of wildlife area	**Extent (HA)**	**%District area**	**Location**	**Wildlife uses**	**Status Protected Gazetted**	**Under Trust Land**	**Threat**	**Proposed intervention**
Namunyak wildlife Conservation trust	-	-	Wamba Samburu east	Tourism	Group ranch	Group ranch	Livestock	Awareness Controlled grazing
Kalama conservancy	-	-	Archers Samburu east	Tourism	Group ranch	Group ranch	Livestock grazing	
Samburu game reserve	16500	0.8	Samburu east	Tourism	Gazetted		Livestock degradation	Boundary marking Enforcement
Maralal sanctuary	500	0.00024	Maralal	Tourism Educati	Gazetted		Human activities degradation	Management plan ,Law enforcement, sensitization

				on research				
Sera conservancy	-	-	Samburu east	Tourism	Group ranch	Group ranch	Human activities degradation	Management plan ,Law enforcement, sensitization
West gate	-	-	Samburu east	Tourism	Group ranch		Human activities degradation	Management plan ,Law enforcement, sensitization
Kichich camp	-	-	Samburu east	Tourism	Gazetted forest	Gazetted forest	Human activities degradation	Management plan ,Law enforcement, sensitization
Latakweny Sanctuary	-	-	Baragoi	Tourism	Group ranch	Group ranch	Human activities degradation Fires	Management plan ,Law enforcement, sensitization

Source: *KWS, Samburu, 2005*

Exploitation of Wildlife Resources

i) Consumptive-currently there is no consumptive use of wildlife .This was suspended several years ago after the quota system was abused in some areas. The policy in place was found to be inadequate in addressing the issue of exploitation. Bird shooting as a consumption use was only recently suspended as a precautionary measure against the spreading of the virulent avian flu.

ii) Non –consumptive-This is widespread in the district and takes the form of wildlife tourism. Leading is the Samburu Game Reserves which is managed by the county council. Over the past ten (10) years a proliferation of community conservancies have sprung up having their roots mainly in the eastern part of the district. In addition to these there are also private camps whose tourist visitation is based on wildlife

Key Environmental Issues

- Declining wildlife number
- Threats to endangered Grevy Zebra and cheetah
- Blockage of migratory routes/corridors
- Extinction of Rhinos from the district
- Reduced range (dispersal areas)
- Destruction of wildlife habitats.

Proposed Interventions

- Identification and opening up and preservation of migratory routes, corridors.
- Safeguarding dispersal areas
- Protection of habitats
- Land use planning
- Awareness creation and education
- Law enforcement
- Research on carrying capacity for livestock and wildlife.
- Census

CHAPTER THREE

3.0 HUMAN SETTLEMENT AND INFRASTRUCTURE

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

3.1 Human Settlement and Planning

Table 22: Land Tenure System and Area (Ha) in the District

Tenure Type	1960	1970	1980	1990	2000	2005
Leasehold	-	-	-	-	-	-
Freehold	-	-	-	-	-	-
Trust land	-	-	-	-	-	-
Gazetted forest	328,806.5	328,806.5	328,806.5	328,806.5	328,806	328,806
Ungazetted forest	-	-	-	-	-	-
National park	-	-	-	-	-	-
National reserve	-	16500	16500	16,500	16,500	16,500
Animal sanctuary	>500	>500	>500	500	500	500
County council	-	-	-	-	-	-
Other GOK land	-	-	-	-	-	-
Wetland	-	-	-	-	-	-
Lake	-	-	-	-	-	-

Sources: *DFO, Samburu, Local Authorities Records.*

In Samburu District Land is held under the following tenure systems:

- Private/individual
- Communal(Trust land, group ranches)
- Public/ Government

Table 23: Land suitability and type of use in (Ha)

No.	Use	Area (Ha)
1.	Agricultural	1,439, 200
2.	Forests	328,800
3.	Surface water	180
4.	Game reserve	16,500
5.	Animal sanctuary	500
6.	Township	66,000
7.	Other (Steep, institutions, roads, military-restricted)	261,900

Land holding sizes range from smallest (50mx100m) to 6, 000 acres (group ranches)

Human and Environmental Health

Common diseases influenced by environmental factors:

- Malaria
- Skin infection
- Diarrhoea
- Eye and ear infection
- Intestinal worms

Note: Status and trend are on the increase.

1 Intervention Measures

- Treatment
- Health education

- Inspection to improve sanitation

3.2 Pollution and Waste Generated from Human Settlements

Sources of land pollution include:

a) Solid waste-polythene/plastics, garbage, empty bottles, waste foods, human and animal wastes, agro chemicals.
b) Liquid wastes-waste water
c) Air –Bonfires, dust, exhaust fumes, noise from generators and religious trumpets

Sources of Wastes

a) Solid –markets, garages, households, lab, hotels and hospitals
b) Effluent-waste water from households and institution
c) Gaseous- smoke fumes and dust
d) Toxic/hazardous-Military waste(un-detonated bombs and spent cartridges and sharps)

Major type of wastes in Samburu is solid waste and is more profound in urban centres. Effluent and gaseous waste is, however, minimal in the district.

Key environmental issues

- Prevalence of diseases
- Increased medical costs
- Lower scenic beauty of the environment
- Incidences of rodents
- Unsightly
- Public irritant-foul smell

Proposed Intervention

- Provision of waste management receptacles
- Health education
- Community mobilization on proper waste management

- Routine inspection on sanitation

3.3 Communication Networks

Transport facilities. Total kilometers of roads is 1, 434.3km (earth and murram) 5airstrips and 10 number of public service vehicles.

Communication: Data on telephone connections and mobile service coverage not available, Safaricom and Celtel as mobile service providers, one post office and 3 sub-posts, number of telephone booths not available.

3.4 Social Economic Services and Infrastructure in the district

Water

Table 3.3: Major sources of water and their numbers

No.	Source	Number
1.	Boreholes	63
2.	Springs	13
3.	Rock catchments	2
4.	Sand dams	5
5.	Wells	300
6.	Earth dams	2
7.	Dams and pans	54
8.	River	2
9.	Lake	1

Proportion of people accessing portable and clean water

- Access by time and distance 35%

Major sources of water pollution in the district

a) Farm herbicides-chemical pollution.
b) Wildlife and livestock waste
c) Soil erosion
d) Human waste disposal (traces of ecoli, bacillary dysentery and salmonella typhi)

Interventions

- Expansion of water points by drilling more boreholes, construction of sub-surface, sand dams, rock catchments and shallow wells
- Provision of sanitation and sensitizing communities to construct more pits latrines.

3.5 Energy Supply

Table 3.4: Sources of Energy Supply

No.	Source	No. of Households	%
1.	Firewood	20,979	85.9
2.	Charcoal	2,393.5	9.8
3.	Paraffin	561.8	2.3
4.	Others-Solar • -Electricity • -Gas	488.5	2.0

Sources: *District statistical office (1990-93 records)*

Key Environmental impacts

- Exploitation of hardwoods for charcoal burning in trust lands and protected areas.
- Bush/ forest fires.
- Degradation of the affected forest sites.

Proposed Interventions

- Promotion of alternative sources of energy.
- Tree planting on farm.
- Awareness creation.

3.6 Sanitation

Proportion of People with Sanitation Facilities

i. Pit latrines 20.5%coverage
ii. Water closet-no data available
iii. Sewer reticulation-only in Wamba referral hospital

Table 3.5: Percentage of Households with Access to Water and Sanitation Services

Water						Sanitation				
Piped	Borehole	Well	River	Lake	Other	Connected to sewer	WC	Pit latrine	Flying toilets	Other
13.2	7.4	45.5	21.8	0.5	4.3	0.7	0.6	18.7	ND	0.4

Source: *District Statistical Office –Samburu*

Where:WC = Water closet and ND = No data

Key impacts of poor sanitation on the environment

- Diseases prevalence
- Insect vectors and rodents infestation
- Contamination of water
- Increased cost of collection and transportation of refuse to disposal site

Proposed Interventions

- Health education
- Community mobilization in enhancement of sanitation
- Routine inspection on sanitation

3.7 Health Facilities

Private clinics	7
Dispensaries	36
Health centers	6
Hospitals	2

Doctor patient ratio: 1:76,600 (DDP, 2002-2008)

Key environmental impacts where health facilities are inaccessible

- Deaths and poor disposal of wastes
- Diseases prevalence

Proposed Interventions

- Access roads
- Establishment of more health facilities with modern waste disposal facilities
- Mobile clinics and health education

3.8 Educational Facilities

Table 24: Number of Educational facilities in the District

No.	Sector	Tertiary	Secondary	Primary	Pre-primary
1.	Public	0	9	125	251
2.	Private	2	5	5	4
3.	Total	2	14	130	255

Source: *District Education office –Samburu, 2006*

Table 25: Percentage of School-going Age by Gender and Teacher Pupils Ratio

Level	%			Teacher - Pupil Ratio
	Boys	Girls	Total /Average	
Secondary	17.2	10.18	13.7	1:20
Primary	66.07	47.48	58.03	!:38
Per-primary(ECD)	51.3	47.7	49.5	1:39

ECD-Early Childhood Development

Source: *DEO, Samburu, 2006*

Table 26: School Enrolment

No.	Level	Boys	Girls	Total
1.	Primary	17567	12229	29,796
2.	Secondary	1,500	870	2,370
3.	ESC/ Pre - primary	7,952	7,298	15,250

Note: Retention to completion rate of pupils in the district is **45.3%**

Table 27: Environmental Challenges and Interventions

No.	Challenge	Interventions
1	Increased Enrolment	Increase/expansion of facilities
2.	Early marriages	Rescue homes/centers
3.	Poverty	proposals on income generating activities e.g. bee keeping, kitchen gardens, school shamba, cattle, goats, sheep and camel rearing
4.	Orphan (HIV/AIDS)	• Establishment of children homes • Rescue homes/centers for street children
5.	Initiations	Sensitizations and community mobilization to limit initiation periods to holidays
6.	Negative Attitude to education	• community sensitizations and mobilized on importance of education • Role models used to instill confidence in the community
7.	Pastoralism	• Establishment of boarding schools • -Mobile schools (Wamba, Waso)
8.	Illiteracy	Out of school programs
9.	Gullying /soil erosion/land degradation	• Re-vegetation • Windbreaks • Soil conservation structures

Source: *DEO Samburu, 2006*

3.9 Energy Sector

Kenya relies on two forms of energy namely; renewable and non-renewable. The raw materials for energy include biomass, fossil, fuel and radioactive minerals. Other sources of energy include hydro, geothermal, solar and wind. The Government recognizes that alternative renewable energy sources hold tremendous potentials, especially for reducing heavy dependence on woody biomass. Exploitation of these energy sources creates

opportunities for income and employment generation, both of which have a positive impact on improving the quality of life while reducing poverty.

Table 28: Sources of Energy Supply

Source	No. of Households	%
Firewood	20,979	85.9
Charcoal	2,393.5	9.8
Paraffin	561.8	2.3
Other (solar, Electricity, Gas)	488.5	2.0

Source: *District Statistical Office (1990-93 records)*

Key Environmental issues

- Exploitation of hardwoods for charcoal burning in trust lands and protected areas.
- Bush/forest fires
- Degradation of the affected forest sites

Proposed Interventions

- Promotion of alternative sources of energy.
- Tree planting on-farm
- Awareness creation.

Table 29: Intervention Matrix

Prioritized issue	Current intervention	Proposed intervention 2006-2010	Remarks
Bush fires	Awareness	Awareness	
Degradation	Conservation	Conservation	
Use of hard woods	Energy Saving	Alternative sources/Species	

Source: *DFO, 2005*

CHAPTER FOUR

4.0 INDUSTRY, TRADE AND SERVICES

Industries, trade and services can benefit a lot by adopting environmental management systems that only address production processes but also promote waste minimization, treatment and disposal.

4.1 Industrial Sector

Currently there are no industries in the district though Maralal town council has set a side land for industrial development. Currently honey refinery is in completion and it underwent an Environmental Impact Assessment (E.I.A). Industries operational in the district though on micro-scale include:

- Honey refineries have all closed down. One standard is in completion stage.
- A proposed skin and hide tannery
- Juakali-weldings, spear making and knives
- Beadwork
- Brick making-stalled

4.2 Trade Sector

Types of trades include retail, wholesale and hawking. Main traded goods are food stuffs, clothes, miraa, agro-chemicals, livestock and its products, tobacco, groceries and medicinal herbs/nuts/gums/barks.

4.3 Service Sector

Banking, postal, telephone and savings and credit services are available in the district though inadequate.

4.4 Tourism

The tourism industry is heavily dependent on the vast and abundant natural resources in the country. These include wildlife, beaches, landscapes and diversity of cultural, historical and archeological resources. Since the natural and cultural resources are unique, fixed in location and often irreplaceable, it is important to control the degree and manner in which they are exploited and to anticipate the effect on the sustainability of tourism by different methods of exploitation. Tourism, if properly planned will contribute to the conservation and management of the environment.

Types of Tourism and Attractions

Being well endowed with a vast diversity of attractive features ranging from wildlife, mountains, ranges, hills, forest, rock outcrops, warm climate, geysers, valleys, woodlands, indigenous cultural diversities and people, beautiful sceneries (malaso and Lesiolo escarpments),wetlands (Kisima,Turkana and Milgis River). Samburu district offers many tourism activities, including wildlife viewing, cultural tourism, scenic safaris, mountain climbing, bird shooting, hiking, camping, camel / donkey safaris, sand sliding (Loibor Seder-Nyiro), and rock climbing (refer to table 30).

Table 30: Types of Tourism and Attraction

No.	Type	Attraction	Facilities	Geographical Location	Environmental Impact
1.	Wildlife viewing	Unique species e.g grevy Zebra, wild dogs	Game reserves Conservancies Private ranches Sanctuaries	Whole district	Degradation Disturbance
2.	Cultural tourism	Cultural villages Curio shops Ornaments/handicrafts Dances	Conservancy Villages Game reserve	Samburu East	Cultural erosion Wood carving Population influx

		Rich culture			
3.	Scenic safaris	Sceneries e.g. escarpments, rocks, geysers, wetlands	Aquatic/terrestrial wetlands Geographical features	Whole district	Access roads to fragile areas Bio-prospection
4.	Mountain climbing	Mountain topography Hills, ranges	6	Whole district	Bio-piracy and prospection Environmental degradation Waste
5.	Bird shooting	Sport tourism	IBAs (Blocks)	4 divisions	Kills non targeted birds Disturbance Loss of rare species
6.	Hiking	Nature trails Wildlife Sceneries	-	Whole district	Degradation Dense road paths Loss of rare plants upon trampling
7.	Camping	Nature	Special delivery public Private	Designated areas	Degradation Bush clearing Pollution and waste Disturbance
8.	Camel safaris	Culture Nature	Designated areas	District	Vegetation Degradation Browsing impact
9.	Sand sliding	Sand dunes Sporting	1	Nyiro	Loss of sand Degradation
10.	Rock climbing	Sporting Experience	1 (Nguronit)	Nyiro	Disturbance Pollution

Source: *KWS, Local Authorities, Records 2006*

Trends in Tourism Development

Over the years the district has made tremendous progress towards the realization of its tourism potential. Samburu game reserve continues to attract large visor numbers. The several communities ran conservancies found in the district have also continually registered impressive visitation. The same also applies to the handful of private tour operators.

Institutional and Regulatory Arrangements

- Wildlife Act that protects wildlife conservation and guides tourism development.
- Local government Act that provides for creation of game reserves and managed by local Authorities.
- The district lacks tourism development plan though proposed.
- Forest Act and
- EMCA,1999
- Sectoral district forums like SWF, Conservancies, DEC, KWS and District livelihood forum.

Management Challenges

- The vastness of the district and law enforcement agencies are overstretched
- Lack of resources
- Lack of district tourism development plan.
- Poaching and poverty
- Harmful cultural practice e.g. mass circumcision where thousands of birds are killed.
- Insecurity
- Poor coordination among lead agencies

Key Environmental Issues in the Sector

- Environmental degradation due to mushrooming of tourism facilities e.g hotels, lodges, campsites.
- Population concentration/influx around major tourism facilities/reserves/lodges.
- Cultural erosion.

- Animal disturbance due to game viewing/traffic.
- Tourism facilities development in fragile ecosystems
- Lack of district tourism development plan
- Over utilization of resources/unsustainable tourism leading to dense road network in reserves/sanctuaries.

Proposed Intervention

- Aggressive environmental awareness and education
- Proper land use planning and put in place sustainable tourism plan
- Creation of livelihood options e.g. eco tourism ventures.
- Regulations to counter foreign culture / abuses.
- Strict monitoring of wildlife viewing, law enforcement, restrict viewing to designated sites, use of the recommended roads/access roads.
- E.I.A and E.A

4.5 Mining and Quarrying

Kenya has great potential for mineral resources exploration and exploitation for economic development. Mining methods involve some disturbance of the earth surface and the underlying strata including aquifers. Some potential adverse impacts on the environment from mining and quarrying activities are likely to occur.

4.5.1 Mining

Various minerals are found in the district although their economic potential has not been ascertained-soda and salt exist in Suguta valley near lake Logipi (Teleki lake), graphite in south horr, bareyl, chromite, talc, columbium and tantantum in Baragoi, stillimanite is found near Kiengok hill. There are scattered deposits of various precious stones including a quamarine, ruby, blue saphire, garnets and amethyst particularly around Baragoi, south horr and Barsaloi, cement deposits is reported in the district (KVDA-strategic plan 2005-10). The extent and amounts of these deposits have not been ascertained except for limited mining of vermiculite at Ndonyo Wasin in Wamba division and occasional prospecting for precious stones in Baragoi division. No major commercial exploitation of minerals is known to have occurred in the district. Vermiculite mining stalled.

Table 31: Type of Minerals and Methods of Extraction

Type of mineral	Method of mining	Material used	Land tenure	Location	Size (Ha)	Quantity	Environmental impacts
1.Precious stones	Mining open cast	Hand tools, Rock blasting	Trust land	Whole district			Quarries, dust, Deaths of animals (quarries) Deforestation
2.Vermiculite	Opencast	Heavy machinery	Trust land	Wamba division	10		Abandoned
3.Cement and other minerals	Exploitation Prospection		Trust land	Baragoi nyiro			Not exploited

Source: *DDP, 1994- 1996, KVDA, Strategic plan 2005-2010*

4.5.2 Quarrying

Quarrying for stones, hardcore and ballast is done haphazardly in micro scales in the district particularly around Maralal town (Headquarter) magnitude and depth of quarries is minimal and done manually using mallets, mattocks etc. However, quarrying for building blocks is picking up in the district in areas like Lolmolog, Marti, Nachola and other prospects in Tuum.

4.5.3 Sand Harvesting

Sand harvesting is done haphazardly in the district along rivers and roads. It poses potential risks to socio-economic infrastructures.

Table 32: Methods of Sand Extraction

Source of sand	Harvesting method	Location	Size(Ha)	Quantity	Regulatory agency	Environmental impacts
1.River	Manual Scooping	Yamo Loikas Whole district	25 5 -	-	Town council County council	River bank erosion Quarries accident spots
2.Road	Manual scooping	Maralal Baragoi road	-	-	Town council County council	Erosion

Source: ***Local Authority Records, 2005***

Key environmental issues

- Abandoned quarries as accident spots
- Quarries exacerbating flooding and erosion risks
- Quarry next to road and settlement eroding socio economic infrastructures.
- Breeding grounds for vectors

Proposed interventions

- Back filling of quarries
- Zoning of quarries
- Control sand harvesting and enforce sustainable sand harvesting guidelines

CHAPTER FIVE

5.0 ENVIRONMENTAL HAZARDS AND DISASTERS

Most environmental disasters are climate /weather and tectonic movements related. Disasters can be natural or man made which may lead to destruction of environment (land degradation, life epidemics) and property. The causes are invader species, drought, floods, landslides, earthquakes, accidents, lightening, fire, disease outbreaks, technological disasters and other disasters. Disasters have a tendency to retard and erode gains made in building meaningful livelihood and economic development.

5.1 Key Disasters in the District

- Drought –recurrent and pro-longed (1999-2001, 2002, 2004, 2005).
- Floods-Elnino (1997-1998). Few human deaths, loss of 52% livestock.
- Insecurity –serious in 1960's, 1970's, 1980's, 1990's. Loss of human, and livestock.

Coping strategies

Reduced number of meals to one per day (or 2 days), moving close to water sources ,resulting to less preferred foods , increase of sales of small stock to purchase foodstuffs, credit transactions and increased gifts and remittances.

Table 33: Types and Trends of Hazards/Disasters

Years	1960s	1970s	1980s	1990s	2000s	2005s	2006s
Disaster types							
Droughts	1	2	3	3	2	1	0
Floods	-	-	-	2	1	1	0
Insecurity (cattle rustling)	2	2	4	6	2	0	1
Land slides (caving in)	-	-	-	1	-	-	-

Source: *ALRMP II, DLPOs, DAO, Records*

Sector Specific Disasters

- Agriculture – Droughts, floods, locust, soil erosion
- Livestock – Droughts, diseases, overgrazing by small stock
- Land – Land slides (minimal)
- Health – Epidemics
- Security – Insecurity (cattle rustling)
- Forest – fires
- Wildlife – Diseases, Drought
- Water – Floods, Drought
- Climate / weather – Lightning, wind blowing off structures

Sector capacity to mitigate disasters is inadequate technically, financially and by human resource.

Table 34: Livestock Sector Specific Disaster Occurrence and Severity

Sector	Year	Type of disaster	No of death of animal	Severity	Interventions	Remarks
Livestock	2000	-East Coast Fever -Drought	Cattle -105339 Goats-55250 Sheep-47596 Cattle-54030 Goats-157693	Very severe 50% 10% 10%	Treatment -restocking programmes	Ongoing
	2005 / 06	Drought	Sheep-137193	20% 15% 15%	-restocking programmes	

***Source**: DLPO, Samburu, 2006*

Table 35: Agriculture Sector Specific Disaster Occurrence and Severity

Sector	Year	Type of Disaster	Severity	Intervention	Remarks
Agriculture	1997	Drought	Total crop failure (98%)	Drought recovery seeds provided	Relief food intervention
	2000	Drought	80% crop failure	Drought recovery seeds provided	Relief food intervention
	2003	Floods	45% crops destroyed by flood water.	Soil conservation structures in the ploughed farms construction of pans on farms to trap run off	Occurred especially on highland areas
	2005	Drought	50%crop failure	Drought crop recover y seeds provided this year (2006)	Relief food distribution continues
	2006	Cattle rustling and insecurity	-More than 20 people died. ->15 injured ->4000 animals stolen -Most farms in the most productive divisions of the Kirisia and Lorroki, left unattended or unplanted -Displacement of farms families.	Government has deployed security personnel in the affected areas. Has also increased Relief food to the district to help displaced families	This has affected the food security activities severely leaving the Samburu community vulnerable to hunger and poverty.

Source: *DAO, Samburu, 2006*

Table 13.4: Forest Sector Specific Disaster Occurrence and Severity

Sector	Year	Type of disaster	Deaths/injured		Property damaged	Environmental damage	Severity	Interventions
Forests	1996	Fires	People -	Animals -	-	Natural forest destroyed (Lorroki forest)	70%	- Suppression -patrols

Source: *DFO, SAMBURU, 2006*

NOTE: Forest fires are common during dry season and severity varies from forest to forest.

Key environmental issues

- Invader species,
- Drought,
- Floods,
- Landslides,
- .Disease outbreaks
- Forest fires
- Insecurity

Proposed interventions

- Control over grazing and enforce stocking rates
- Research on alternative use for invader species
- Build Dams and pans to control flood waters
- Enhance fire surveillance
- Improve security

CHAPTER SIX

6.0 ENVIRONMENTAL EDUCATION

As Kenya aspires to achieve sustainable development, there is need to educate the public on importance to participate in environmental conservation and application of the appropriate technology while addressing their socio-economic development concerns.

Environmental educations in the district are of the following forms

- Formal: In learning institutions
- Informal: By NGOs, CBOs, Lead agency
- Indigenous knowledge on environmental management is passed from generation to generation of the community

Table 36: Status of Environmental Programmes in Schools

No. of Schools				
Primary	Secondary	Tertiary	Types of programmes	Remarks
37	5	1	-4k club -Young farmers -Scouts and girl guides	
8-10	-	-	-Environmental club -Gardens for life	

Source: *DEO, 2006*

6.1 Public Awareness and Participation

Status of environmental awareness is picking up on ideals of community mobilization by NGOs, CBOs, and lead agencies. Integration of community indigenous knowledge as an incentive and catalyst in enhancement of public awareness. Calendar year events as other avenues e.g. World Environment Day, tree planting season, world water, wetland and sanitation day/ week.

6.2 Environmental Information

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

Types, sources and status of environmental information, access, dissemination and utilization are generally poor and the district has no data bank. Only two documentation centers exists in the district. No libraries and archives. Circulating newspapers/magazines include:

- Daily nation
- Standard
- Kenya Times
- NEMA news magazines
- Others –NGOs, CBOs, and churches.

6.3 Indigenous Knowledge

Kenya has 42 different ethnic communities with a very rich indigenous knowledge (IK) base unique to each community. This cultural diversity offers potential information that can be exploited to contribute positively to national development and environmental sustainability.

Information on IK in the District has not been well documented and properly packaged to allow effective dissemination, hence contributing to the massive loss of IK from one generation to the next since the few remaining practitioners die with the knowledge.

Types of IK, Innovations, Practices on Environmental Management.

- Ethno veterinary /botany –herbal medicine for both human and livestock
- Deferred grazing
- Taboos on non-exploitation of juvenile i.e. plants and animals
- Taboos prohibiting natural resource exploitation as human equals to other creations
- Folk lore's on dangers of poaching, hunting or setting fire to forests

- Strong believe on co-existence of human and other creations
- Use of dead woods
- Lopping /pollarding as opposed to clear felling

Challenges on Utilization of IK

- Lack of patenting policy /legislation
- Bio-piracy
- Piracy on intellectual property rights –no regulation

IK Players

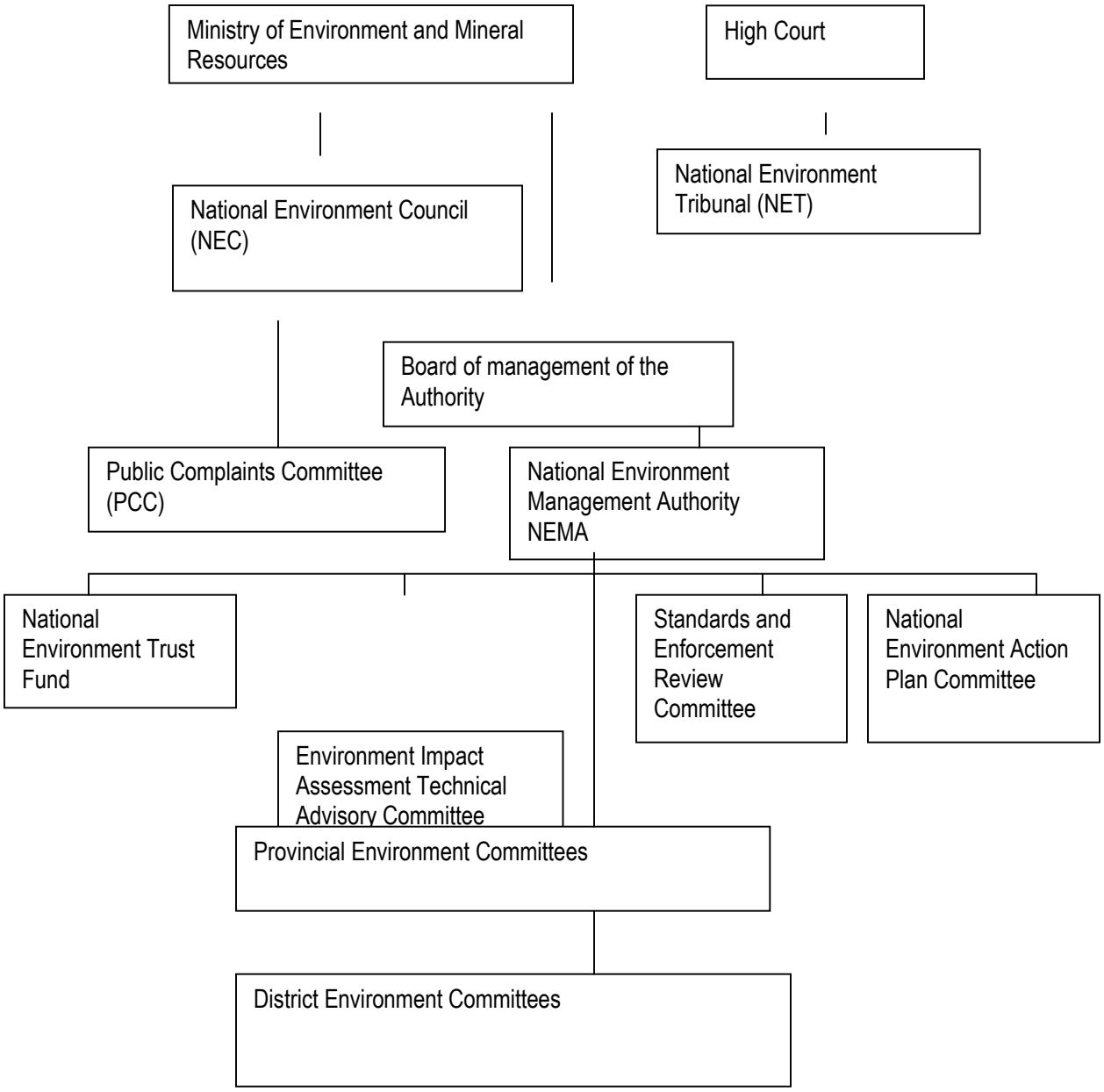
- Astronomers
- Palmist
- Seers
- Councils of elders
- Intestinal interpreters
- Philosophers

CHAPTER SEVEN

7.0 ENVIRONMENTAL GOVERNANCE AND INSTITUTIONAL FRAMEWORKS

Environment Management and Coordination Act (EMCA), 1999 vests the responsibility of environmental conservation and management on National Environment Management Authority. Status of environmental governance and institutional arrangements is weak owing to poor enforcement of laws and the inadequate resource capacities of the implementing institutions.

Figure 2 Institutional framework for EMCA



1. National Environment council (NEC)

It's main function is to formulate policy on environmental management and give directions in the implementation of the EMCA.

It is also responsible for setting national goals and objectives and determines policies and priorities for the protection of the environment.

2. National Environment Tribunal (NET)

Deals with the considerations of appeals against refusal to grant licenses, imposition of any conditions and limitations on a license issued under the Act. Any person aggrieved by the ruling of the tribunal may appeal to the high court.

3 Public complaints committee (PCC)

Its function is to investigate any complaints of environmental degradation. It reports its findings and recommendation to NEC.

4. National Environment Management Authority (NEMA)

Its main function is to exercise general supervision coordination over all matters relating to the environment. It is the principle instrument of the government in the implementation of all policies relating to environment.

5. Standards and Enforcement Review Committee (SERC)

Advises the Authority on the established criteria and procedures for the measurement of quality e.g. water quality and recommends minimum quality standards.

6. National Environment Action Plan Committee (NEAPC)

This is a cross – sectoral national committee which prepares a National Environment Action Plan for consideration and approval by the National Assembly.

7. Provincial or District Environment Committees (PEC/DEC)

These are responsible for proper management of the environment within the province and the district respectively; they develop Environment Action Plans of their districts and provinces respectively and pass them to the NEAPC.

Regulatory and Management Tools

- -Laws, by-laws, policies
- -Committees
- -Indigenous knowledge
- -Management plans, standards, guidelines, regulations

Key issues in compliance and enforcement

- -Lenient penalties
- -Colonial dated laws/policies
- Resource constraints

Key areas of overlap between laws, policies in Kenya and EMCA include the non-provision of Environmental Impact Assessment and Audit among the laws. Such provisions are clearly spelt in EMCA though their enforcement is still in process. Multilateral Environment Agreements (MEAs) other than convention on International Trade of Endangered Species (CITES) on Aloe and poverty reduction strategies most MEAs have not been implemented in the district.

CHAPTER EIGHT

8.0 IMPLEMENTATION STRATEGY

8.1 Overview

This chapter focuses on the implementation strategy, monitoring and evaluation systems that will be used to access the project management process during the plan period. It also presents implementation, monitoring and evaluation matrix, that the district will put in place to ensure that the implementation of the plan is carried out to achieve the objectives.
The District Implementation and Monitoring Action Plans were developed from intensive consultation workshops at District level.

The District Action Plan derives its information from Civil Society Consultation Workshops (CSCW) and the Technical Planning Committee (TPC

Implementation of the Action Plan as mentioned in the preceding sections will not be a preserve of NEMA but all Kenyans and non-Kenyans. It is everybody's duty to identify any environmental intervention activity or activities in this report and implement. This will involve resource mobilization from within the district, Province, nationally and even internationally.

The donor community through registered NGOs and CBOs can support some of the intervention strategies identified for addressing the challenges in the District. Of course the Kenya Government through various programmes in other ministries may also play an active role in addressing the many challenges. Sectors like water, energy, forest, Mining, fisheries, roads, housing, local authority, education, research and disaster management, agriculture and livestock may individually or collectively through allocation of funds implement environmental remedial measures.

8.2 Monitoring and evaluation

Monitoring and evaluation will be carried out in using participatory approaches where stakeholders are involved at all stages. It will be undertaken on continuous basis through meetings and field visits. Reports will be discussed at all stages but quarterly reports will be prepared and reviewed. Evaluation will be undertaken periodically preferably on annual basis in the line with the performance contracting period in the public service. The perforce of evaluation is to ensure efficient and effective implementation as well as ensuring that environmental concerns have been addressed and integrated in development process. It will involve documentation of best practices for the purpose of replication. The implementation strategy will be evaluated using the matrices below.

Table 37: IMPLEMENTATION MATRIX / STRATEGY

						Estimated costs '000s and time					
Priority Issue	**Objectives**	**Output**	Activities	**Stakeholders**	**Responsible institution**	**09/10**	**10/11**	**11/12**	**12/13**	**2013**	**Remarks**
1. Deforestation	-To conserve and protect the existing vegetation in gazetted areas, rangelands and cultivated areas -To re-afforest degraded areas with suitable tree species. -To build	-Increased forest cover -Sustainable use of forest resources -Communities organized into conservation groups and committees / users group -CFAs	-Stakeholders meeting -Enrichment planting in gazetted areas -Identify and map degraded sites -Tree planting in degraded sites -Farm forestry / agroforestry -Awareness creation and raising -Trainings -Formation of forest / environment protection committees and groups / users association	ALRMPII, NEMA, FD, Provincial Administration, MOA, Community, RPK and Local Authorities AWF KVDA MTC SCC ENNDA	FD MOA Samburu county Council Maralal Town Council RPK ENNDA KVDA	3000	2000	1000	800	500	

	capacity of communities on conservation forestry	-Protection committees	-Enactment of by laws restricting use of cedar in construction -Policy on charcoal burning								
2. Overgrazing	To Reduce overgrazing in pasture land	• Availability of pastures • Denuded land rehabilitated	• Hold livestock marketing stakeholders meeting • Streamline livestock marketing • Activate all sale yard committees • Controlled / deferred grazing • Support establishment of grazing committees	SCC Practical Action DLMC MTC ALRMP R.P.K K.V.D.A A.W.F F.D DLPO	DLPO SCC MTC ALRMPII KVDA DLMC R.P.K	2550	2200	1300	200	250	

			• Enact policy on proper livestock stocking rates Support to livestock off take programmes								
3. Soil erosion	• Conserve soils in cultivated and pasture land • Reduce land degradation caused by gully formation	• Improved land productivity • Gullies protected and healed (land reclaimed)	• Community mobilization • Formation and empowerment of soil conservation committees • Layout of soil conservation structures • Controlled grazing / deferred grazing Replanting and reseeding of denuded areas	PA Group ranch officials Land settlement DFO RPK ALRMP II MOA Community	MOA KFS RPK	3000	2300	1300	300	300	

4. Droughts	• Establish EWS/LEWS • Enhance drought preparedness and coping mechanisms	• Probability of crop / livestock failure reduced • EWS/LEWS monthly bulletin • Drought preparedness • Strengthened • Coping mechanisms enhanced	• Diversification of IGAs • Community mobilization on sustainable use of natural resources • Strengthening traditional coping mechanisms • Drought preparedness interventions • Monitoring sites for LEWs/EWS Data collection and dissemination of LEWS/ EWS information	PA RPK ALRMPII World Vision CCF NEMA Community DLPO MOA	DLPO MOA ALRMPII RPK	2650	2200	1200	200	200	

5. Floods	To Reduce flood related disasters	• Minimized floods related destructions • Preparedness	• Community mobilization and formation of water harvesting groups • EWS • Construction of diversion ditches / water storage structures Catchment protection and rehabilitation	PA MOA ALRMP II SCC MTC NEMA NGO's	WRMA MOA	4000	3000	3000	2000	1000	
6. Insecurity (cattle rustling)	Conflict management and peace building	• Reduced conflicts • Law and order maintained • Interdependence of humans as individuals and groups	• Dialogue meeting with peace committee and community • Sensitization on harmonious livings Deployment of law enforcing agents	Community Peace committee, Security agents, Leaders – (political and opinion), NGOs CBOs FBOs	OP	4000	3200	1200	1000	1000	• Capital intensive • Voluntary based initiatives
7. Water catchment degradation	To protect, rehabilitate and conserve water catchment areas	• Improved water quality and flow • Improved habitat	• Community sensitization • Fencing and reforestation • Establish water catchment protection committees	WRMA Community FD KVDA KWS MOA RPK CSOs	WRMA KWS MAO DFO NEMA KVD	4000	3500	2000	800	500	

8. Water pollution	-Reduce pollution in watering points / sources -Safeguard water quality	-Reduced water related diseases -Improved water quality	-Community sensitizations -Field days on safe use and disposal of chemicals -On-farm conservation structures Pegging of water sources	Community NEMA Public Health WRMA MOA DLPO DVO Practical Action (ITDG) RPK	MOA DLPO DVO Public Health	2000	1200	1200	1200	1200	
9. Water use conflicts	Sustainable use and equitable distribution of water resources	-Reduced water use conflicts -Good management of water resource	-Establishment and empowerment of water users Associations in water management and conflict resolutions -Stakeholders meeting Develop and	Community , WSB CSOs , ALRMPII WRMA FD , RPK OP SCC MTC	WRMA DLPO	8000	7200	7200	7200	7200	

			improve water services								
10. Blockage of wildlife migratory routes / corridors	Open / safeguard wildlife migration	-Reduced human-wildlife conflicts -Easy migration of animals	• Identification and mapping of corridors • Sensitization • Stakeholders meeting • Enforcement of legislations • Evictions Land easement	SWF Lands NEMA Dept. of Physical Planning MTC SCC Agriculture AWF KWS Livestock department Community	KWS MTC SCC	4800	3800	1300	350	200	

11. Habitat loss / reduced wildlife dispersal areas	-Secure wildlife dispersal areas and manage -Maintain the present ones	-Enhanced wildlife range -Reduced conflicts	-Awareness creation / raising -Land easement -Patrols -Tree planting Establish community conservancies	SWF Lands KWS Physical planning Agriculture AWF Livestock FD Community NEMA NRT	KWS MTC SCC	2800	1800	300	350	200	
12. Human wildlife conflicts (forestry - wildlif	-Reduce human-wildlife conflicts -Protection of *Acacia elatoir* by ringing with wire mesh	-Conflicts minimized -Reduce number of animals killed -Coexistence of human and wildlife	-Increase patrol teams -Open outposts in animal problem areas -Land use planning Protect targeted species	AWF, KWS SWF DLPO, DVO SCC, MTC NEMA Lands	KWS	6800	6720	860	946	1000	

e conflicts emerging)											
13. Endangered species	Safety of endangered species	-Increased population of endangered species -Reduced poaching	• Awareness creation • Patrols • Tree planting • / protection • Establish and support community conservancies • Gather intelligence • Research • Vaccination against anthrax / rabies Census	FD, NEMA DEC Conservancies Communities SWF NRT KWS Earth watch Veterinary Department AWF	KWS	4000	5000	600	300	200	Grevy wild dogs, elephants e.t.c Vaccination to target domestic dogs for rabies and other livestock for anthrax e.t.c

17. Poor sanitation	Improved sanitation	-Clean environment -Properly managed disposal sites -Increased VIP latrine coverage -Decreased insect vectors & rodents -Removal of temporary structures -Houses properly planned & put up	• Daily collection of garbage • Designate & fence disposal sites • Any building coming up to have VIP latrine • Discourage temporary structures in town • Vetting of structures • Vetting of all building plans Formation of resident town management committees /associations	NEMA SCC MTC PPO Business community	Public Health Office SCC MTC DEC	1000	1000	1000	1000	1000	
18. Invasive species	control the use and introduction of invasive species	-Use of environment friendly species -Enhanced biodiversity	• Identify and map areas occupied by invader species • Eradication • Alternative	FD MOA Livestock department 99 MTC RPK	KFS SCC MTC DEC	2400	1400	1400	400	250	Duosperma species Acacia reficien Opuntia

19. Bioprospection / biopiracy	Reduce biopiracy	• Reduced biopiracy • Preservation of intellectual property rights	• Stakeholders meetings • Awareness creation • Establishment of non-timber based business ventures • Enact policy and legislation Linking communities to research institutions	FD LA/GOK RPK NMK ICIPE KEFRI Universities AWF	FD KWS	2400	1400	200	150	100	
20. Tourism	Capacity plan tourism facilities in the district	Sustainable tourism	• Assessment of protected areas capacity • EA • Zonation Development of tourism plan for the district	SCC MTC NEMA KWS AWF	SCC MTC KWS SWF AWF	1600	1500	500	500	300	
21. Quarrying	Regulate quarrying	• Sustainable quarrying • Guidelines	• Rehabilitate quarries • Form quarrying groups / associations • Awareness creation • Zonation • Identify and designate or zone quarrying areas Guidelines formulation	FD SCC MTC Mines & Geology NEMA Communities Miners Land owners	Mines & Geology MTC SCC NEMA	200	200	200	200	200	Haphazard and manual Emerging issue
22. Sand harvesting	Regulate sand harvesting	• Sustainable sand harvesti	• Rehabilitate quarries • Form associations, groups and	SCC MTC Mines &	Mines and Geology SCC	150	150	150	150	150	Haphazard and manual

Table 38: MONITORING AND EVALUATION MATRIX

Activities	OVIs	MoV	Reporting Schedule	Implementers	Responsible Institution for M & E	Remarks	Targeted Issue
1. a) Stakeholders meeting b) Identify and map degraded sites c) Enrichment planting in gazetted areas	1) No. of meetings 2) Areas identified and mapped 3) No. of trees planted 4) Acres planted	• Reports • Field visit • Survival %	Monthly Quarterly Annually	FD MOA RPK AWF NRT ENNDA KVDA SCC MTC	FD NEMA	District wise	Deforestation
d) Tree planting in degraded sites	1) No. planted 2) No. of sites targeted	• Reports • Field Visits					
e) Farm forestry / agro forestry	1) No. of seedlings planted 2) No. of contact farmers reached 3) No. of nurseries established	• Reports • Field Visits • No. of contact farmers reached					
f) Awareness creation and raising	1) No. of barazas, workshops, seminars held 2) No. of groups or people trained	• Reports					
g) Formation of protection committees / CFAs	No. formed	• Reports • Operations					
2. a) Hold livestock	1) Marketing streamlined	Reports	Monthly	DLMC DLPO			

3. a) Community mobilization	No. of barazas held	• Reports • Barazas held	Monthly Quarterly Annually	MAO RPK DLPO NRT ENNDA KVDA	MAO NEMA	Divisions having agricultural activities	Soil erosion
b) Formation and empowerment of soil conservation committees	5 catchments committees per division	• Reports • No. trained					
c) Layout of conservation structures	100 farms targeted per year	• Reports • Site visits • No. of farms laid					
d) Deferred grazing	Area conserved	Reports					
e) Replanting and reseeding of degraded areas	Areas reseeded or nted	Reports					

4. a) Community mobilization on sustainable use of natural resources	20 campaign barazas	• Reports • No. of barazas held and attendance	Monthly Quarterly Annually	MOA RPK DLPO ARLMPII CSOs	MOA DLPO ALRMPII		Drought
a) Diversify IGAs	No. of IGAs	Reports					
b) Strengthening traditional coping mechanisms	Coping mechanisms strengthened	• Reports on coping mechanisms • Application rate of copying mechanisms					
c) Drought preparedness interventions	Level of preparedness	• Reports • No. and type of interventions					
d) Identification of monitoring sites for LEWS	Sites established	• Data • LEWS bulletin					

e) Data collection for LEWS	Data collected	• Data for LEWS					
f) Dissemination of LEWS information	LEWS information availed	Bulletin					
5. a) Community mobilization and formation of water harvesting groups	1) 20 barazas held 2) Groups formed	• Reports • No. of Barazas held and attendance	Monthly	MOA WRMA ALRMPII CSOs KVDA MTC SCC ENNDA	WRMA NEMA ALRMPII	Both lowland and plateau	Floods
b) EWS	Data and information on EWS	• Data • EWS bulletin	Quarterly				
c) Construction of diversion ditches / water storage structures	Water pans and dams constructed	• Reports • No. of storage structures	Annually			Cost of structures vary with site	
d) Catchment protection and rehabilitation	Protection and rehabilitation activities	• Reports • No. of rehabilitation works					

6. a) Dialogue meeting with peace committee and community	1) Meetings held 2) Minutes	Reports	Monthly Quarterly Annually	Community Peace committee Security agents Leaders CSOs	OP	Use of non-violence techniques in solving conflicts	Insecurity (Cattle rustling)
b) Sensitization	Meetings held	Reports					
c) Deployment of law enforcing agents	No. deployed	Reports					
7. a) Community sensitization	20 barazas held	• Reports • No. of barazas held and attendance	Monthly Quarterly Annually	MOA WRMA FD RPK KWS KVDA MTC SCC ENNDA	WRMA NEMA FD		Water catchment degradation
b) Fencing and catchment reforestation	1. 30,000 tree seedlings planted 2. Areas rehabilitated	• Reports • Hectares reforested					
c) Establish water catchment committees	Functional committees	• Minutes • Reports					
d) Catchment patrols	Patrols per catchment	Reports					

e) Development and protection of springs	1. Springs developed 2. Spring discharge rate	• Reports • No. of springs protected					

8. a) Community sensitization	Barazas held	Reports	Monthly	MOA DLPO WRMA NEMA	DPHO NEMA WRMA		Water pollution
b) Field days on safe use and disposal of chemicals	Field days held	Reports	Quarterly	DVO DPHO RPK			
c) On farm conservation structures	Structures constructed	Reports	Annually				
d) Pegging of water sources	Pegged water sources	• Reports • Site visits					
9. a) Establishment and empowerment of water user's Associations	1) No. of associations 2) Barazas held 3) Trainings	Reports	Monthly Quarterly	PA WRMA NEMA DLPO	WRMA NEMA CSOs		Water use conflicts
b) Stakeholders meeting	1) Meetings held 2) Resolutions	Reports	Annually	DSDO Religious Institutions NGOs			
c) Develop and improve water services	No. of water sources	• Reports • Site visits					
10. a) Identification and mapping of corridors b) Land easement	1) Areas mapped 2) Corridors created 3) Land eased	Reports	Monthly	KWS MTC SCC PA Group Ranches	KWS NEMA MTC SCC		Blockage of migratory routes / corridors
c) Sensitization	1. No. of meetings	Reports	Quarterly	EW			

11. a) Increase patrol teams	Patrols de	Reports	Monthly Quarterly Annually	KWS MTC SCC SWF Lands AWF	KWS NEMA MTC SCC		Human-wildlife conflicts
b) Open outposts in problem animal areas c) Land use planning d) Protect debarked species	No. of tpost opened	Reports					
12. a) Awareness creation and raising	1) Barazas held 2) Area covered	Reports	Monthly Quarterly Annually	PA SCC MTC KWS Lands FD AWF Group ranches	KWS NEMA MTC SCC		Habitat loss / reduced wildlife dispersal areas
b) Land easement	Hectares eased	Reports					
c) Patrols	Patrols made	Reports					
d) Reforestation	Area reforested	Reports					

e) Establishment of community conservancy	No. established	• Reports • Site visits					
13. a) Census b) Awareness creation	1) Barazas held 2) Census results	Reports	Monthly Quarterly Annually	KWS FD SCC MTC Research institutions DVO NRT EW SWF	KWS NEMA MTC SCC	Vaccination to target domestic dogs for rabies and other livestock for anthrax e.t.c	Endangered species
c) Patrols	No. of patrols	Reports					
d) Reforestation	Hectarage planted	Reports					
e) Establish and support community conservancies	No. established	Reports					
f) Research	No. undertaken	Reports					
g) Vaccination	No. vaccinated	Reports					
h) Gather intelligence	Reports	Reports					

14. Awareness creation	Barazas held	Reports	Monthly Quarterly Annually	KFS DEC RPK	KFS NEMA		Illegal settlements / grazing in gazetted Government forest
a) Evictions	No. evicted	Reports					
b) Patrols	No. patrols	Reports					
c) Enrichment planting	Acres planted	Reports					
15. Trainings / awareness creation	Barazas held	Reports	Monthly Quarterly Annually	KFS DEC Communities RPK AWF	KFS NEMA	Trainings to target use of modern bee keeping technologies	Forest / bush fires
a) Patrols	Patrols made	Reports					
b) Fire suppression	Fire cases acted	Reports					
c) Provision of odern beehives	No. issued	Reports					
d) Tree planting	Area rehabilitated	• Reports • Site visits					

16. a) Sensitization b) Formation of resident town management committees /associations	1. Barazas meetings and seminars and areas sensitized 2. No. formed	Barazas / meetings and seminars held	Monthly	DPHO Clerk to SCC Clerk to MTC NEMA	MOH NEMA	Community enlightened/sensitized to know their roles	Polythene/plastic pollution
c) Law enforcement d) Clean ups / ıinage opening	1) Notices issued 2) Prosecutions done 3) No. of clean ups	• No. of different notices issued • No. of cases prosecute d	Yearly				
e) Stakeholders meeting	Meetings held on how to make the town clean and provision of dust bins	No. of stakeholders meetings held & No. of dustbins provided					

17. a) Collection of refuse b) Formation of resident town management c) committees/associations	1) Daily collection of refuse 2) No. formed	No. of daily tones trips of garbage collected	Weekly Monthly Yearly	DPHO Clerk – MTC Clerk – SCC	MOH NEMA		
d) Identification & fencing of dumping sites	Dumping site identified & fenced	No. identified & fenced					
e) Vetting of buildings coming up / construction	No. of constructions coming up which are approved	No. of VIP / Latrines built					
18. a) Areas identified and mapped b) Eradication of invasive species c) Enact by laws	1) Areas cleared 2) Areas identified and mapped 3) By laws enacted	• Reports • Site visits	Monthly Quarterly Annually	KFS MOA NEMA DLPO			Invasive species

d) Use of alternative species	Reports	Reports					
e) Controlled grazing	Reports	Reports					
19. a) Stakeholders meeting	Meeting held	Reports	Monthly	KFS MOA	KFS KWS		Bioprospection / Biopiracy
b) Awareness creation	Barazas held workshop	Reports	Quarterly	KWS EW	NEMA		
c) Non-timber business ventures	No. established	Reports	Annually	SWF AWF			
d) Policy / legislation enacted	Report	Reports					
e) Linking communities to research institutions	Linkages	Reports					
20. a) Area capacity assessment	Areas assessed	Reports	Monthly	KWS SCC	KWS SCC		Tourism
b) EA	No. done	Reports	Quarterly	MTC AWF	MTC NEMA		
c) Zonation	Areas zoned	Reports	Annually	SWF			
d) Tourism plan	Plan developed	• Reports • Site visits					

21. a) Rehabilitation of quarries	No. rehabilitated	Reports	Monthly Quarterly Yearly	SCC MTC NEMA FD DEC Miners Land owners Mines & geology	SCC MTC NEMA Mines & Geology	Levelling + tree planting	Quarrying
b) Zonation	Areas zoned	Reports					
c) Awareness creation	Barazas held	Reports					
d) Form groups / associations e) Formulate guidelines	No. formed	Reports					
22. a) Rehabilitation of quarries	No. rehabilitated	Reports	Monthly Quarterly Yearly	SCC MTC NEMA FD DEC Miners Land owners Mines & geology	SCC MTC NEMA Mines & Geology	Levelling + tree planting	Sand harvesting
b) Zonation	Areas zoned	Reports					
c) Awareness creation	Barazas held	Reports					
d) Form groups / associations e) Formulate guidelines	No. formed	Reports					

APPENDIX I DEAP TECHNICAL COMMITTEE: Membership

1. J. K. Muyanga	District Development Officer – chairman
2. F. O. Nyibule	Warden KWS – Member
3. J. K. Nzou	District Forest Officer – Member
4. P. B. Achoki	District Physical Planning Officer – Member
5. S. K. Kiura	Deputy District Education Officer – Member
6. W. K. Cheboss	District Agriculture Officer – Member
7. Ritchie Kitilit	District Water Engineer – Member
8. Pius K. Kasusya	Resource Projects – Member
9. Augustine Lkeitan	Public Health Officer – Member
10. P. P. Lekenit	District Environment Officer – Secretary

APPENDIX II Projects to undergo EIA / EA

1. General – an activity out of character with its surrounding; any structure of a scale not in keeping with its surrounding; major changes in land use.

2. Urban Development including - designation of new townships; establishment of industrial estates; establishment or expansion of recreational areas; establishment or expansion of recreational townships in mountain areas; national parks and game reserves; shopping centers and complexes.

3. Transportation including - all major roads; all roads in scenic, wooden or mountainous areas and wetlands; railway lines; airports and airfields; oil and gas pipelines; water transport.

4. Dams, rivers and water resources including - storage dams, barrages and piers; rivers diversions and water transfer between catchments; flood control schemes; drilling for the purpose of utilizing ground water resources including geothermal energy.

5. Aerial spraying.

6. Mining, including quarrying and open-cat extraction of - precious metals; gemstones; metali ferrous ores; coal; phosphates; limestone and dolomite; stone and slate; aggregates, sand and gravel; clay; exploration for the production of petroleum in any form; extracting alluvial gold with use of mercury.

7. Forestry related activities including - timber harvesting; clearance of forest areas; reforestation and afforestation.

Agriculture including – large-scale agriculture; use of pesticide; introduction of new crops and animals; use of fertilizers; irrigation.

8. Processing and manufacturing industries including - mineral processing, reduction of ores and minerals; smelting and refining of ores and minerals; foundries; brick and earthware manufacture; cement works and lime processing; glass works; fertilizer manufacture or processing; explosive plants; oil refineries and petrol-chemical works; tanning and dressing of hides and skins; abattoirs and meat-processing plants; chemical works and process plants; brewing and malting; bulk grain processing plants; fish-processing plants; pulp and paper mills; food-processing plants; plant for the manufacture of assembly of motor vehicles; plant for the construction or repair of aircraft or railway equipment; plants for the manufacture or assembly of motor vehicles; plants for the manufacture of tanks, reservoirs and sheet metal containers; plants for the manufacture of coal briquettes; plants for manufacturing batteries.

9. Electrical infrastructure including – electricity generation stations; electrical transmission lines; electrical sub-stations; pumped – storage schemes.

10. Management of hydrocarbons including – the storage of natural gas and combustible or explosive fuels.

11. Waste disposal including – sites for solid waste disposal; sites for hazardous waste disposal; sewage disposal works; works involving major atmospheric emissions; works emitting offensive odours.

12. Natural conservation areas including – creation of national parks, game reserves and buffer zones; establishment of wilderness areas; formulation or modification of forest management policies; formulation or modification of water catchment management policies; policies for the management of ecosystems, especially by use of fire; commercial exploitation of natural fauna and flora; introduction of alien species of fauna and flora into ecosystems.

13. Nuclear Reactors.

14. Major developments in biotechnology including the introduction and testing of genetically modified organisms.

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