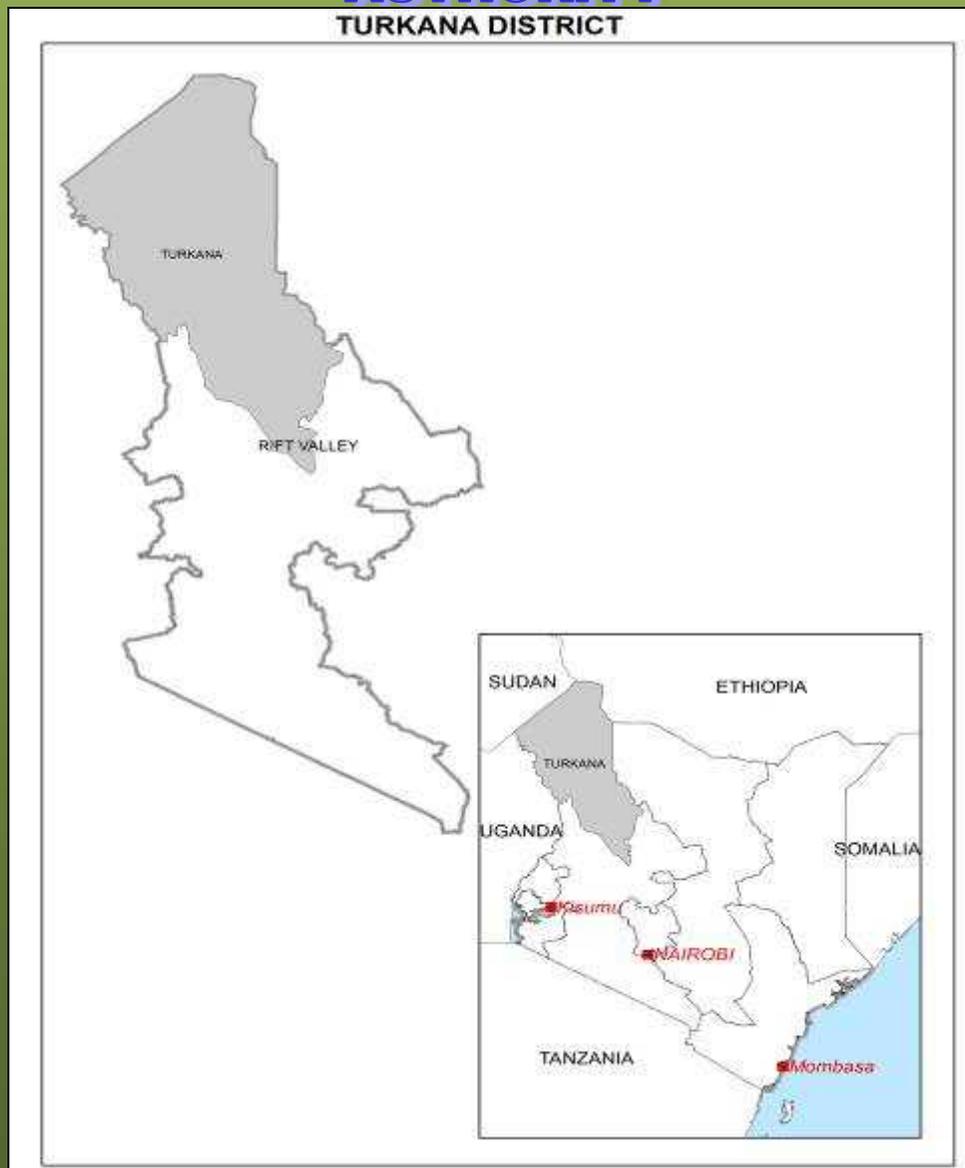




REPUBLIC OF KENYA
MINISTRY OF ENVIRONMENT AND MINERAL RESOURCES
NATIONAL ENVIRONMENT MANAGEMENT
AUTHORITY



TURKANA DISTRICT
ENVIRONMENT ACTION PLAN
2009-2013

EXECUTIVE SUMMARY

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

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

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

Chapter three, details the Human settlements and infrastructure in Turkana District covering situation analysis, challenges and proposed interventions. Environmental challenges addressed include; waste management, sanitation, pollution, diseases, land use, demand for water, energy, materials for construction, land and wetlands degradation, policy and legislation, biodiversity loss and land tenure.

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

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

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

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

FOREWORD

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

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

The Environmental Management and Coordination Act (EMCA, 1999) provides for the integration of environmental concerns in national policies, plans, programmes and projects. In this regard, EMCA 1999 provides for the formulation of National, Provincial and District Environment Action Plans every five years.

Environmental Action Planning is a tool that aims at integrating environmental concerns into development planning. The process followed in preparing this DEAP was participatory, involving various stakeholders from institutions and sectors, including the public, private, NGOs and local communities at District and Provincial levels. These consultative meetings provided the basis also for formulation of the PEAP and finally the National Environment Action Plan.

The DEAP addresses environmental issues from various sectors in an integrated manner and discusses their significance in development planning. It proposes a strategy for achieving sustainable development in line with Kenya's quest to meet the Millennium Development Goals (MDGs) Vision 2030 and Medium Term Plan (MTP 2008-2012). The Plan has brought out a number of proposed interventions, legal and institutional framework to be incorporated into sectoral development plans and programmes. Its implementation will be monitored by the DEC and will be reflected in the State of the Environment Reports.

The preparation of the DEAPs for Rift Valley Province owes much to the technical and financial assistance provided by the European Commission under its Community Development for

Environment Management Programme. This support, which included innovative community and civil society consultations, facilitation of DEC meetings, as well as final publication costs, is gratefully acknowledged. I also commend the assistance provided by UNDP under the Poverty Environment for supporting the development of the EAP Manual and supporting the preparation of the DEAP for Turkana.

I wish to underscore that the 2009-2013 DEAP report is a broad-based strategy that will enable the District attain sustainable development as envisaged in Vision 2030.

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

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

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

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ACRONYMS

ACK	Anglican Church of Kenya
AGC	African Gospel Church
AIC	Africa Inland Church
ALRMP	Arid Lands Resource Management Project
ASAL	Arid and semi-Arid Lands
ASIIG	Additional School Infrastructure Improvement Grant
BOG	Board of Governors
BSIIG	Basic School Infrastructure Improvement Grants
CBF	Constituency Development Fund
CDF	Constituency Development Fund
CCF	Christian Children`s Fund
CEDAW	Convention on the Elimination of All Forms Discrimination
CFS	Child Friendly Schools
CRC	Convention on the Rights of the Child
DEB	District Education Board
DEO	District Education Officer
DICECE	District Centre for Early Childhood Education
DOL	Diocese of Lodwar
ECD	Early Childhood Development
EMIS	Education Management Information System
FBO	Faith Based Organization
FPE	Free Primary Education
GER	Gross Enrolment Rate
KESSP	Kenya Education Sector Support programme
MDG	Millennium Development Goals
MOE	Ministry of Education
MOH	Ministry of Health
MOR&W	Ministry of Roads & Public Works
MOW	Ministry of water
NCCK	National Council of Churches of Kenya
NGO	Non- Governmental Organizations
PAG	Pentecostal Assemblies of God
PSABH	Primary Schools Action for Better Health
PTA	Parent Teachers Association
RCEA	Reformed Church of East Africa
RSRTP	Rapid School Readiness Initiative Programme
SBTD	School Based Teacher Development
SFP	School Feeding Programme
SMC	School Management Committees
SNV	Netherlands Development Organization
TCC	Turkana County Council
TEFA	Turkana Education For All

TIVET	Technical Industrial Vocational and Entrepreneurship Training
TTRC	Turkana Teachers Resource Center
UNDP	United Nations Development Programme
UNICEF	United Nations Children`s Education Fund

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CHAPTER ONE

1.0 Introduction

1.1 Preamble

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

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

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

1.2 Challenges of environmental management

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

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

1.3 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.

1.4 DEAP Methodology

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

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

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

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

Objectives of District Environment Action Plan

The objectives of District Environment Action Planning include the following:

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

To formulate appropriate environmental management strategies specific to the district

DEAP Scope

The preparation of the Turkana DEAP has been realigned with Vision 2030, Midterm Plan (MTP 2008-2012) as directed by the government. The current DEAP covers the period of 2009-2013 and as per EMCA shall be revised after every five years. The DEAP will be monitored by the annual preparation of the State of Environment Report. The

environmental indicators that have been developed in the implementation matrix will be monitored by the respective lead agencies on an annual basis and incorporated into the annual State of Environment Report. The National (SoE) Steering Committee and the National Environment Action Planning Committees have approved the indicators.

1.5 District profile

1.5.1 Geographic Location, Size and Administrative Units

Situated in the north-western corner of Kenya, Turkana district has three international borders with Ethiopia, Sudan, and Uganda; nationally, it borders Samburu, Baringo and West Pokot districts. It is the largest district in Kenya, covering an area of 77,000 square kilometers, which is about 42% of the area in the Rift Valley province. The larger Turkana district has 17 Divisions, 58 locations and 158 sub-locations but the recent sub-divisions of the district to create two more districts has resulted in the units being sub-divided as indicated in the table below.

The table captures the Divisions, Locations and sub-locations by coverage area, numbers and names .the table 1 below shows area of the by division.

Table 1:Area of the district by division.

DIVISION	AREA KM2	NO. OF LOCATION	SUB-LOCATION
Lokichogio	9126	6	13
Kaaling	10830	4	13
Lapur	4652	3	7
Lokitaung	5208	4	11
Kibish	5104	3	7
Oropoi	5348	3	11
Kakuma	5596	3	10
Total	45887	26	72
Lokichar	2913	3	7
Kainuk	2504	2	6
Lokori	5008	4	11
Lomelo	5962	5	9
Katilu	1187	1	4
Total	17574	15	37
Turkna central			
Central	2099	2	5
Kerio	2703	3	8
Kalokol	3493	3	8

District Political boundaries

Turkana had three constituencies, Turkana North, Central and South. The three has been gazzetted as districts with headquarters at Loktaung, Lodwar and Lokichar respectively. The Lodwar Municipal Council and the County Council of Turkana represent the only two Local Authorities in the district.

1.5.2 Climate and Physical features

Turkana has been classified as an Arid and Semi-Arid Land (ASAL) district. The climate is characterized by warm to hot, with temperatures ranging between 24 to 40 degrees Celsius. Rainfall is erratic and unpredictable both in timing and distribution. Moreover, most of the precipitation is run off through the myriad of seasonal streams and rivers that drain the highlands that surround Turkana District. However, in general, the rainy season (*agiporo*) comprises long rains between April and August, and short rains between October to November. January, February and September tend to be the driest periods (*akumo*). Rainfall tends to be the highest in the western parts of the district and other areas of high elevation. For the last two decades, the ASAL districts have frequently suffered from failures in the annual rains but 2006 and 2007 witnessed a higher than expected rainfall. Conversely, flooding is also possible when there is too much rain like it was witnessed in October 2006 where many parts of the district experienced losses of livestock and small garden crops due to the flush waters.

The district has several topographical features to note, including mountain ranges to the west, open plains in the centre, and rivers and Lake Turkana to the east. Lake Turkana is the largest and most saline of the Rift Valley lakes, though its water is arguably potable. There is no outlet, and with reduced inflows and high evaporation, the water is subject to three to four meter seasonal fluctuations in level. In total, the level has dropped 10m between 1975 and 1992.

1.6 Population Size and Distribution

Turkana district has a population by 2007 of about 521,000 inhabitants projected with a population growth rate of 3.3% from the 1999 census of 453,427 people.

The table 2.1 below shows the population distribution in the whole district and its density. The table below shows 2.1 population size, and distribution (density)

Table 2: population size, and distribution (density)

DIVISION	POPULATION					DENSITY				
	1999	2001	2003	2005	2007	1999	2001	2003	2005	2007
Lokichoggio	36,187	38,391	40,729	43,210	45,841	5	5	5	5	6
Kaaling	24,053	25,518	27,073	28,722	30,472	3	3	3	4	4
Lapur	12,780	13,558	14,384	15,260	16,190	6	6	6	7	7
Lokitaung	22,586	23,962	25,421	26,970	28,612	12	13	14	15	16
Kibish	6,057	6,426	6,818	7,234	7,675	1	1	1	1	1
Lokichar	21,791	23,118	24,526	26,020	27,605	5	5	5	6	6
Oropoi	18,020	19,118	20,283	21,518	22,829	3	4	4	4	4
Lokori	17,915	19,006	20,163	21,391	22,694	3	3	3	3	3
Lomelo	6,087	6,458	6,852	7,270	7,713	1	2	2	2	2
Katilu	12,548	13,312	14,122	14,982	15,894	10	11	12	12	13
Kainuk	11,799	12,518	13,281	14,089	14,947	7	8	8	9	9

Central	35,409	38,107	40,428	42,890	45,502	45	48	51	54	57
Kerio	15,409	16,347	17,342	18,398	19,519	6	6	6	7	7
Kalokol	28,735	30,485	32,342	34,311	36,400	13	14	15	16	17
Turkwel	49,881	52,918	56,141	59,560	63,187	9	9	10	11	11
Loima	33,979	36,047	38,242	40,571	43,042	10	10	11	12	12
Kakuma	97,114	103,028	109,303	115,959	123,021	26	28	30	31	33

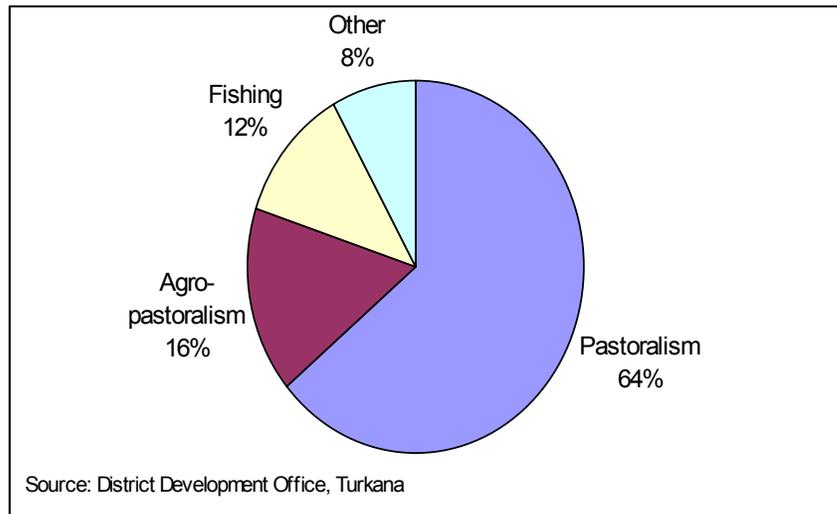
A Key feature of the district is the presence of the Kakuma refugee camp with a population of approximately 100,000 refugees with an influx of approximately 900 refugees yearly

1.7 Social, Cultural and Economic characteristics

The district is made up of less than one-third of the land that is suitable for farming hence limiting economic activities in the district. This has contributed to the overall poverty index being more than 71%, with less than one-third of the population in some form of wage employment. Pastoralism is the main economic activity in the district with agro-pastoralism coming in a distant second. Fishing is a key activity for people living along the lakeshore.

The rest earn their livelihoods from other activities such as , baskets or brooms making; running small-scale businesses; and undertaking casual employment. There are also some mining activities, especially in the southern parts of the district.the figure 1 below shows the main economic activities in the district.

Main Economic Activities



Animals constitute a key source of wealth, with camels and cattle being particularly prized, though goats and sheep are also kept to meet more immediate needs. They provide for almost all the Turkana's material and nutritional needs, and are also symbols of social standing.

Livestock provide pastoralists both with resources to provide for their immediate nutritional needs (e.g. meat and milk) and also to support economic activity. They sell or barter live animals and livestock products, mainly hides and skins, to generate cash income to buy other foodstuffs such as sugar. In 2004, over 10,000 kg of hides and about 2.5 million litres of milk were sold¹.

The sector faces numerous constraints and challenges that limit the productivity of pastoralism. Endemic diseases, poor livestock prices, lack of livestock marketing information, and insecurity, all lower the productivity of pastoral's. Poor husbandry practices and long trekking distances also consume energy that could be more effectively put to use. Still, there is an encouraging trend in the increase in the sales of goats over the last few years.

Turkana is endowed with significant natural resources, including limited deposits of minerals such as gold, gemstones and gypsum. It has thin forests along the riverbanks and the hills, while Lake Turkana is a major source of fish. Other resources include alluvial soils and wildlife.

The district has a poverty level of over 71%. These level varies with the divisions as follows;

Central (72 %) Kaaling(57%) Kakuma (66%) Kalokal (71%) Katilu (51%) Kerio (52%)
Kibish(59%) Lapur(55%) Loima(61%) Lokichar (65%) Lokichoggio (67%) and Lokitaung
(67%).

CHAPTER TWO

2.0 Environment and natural resources

2.1 Soil and land use

2.1.1 soil

Soils are not well developed due to aridity and constant erosion by water and wind. Often they are capped by stone mantles. Colluvial soils tend to be reddish over the basement system and generally grey buff or white over the volcanoes. Aeolian soils are dune sands either active or fossil; Alluvial soils range from coarse sands to flash flood silts, while black or brown clays occur locally in areas of impended drainage.

Due to the low rainfall and high temperatures there is a lot of evapo-transpiration resulting into deposition of salt in the soil and capping on the surface. As a result only 30% of the district soils can be rated moderately suitable for agricultural production.

These moderately fertile soils are found at the central plains of Lorengippi, the upper Loima and the lowlands of Turkwel, Nakaton and Kawalathe drainage along the lake at Todonyang plains, the lower Kalokol and Turkwel-Kerio River and a portion of Loru plateaus. The table below shows the soil distribution and their characteristics

Table 3: Soil distribution and their characteristics

Rock Material	Type/Soil Parent	Type of soils	Characteristics	Distribution (Km ²)	% Cover age
Undifferentiated metamorphic rocks, predominantly gneisses		Loamy sands, clay loams	Well drained, shallow and stony, low productive capacity due to frequent rock out crops	702 Km ²	1.1%
Undifferentiated tertiary volcanic rocks, including basalts, rhyolites and pyroclastic rocks		Friable clay loam of various colours	Well drained, shallow, very gravely, stony and rocky, productive capacity very low due to the rocky and bouldery character of the land its low moisture reserves	3229 Km ²	5%
Undifferentiated metamorphic rocks, mostly banded gneisses,		Friable loamy sand to sandy	Well drained, shallow, rocky and stony,	1334 Km ²	2.1%

poor to moderately rich in Ferro magnesium minerals	clay loam of various colours	productive capacity low due to shallowness and low water holding capacity		
Undifferentiated tertiary volcanic rocks, including basalts, rhyolites and pyroclastic rocks	Clay loam to silty clay loam	Well drained, very yellow friable, calcareous, gravelly and stony	2808 Km ²	4.3%
Undifferentiated volcanic rocks, basalts capping pyroclastic rocks with interbedded older lava's	Clay to fine sandy clay loam, bouldery red clay	Well drained, very shallow, yellowish brown, rocky, stony and gravelly	2246 Km ²	3.5%
Recent basalts, partly covered by pyroclastic material and ashes	Fine gravelly sandy clay loams	Excessively drained, higher humus content in the top soils. Productive capacity high due to a fair soil moisture storage, good infiltration capacity and high soil fertility	140 Km ²	0.2%
Undifferentiated tertiary volcanic rocks mainly basalts	Rocky outcrops, stony and boulder clay loam	Moderately to well drained, shallow to moderately deep, yellowish brown to dark red	562 Km ²	0.9%
Undifferentiated tertiary volcanic rocks basalts, trachytes and pyroclastic rocks	Clay loam	Well drained, shallow to deep, dark reddish brown, gravelly and stony	1334 Km ²	2.1%
Undifferentiated tertiary volcanic rocks mainly strong tilted strata of basalts, less consolidated pyroclastic materials	Stony clay loam	Well drained, very shallow, yellowish brown, calcareous, locally saline, extremely gravelly and stony	7862 Km ²	12.2%
Undifferentiated metamorphic rocks	Stony coarse sandy loam	Well drained shallow to moderately deep, yellow brown to yellowish red	1123 Km ²	1.7%
Undifferentiated tertiary volcanic rocks and derived colluviated material	Clay loam and clay	Well drained, deep and shallow, dark reddish brown, calcareous, stony and in some places saline	1264 Km ²	1.6%
Undifferentiated tertiary volcanic rocks and derived colluvial and alluvial deposits	Clay to loam	Well drained, shallow to moderately deep, dark reddish to dark grayish brown,	3510 Km ²	5.4%

		calcareous, locally saline, very friable		
Colluvium and alluvium derived from undifferentiated volcanic materials	Clay loam to heavy clay	Moderately to imperfectly drained, moderately deep to deep, very dark grayish brown to dark brown, firm, strong calcareous, locally saline strongly sodic in the deeper subsoil	7301 Km ²	11.3%
Undifferentiated volcanic rocks and mainly alluvial sediments	Fine sandy loam	Well drained, very deep, pale brown, very friable to loose, saline	2036 Km ²	3.2%
Sub-recent volcanic ashes, partly redeposit by alluvial processes	Sandy clay loam	Well drained, very deep, very friable, calcareous stony and gravelly	702 Km ²	1.1%
Colluvium and alluvium derived from undifferentiated metamorphic rocks	Sandy clay loam, stratified loamy sand	Well drained, very deep, yellowish brown, compact, calcareous saline and sodic with a fine gravelly surface layer	4074 Km ²	6.3%
Tertiary sandstones and conglomerates	Clay to loam	Well to moderately drained, very shallow to deep, pale brown to yellowish brown, calcareous, extremely gravelly with a pink coloured quartz-gravel pavement on the surface. Extremely saline	913 Km ²	1.4%
Undifferentiated volcanic rocks mainly basalts	Boulder clay	Moderately well drained, moderately deep, yellowish grayish brown, calcareous firm, stony	421 Km ²	0.6%
Undifferentiated metamorphic rocks, mainly gneisses, moderately rich in Ferro magnesium minerals	Loamy coarse sand to coarse sandy clay loam	Well drained, very shallow, yellowish red to dark brown, gravel	2948 Km ²	4.6%
Strong weathered older sediments, derived from undifferentiated metamorphic rocks	Sandy clay loam to sandy loam	Well drained, very deep dark reddish brown, compact	2668 Km ²	4.1%

Mostly clay sediments, derived from undifferentiated volcanic and metamorphic rocks	Clay	Imperfectly drained, very deep, dark brown, calcareous, saline and sodic	2457 Km ²	3.8%
Sub-recent sandy and clay riverine alluvium	Stratified micaceous fine sand to sandy loam	Well drained, very deep, pale brown to dark brown, calcareous, saline and sodic in deeper sub soils	3931 Km ²	6.1%
Sub-recent clay alluvium	Firm clay loam, local cracking clay	Imperfectly poorly drained, very deep, dark brown calcareous, saline and sodic	2527 Km ²	3.9%
Alluvial and lake bed deposits derived from recent sub-recent volcanic sources	Silty clay with a salt crust at the surface	Imperfectly to poorly drained, very deep, olive brown, extremely saline, sodic and calcareous	491 Km ²	0.8%
Older alluvium and sub-recent wind blown deposits	Loamy sand to sand	Excessively drained, very deep, pale brown to brown loose, imperfectly drained, calcareous and saline	1053 Km ²	1.6%
Fine sandy, silty and loamy lake bed deposits	Stratified loamy fine sand	Very deep, yellowish brown, very friable, slightly saline and imperfectly drained	562 Km ²	0.9%
Fine sandy to clay, partly consolidated, lake bed deposits, mostly with thick wind blown sand cover	Loose stratified sand, stratified loamy sand to fine sand, gravelly loam to gravel	Excessively drained, very deep, pale brown, very friable, saline and calcareous	2668 Km ²	4.1%
Recent, sub-recent sandy, loamy and clay riverine alluvium	Fine sands to light clay	Well to moderately well drained, very deep, pale brown to dark brown, loose to very friable and firm, stratified, micaceous, in some places calcareous and saline	2176 Km ²	3.4%
Wind blown deposits derived from undifferentiated sources	Fine to medium sand	Excessively drained, very deep, pale brown, very friable to loose, locally calcareous	562 Km ²	0.9%
Sub-recent volcanic rocks, basalts	Rock outcrops, stones and		281 Km ²	0.4%

	boulders			
Recent basalts, partly covered by volcanic ashes and pyroclastic rocks	Rock outcrops, ash soils of varying depth		702 Km ²	1.1%

Source: Range Management Handbook of Kenya Vol.119 and DAO Turkana reports

2.2.2 Land and Land Use

Due to the predominantly arid climate there is relatively little vegetative cover to stabilize the soil. As a result the soils are easily eroded. Wind erosion and deposition is an important feature in the district and areas of strong sheet erosion occur on all steep slopes where vegetation is removed by the grazing animals. There are local occurrences of highly saline soils and of soils with low mineral contents. Only a small part of the district soils have potential for irrigated agriculture.

The cultivated areas in the district has <2.5% slope. Most of the cultivation is carried out communally.

Table 4: Land use potential and agro-ecological zones

Division	Area Km ²	AEZ(S)	Current Use	Potential Land Use
Lokichoggio	9126	Lower midlands (LM5) Inner lowlands 6 (IL6)	Livestock keeping	Livestock keeping, water harvesting for farming
Kaaleng	10830	Inner lowlands 6 (IL6) Inner lowlands 7 (IL7)	Livestock keeping	Livestock keeping
Lapur	4652	Inner lowlands 7 (IL7)	Livestock keeping	Livestock keeping
Lokitaung	5208	Inner lowlands 7 (IL7)	Livestock keeping	Livestock keeping
Kibish	5127	Unsurveyed area	Livestock keeping	Livestock keeping, water harvesting for farming
Lokichar	2913	Inner lowlands 5, 6 & 7 (IL5, 6 & 7)	Livestock keeping	Livestock keeping
Oropoi	5348	Lower midland 5(IL5) Inner lowlands 6 (IL6)	- Livestock keeping - Sorghum growing	Livestock keeping, water harvesting for farming
Lokori	5008	Inner lowlands 4, 5, 6 & 7 (IL 4, 5, 6 & 7)	-Irrigation sorghum and maize growing - Livestock keeping	Livestock keeping, water harvesting for farming, irrigation
Lomelo	5962	Lower midlands 5 (LM5) Inner lowlands 5, 6 & 7 (IL5, 6	Livestock keeping	Livestock keeping

		& 7)		
Katilu	1187	Inner lowlands 5 & 6 (IL5 & 6) Lower midlands 5 (LM5)	- Irrigation scheme - Sorghum and maize growing, livestock	Livestock keeping, water harvesting for farming, irrigation
Kainuk	2504	Inner lowlands 4 & 5 (IL5 & 6) Lower midlands 5 (LM5)	- Irrigation scheme - Sorghum and maize growing - Mangoes and paw paws - Livestock keeping	Livestock keeping, water harvesting for farming, irrigation
Central	2099	Inner lowlands 7 (IL7)	Livestock keeping, very little agriculture	Livestock keeping, water harvesting for farming, irrigation
Kerio	2703	Inner lowlands 7 (IL7)	Livestock keeping, very minimal agriculture	Livestock keeping, water harvesting for farming, irrigation
Kalokol	3470	Inner lowlands 7 (IL7)	Livestock keeping, very minimal agriculture	Livestock keeping, water harvesting for farming
Turkwel	3093	Inner lowlands 5, 6 & 7 (IL5, 6 & 7)	Irrigation scheme and livestock keeping	Livestock keeping, water harvesting for farming, irrigation
Loima	2174	Inner lowlands 5 & 6 (IL5 & 6)	Livestock keeping	Livestock keeping
Kakuma	5596	Inner lowlands 6 & 7 (IL6 & 7)	Livestock keeping, little farming	Livestock keeping, water harvesting for farming

Source: *Eco-Climatic Zones of Northern Kenya Map*

NB: There is no finer details showing agro-ecological zones by area (Km²) in each division but can be estimated as below; in % ages for the district.

1. Lower midland zone 5 (semi-arid) 3%
2. Inner midland zone 4 (transition) 1%
3. Inner lowland zone 5 (semi-arid) 16%
4. Inner lowland zone 6 (arid) 42%
5. Inner lowland zone 7 (very arid) 38%

Key Environmental Issues

- Locust invasion
- Soil erosion
- Invasion of farm land and pastures by *Prosopis juliflora*
- Habitat loss

- Loss of biodiversity

Proposed Interventions

- Pegging an protection of
- aerial spraying of tree locusts
- Community mobilization and training on alternative uses of prosopis
- Pegging of riparian areas
- Promote Rain water harvesting for crop and animal production
- Promote soil conservation measures
- Management of Prosopis on farm land and pastures
- Encourage afforestation and reforestation programmes
- introduction of agroforestry systems
- Enforcement of relevant laws and legislations

2.3 Agriculture, livestock and fisheries

2.3.1 Agriculture

There are two main farming systems in the district and they are pastoralism and agro-pastoralism. Pastoralism is the most dominant economic activity in the district where pastoralists are mobile, moving livestock between the wet season grazing areas (plains and closer to their settlements) during and just after the rainy seasons and to the dry season grazing areas (high ranges and towards the district borders). Other systems within pastoralism include; transhumance and nomadism.

Agriculture is mainly subsistence. The main crops grown include sorghum, maize, cowpeas and green grams. Others are date palm, mangoes, local vegetables, kales, spinach, bananas and tomatoes. The cropping system practiced in the district include; crop rotation, mono-cropping and kitchen gardening. the table below shows the agricultural potential of farming systems

Table 5: Land Use Potential-agricultural production systems

Division	No. of Locations	No. of Sub-Locations	Total Area Km ²	Irrigation Area (Ha)	Rainfed Agriculture (Ha)
Lokichoggio	6	13	9126	-	70
Kaaleng	4	13	10830	-	-
Lapur	3	7	4652	-	-
Lokitaung	4	11	5202	-	-
Kibish	3	7	5127	-	110
Lokichar	3	7	2913	-	-
Oropoi	4	11	5008	-	120
Lomelo	5	9	5962	-	-

Katilu	1	4	1187	212	280
Kainuk	2	6	2504	462	300
Central	2	5	2099	300	100
Kerio	3	8	2703	-	145
Kalokol	3	8	3470	120	119
Turkwel	4	14	3093	736	250
Lokori	4	11	5008	920	-
Loima	3	12	2174	-	15
Kakuma	3	10	5596	-	500
District Total	56	158	77,000	2750	2009

Key Environmental Issues

- land degradation
- Poor farming methods
- Inadequate soil and water conservation structures
- Water pollution due to effluent discharge from tea industries

Proposed interventions

- Promote soil and water conservation measures
- Enforcement of relevant regulations and legislations
- Intensify agricultural services to the local communities through seminars, farm works and demonstration

2.2.2 Livestock

Livestock Production is the main economic activity practiced in Turkana District; where the nomadic pastoralists utilize a wide variety of habitats under difficult and diverse environmental circumstances. The pastoralists' basic survival strategy is to use the low laying more arid and less productive rangelands during the wet season and move to higher elevation, less arid and more productive rangelands in the dry season. Traditionally the Turkana pastoralists have practiced wet season grazing and Dry season grazing regimes. The main classes of livestock kept in Turkana include cattle, goats, sheep, camels, donkeys and poultry to a lesser extent.

The livestock systems practiced in the district include; Pastoralism (extensive system) at 64% and Agro-pastoralism (both extensive and intensive) at 16%.

Extensive livestock production system is the most reliable source of livelihood in Turkana district. The pastoralists are forced to lead a nomadic way of life and move with their livestock in search of water and pastures and are sometimes forced to cross into bordering

countries such as Uganda to the west and Sudan, Ethiopia to the north and north-east in search of greener pastures.

The highest threats to this way of life are drought and insecurity which have adversely affected livestock production in the district. As a result of recurrent droughts there is environmental degradation due to overgrazing. Areas which are rich in pastures are not accessible to the pastoralists owing to lack of security.

Agro-pastoralism is a system where both livestock and crop production activities are practiced and mainly confined to low lying areas along riverine and densely wooded areas. Livestock contributes 25 – 30% of the total income in this system in some areas milk animals are confined and fed in enclosures. Agro-pastoralists practice both intensive and extensive system. A section of the herd is moved from place to place in search of forage and water while in intensive system lactating animals are confined and fed on forage obtained from their farms situated in irrigation schemes along river Turkwel.

Table 6: Livestock Populations Estimates and Trends

Year	Cattle	Sheep	Goats	Camels	Donkeys	Poultry
1978	522,900	800,310	1,867,390	112,400	-	-
1981	147,000	335,340	782,460	108,000	-	-
1982	158,100	342,690	799,610	99,800	77,700	-
1984	162,900	463,800	1,082,200	94,100	57,800	-
1987	221,100	556,830	1,299,270	108,800	62,200	-
1988	288,500	650,070	1,516,830	8,100	44,100	-
2004	197,900	1,054,400	2,021,000	172,400	35,160	11,202
2005	197,900	1,054,400	2,021,000	172,400	35,160	12,835
2006	197,900	1,054,400	2,291,000	172,400	35,160	12,835

Table 7: Bee keeping Production Trends

Quarter	Type of Hive	Total No. of Hives	No. of Hives Occupied	Estimated Honey Yield Per Hive	Estimated Total Honey Harvested (Kgs)
1 st	KTBH	904	420	5	2,100
	Langstroth	97	52	5	260
	Traditional	9190	5,300	3	15,900
2 nd	KTBH	954	425	8	3,400
	Langstroth	106	52	8	416
	Traditional	9,190	5,300	3	15,900
3 rd	KTBH	1,054	510	8	4,080
	Langstroth	136	50	8	400
	Traditional	9,190	5,300	3	15,900
4 th	KTBH	1,067	250	8	6,000
	Langstroth	136	85	8	680
	Traditional	9,190	5,450	3	16,350
TOTAL					81,386 Kgs

Key Environmental Issues

- Pollution
- Overgrazing leading to land degradation
- Livestock pests and diseases
- Poor animal husbandry
- Soil erosion

Proposed interventions

- Control of pollution by enforcing relevant laws and regulations such as water quality regulations ,waste management regulations and Public Health Act
- Control of pests and livestock diseases
- Enhance soil conservation measures
- enhance extension services to livestock farmers
- community sensitization
- Encouraging farmers to adopt proper stocking rates to maximize on productivity and reduce Environmental degradation
- Addressing issues of insecurity in the District

2.2.3 Fisheries resources

Lake Trukana is the main source of all captures fisheries in the district Lies between altitudes of 368 and 373 m above sea level. About 260 Km long in a North-south direction and 40 Km wide and 7,560 sq km. the district has 12 fish landing beaches on the western side and 5 on the Eastern side. River Omo is it's main inlet and accounts for 90 % of the influx. The lake has a salinity of 2224 ppm and has no outlet.

Fish Productions

All fish produced in the district is from Capture fisheries. Aquaculture/fish farming is not practiced due to the prevailing climatic conditions. Lake Turkana is the only underexploited lake in Kenya and has the potentials of producing about 30,000 MT annually as opposed to the current production of about 6,000 MT. Twelve fish species are commercially exploited from the lake.

The table 8 below shows fish production patterns in the district.

Fish production Pattern

Table 8: production systems

Year	WT(MT)	Year	WT(MT)
1963	1,250	1971	3,600
1964	780	1972	4,100
1965	1,180	1973	5,100
1966	1,540	1774	5,800
1967	1,750	1975	15,560
1968	2,100	1976	17,044
1969	3,700	1977	15,472
1970	4,800	1978	15,560
1979	13,731	1988	4,128
1980	12,384	1989	3,634
1981	10,529	1990	678
1982	11,044	1991	899

1983	10,113	1992	987
1984	8,484	1993	1,349
1985	7,460	1994	1,567
1986	7,324	1995	1,965
1987	7,240	1996	4,629
1997	6,346		
1998	10,520		
1999	4,900		
2000	3,216		
2001	5,804		
2002	4,583		
2003	5,337		
2004	6,412		
2005	2,400		
2006	4,399	(Source:	Fisheries Depart Turkana)

(Source: KMFRI, Fisheries Depart Turkana).

Key Environmental Issues

- Declining fish stocks
- pollution
- Loss of fish species biodiversity
- Poor waste management at the beaches
- Receding water levels of the Lake hence interfering with fish breeding grounds
- Illegal fishing allowed during closed seasons
- Socio-cultural practices that promote unsustainable fishing practices and ad hoc saving.

Proposed Interventions

- Controlling fishing through regulation and enforcement of existing regulations
- Control pollution and use of chemical fishing
- Promote fish farming and introduce new species of fish
- Promote use of recommended fishing nets, methods and fishing efforts
- Protect and conserve fish breeding grounds/wetlands
- Manage waste materials in beaches
- Install proper fish storage facilities to reduce post harvest loss
- Empower local communities to enter fish export market

2.4. Water resources

Turkana District is divided into four major Catchment areas namely:-Suguta,Lake Turkana,Lotikipi plains and Sanderson Gulf.The Major rivers in the district are; Kerio,Turkwel,Tarach and suguta River

Status and Trends of Water Resources

Most of the rivers and their respective lagga system in Turkana tend towards east to the Lake Turkana. As they move they collect a lot of dissolved substances and that's why the water in these rivers are very turbid.

Lake Turkana is mainly fed by Omo River (Contributes about 95% of the waters) which originates from Ethiopia. The lake has no outlet. Turkwel and Kerio rivers also drain into Lake Turkana. It was recently reported that the lake is receding at an alarming rate (Daily Nation, 2006). The lake water is generally not suitable for drinking by either humans or livestock. The Lake water is characterized by high pH (8.6-10.6), high content of sodium and potassium, and high content of total dissolved solids. The lake water also has high amounts of silt and organisms. This makes the water not portable, not fit for long periods of livestock watering and unfit for irrigation. The water quality is not homogeneous. The water is of 'better' quality near the Omo Delta and has low salinity.

Fresh water boreholes are contained along major rivers/laggas and on tertiary volcanic. Of the 282 boreholes assessed, 62 of them were too saline for human consumption and 14 are considered too saline even for livestock. There is a reduced river flow due to climatic changes. The table below shows the summary of water sources in the district. About half of the sub-locations in Turkana have no safe water source. These are mainly concentrated in Lomelo, Loima and Kibish divisions. Together with human population density these results can give a quick indication of where to have water development interventions that cover both quality and quantity of safe water sources.

Majority of the locations in Turkana district have over 80 % of the population without acceptable service level. For mapping purposes, acceptable service level has been taken as access to clean (borehole, hand pump, sand dam, etc) water with good reliability. According to the data only Lokichogio and Lodwar Town have less than 60% of the population without acceptable service level. Lokori and Lorogon populations fall in the range of between 61-80% without safe water

According to the Ministry of State for Special Programmes Monthly Drought bulletin for November 2007, the walking distance to fetch water has slightly increased to 3.2 km in November from 2.1 km in October 2007. The residents walk for 2.1 hours as an average time to fetch water .the table 9 below shows the summary of water sources in the district.

Table 9: Summary of Water Sources

Source	Number
Lake	1
Boreholes	282
Wells	155
Dams/Pans	197
Springs	26
River Abstractions	19
River Access Points (Edoket)	3
Emergency water tankering points	19
Lake Access points	17
Rock catchments	19
Sand/subsurface dams	21
Roof catchments	~ 3

Source: Turkana MIS

Key Environmental Issues

- River bank Erosion
- Clearance of riverine vegetation for building materials, mats, baskets, fencing poles, encroachment cultivation charcoal burning and wood carving
- Excavation of soil near the riverbank for brick making
- Uncontrolled waste disposal polluting surface water bodies
- Overgrazing of livestock along the riverine
- Concentration of boreholes at Lodwar water supply, which can result to depletion of the aquifer.
- High pressure wind causing serious wind erosion and transfer of sands
- Dumping sands in houses (Natural Phenomenon)
- Invasion of prosopis Juviflora
- Sand harvesting
- The management of Turkwel River Gorge dam
- Over abstraction of surface water from River Turkwel
- Encroachment of water catchment areas

Proposed Interventions

- Tree planting along the riverine
- Reduce encroachment along the riverine

- Proper land use zoning
- Promote soil conservation measures
- Enforce rules and regulations of the water Act 2002/EMCA 1999
- Pegging and demarcating of riparian land.
- Enhance Proper waste disposal methods
- Promote awareness on water resource management
- Promote Afforestation and re - Afforestation programmes
- Encourage formation of sand harvesting association and enforce sand harvesting guidelines
- Involvement of the community in management of the water resources
- Flood control and storage of water resource for Turkwel aquifer.
- Control of abstraction from the river by issue of permits/renewal of permit by irrigation schemes
- Establish more river gauging stations along the Turkwel River
- Efficient management of water in irrigation scheme
- Protection and conservation of riparian areas

2.5 Forestry

The types of forests found in the district are Lake shore forests, Riverine forests, Wood shrub land and Hill top forests.

Status and Trends of Forests Resources

Deterioration of vegetation around the refugee camp and harvesting zones, firewood harvesting for refugees, conversion forest areas and expansion of land for irrigation are common in the district.

Unsustainable charcoal production study done by KFS in Turkana between 2004 to 2006 indicates an average of 25000 bags of charcoal left the district per month. This is equivalent to a total of Kshs. 5,000,000/=per month earned by communities. The table below shows the vegetation cover in the district. the table 10 below shows the types and status of forests in the district.

Table 10: Types and status of forests

	VEGETATION		Extend (ha) APPROXIMATE AREA (KM2)
	Types of forests PHYSIOGNOMIC CLASS	FLORISTIC COMMUNITY	
1	Forest	<i>Juniperous procera</i> <i>Losonia inamis</i>	106
2	Dense bush land	<i>Euphobia Nyikaye</i> <i>Pappae capensis</i>	261
3	Bush land	<i>Acacia Senegal</i> <i>Acacia tortilis</i> <i>Comophora Africana</i>	285
4	Wooded annual grassland	<i>Acacia tortilis</i> <i>Aristida motabilis</i>	1142
5	Wooded annual grass land	<i>Acacia tortilis</i> <i>Indigofers spinosa</i> <i>Heliotropium Stuedleri</i>	170
6	Dense bushland	<i>Acacia reficiens</i> <i>Indigofers species</i>	410
7	Bush land	<i>Acacia reficiens</i> <i>Indigofers species</i> <i>Sedera birsuta</i>	4096
8	Woodland	<i>Acacia tortilis</i> <i>Indigofera spinosa</i> <i>Indigofera cliffordiana</i>	194
9	Dense bush land	<i>Acaciaa tortilis</i> <i>Indigofers spinosa</i>	66
10	Wooded dwarf shrub land	<i>Indigofera species</i> <i>Acacia species</i>	3472
11	Dwarf shrubland	<i>Sericocomopsis</i> <i>Hildebrandtii</i> <i>Seddera Hirsuda</i>	171
12	Wooded dwarf shrubland	<i>Indigofers spinosa</i> <i>Balanites aegyptica</i>	2127
	VEGETATION		
	PHYSIOGNOMIC CLASS	FLORISTIC COMMUNITY	
13	Shrub land	<i>Salhadora Persia</i> <i>Balanite aegyptica</i>	
14	Riparian forest	<i>Acacia tortilis</i> <i>Salhadora persia</i>	
15	Riparian Forest	<i>Acacia tortilis</i>	

5		<i>Hyphaene verticosa</i>
1 6	Wood land	<i>Acacia tortilis</i> <i>Salvadora persia</i>
1 7	Dense shrub land	<i>Acacia tortilis</i> <i>Salvadora persia</i>
1 8	Shrub land	<i>Acacia tortilis</i> <i>Salvadora persia</i>
1 9	Irrigated agricultural land	-
2 0	Annual grass land	<i>Solanam coagulanus</i>

Source of information Map DRSRS
KFS Turkana

Key environmental issues

- Deforestation
- Encroachment of the forest for cultivation
- Illegal logging
- Lack of environmental /forest management
- Loss of biodiversity
- Loss of vegetation cover through charcoal burning and extraction of fire wood
- Poor methods of extracting medicinal parts trees
- Unsustainable methods in natural resource utilization
- Land use conflicts
- Invasive species

Proposed interventions

- Awareness creation and sensitization of people living around the forest areas.
- Develop forest management plans
- Encourage community participation in forest management
- Enforcement of laws and regulations on illegal logging and charcoal burning activities
- Enforcing the relevant legislative measures
- Initiating afforestation and reafforestation programmes
- Introduction of other sources of income generating activities other than charcoal burning
- Involvement of the local people in the management of forestry resource through participation in afforestation and management planning processes.

2.7 Wildlife

The district has two national reserves. These are south turkana national reserve (area 1091 km²) and central island national reserve that contains (area 5km²). Wildlife found in the district include;crocodiles,monitor lizards,flamingoes,fish snakes,Elephants,Dik dik,Zebra,Hyenas,Pythons,Baboons and Monkeys

2.8 Biodiversity conservation

The district is endowed with both flora and fauna. The district is endowed with important fauna and flora due to the presence of national reserves and forests. They are important sources of food, beverages, medicine, forage, vegetable oil, fibre and hides and skins. The forests are believed to have several species of flora, fauna & micro-organisms. However, many species still remain unknown because they have not been documented or not yet even discovered.

Major Eco systems include Loima hills forests, Dry land flat plains, Mountain ranges, Riverine vegetation, springs and other watering points

The main vegaetation type in the district include bush lands, open grass lands and patches of shrubs, trees and shrubs, shrub wood lands and perenial grasses

The types of ecosystem biodiversity include mountain range eco system, perennial grasses, riverine vegetation eco system, riverine vegetation eco system, trees and shrubs, marine and inland water ecosystem

Key Environmental Issues

- Unplanned land use practices that threatens conservation on biodiversity
- Deforestation
- Lack of soil and water conservation measures.
- Invasive species
- Drought
- Overgrazing
- Forest encroachment for settlement and farming
- Poaching of wildlife
- Destruction of wildlife migratory corridors and dispersal areas
- Wildlife diseases.
- Wild fires caused mainly by poor honey harvesting activities
- Livestock restocking after droughts
- Insecurity
- Inadequate watering points and or distribution
- Frequent droughts

Proposed Interventions

- Enforcement of legislation to protect endangered species
- Promote diversification of alternative livelihoods
- Formation of Water Resource Users Associations (WRUAs)
- Involvement of community participation in environmental conservation
- Formation of community based conservation groups to protect and conserve the hilltops
- Create awareness on conservation and sustainable utilization of biodiversity resources amongst the community.
- Application of indigenous knowledge (IK) in biodiversity conservation alongside other approaches
- Control of inappropriate land use and encroachment into wildlife conservation areas and protected/gazetted forests
- Community involvement in forest management.
- Promotion of modern bee keeping techniques to control wild fires
- Peace building initiatives to enhance security
- Livestock water improvement to promote even utilization
- Enhanced livestock off take

CHAPTER THREE

3.0 Human settlement and infrastructure

3.1 Human settlement and planning

In Turkana District, the land tenure since independence has been only in Trust Land. There are two types of Trust Land in the district include Lodwar Municipal and Turkana County Councils.

The centres that have development plans include; lodwar, lokichoggio, kakuma, kibish, lokichar, katilu, lorugum, Kapeddo, Lokitaung, Lokori, Kainuk, Kaputir, Lopur, Kalokol

Land use types in the district includes; residential, industrial, recreational, public purpose, public utility, commercial, agricultural, agricultural, pastoralism, mining and quarrying

The Land Adjudication has not begun in Turkana District due to lack of staff and legal matters. However, demarcation is being done in township areas to control haphazard developments. This has been done particularly in Lodwar and the main town of Kainuk, Kakuma and Lokichoggio.

In the rural areas people settle in group manyattas for rapid response in case of attack. Due to pastoralism, people settle temporarily in places where there is pasture while fishermen settle around the water mass. This is the most important factor affecting settlement in the district and the reason is self-explanatory.

Settlement Patterns and Distribution

The population density in the district varies from 29 persons per Km² in Kakuma Division to 1 person per Km² in Kibish Division.

Permanently and semi-permanently settled areas in the district are found along Turkwel and Kerio rivers where irrigated farming is practiced. Along these areas, there exist peri-urban market centers with the necessary social infrastructures like schools and health facilities that support human settlement.

There is no clear pattern of poverty distribution in the district as the poor and the rich exist side by side especially in the rural areas. Nevertheless most of the poor are found in the northern part and central plains due to recurrent drought and diseases. Cattle rustling from neighboring countries have worsened the situation.

The poor are found in the major towns and market centers of the district. They include migrants from other parts of the district in search of relief food and assistance from relatives engaged in productive economic activities in towns and market centers.

There is also an influx of refugees in the district. The biggest camp is Kakuma camp. The table 11 below shows the population distribution.

Table 11: Population Distributions and Density by Division (2002)

DIVISION	POPULATION	DENSITY
Lokichoggio	38,972	4.3
Kaaleng	25,905	2.4
Lapur	13,764	3.0
Lokitaung	24,325	4.7
Kibish	6,523	1.3
Lokichar	23,489	8.1
Oropoi	19,408	3.6
Lomelo	6,556	1.1
Katilu	13,514	11.4
Kainuk	12,708	5.1
Central	38,685	18.4
Kerio	16,595	6.1
Kalokol	30,948	8.9
Turkwel	53,722	17.4
Loima	36,595	16.8
Kakuma	104,624	18.7
TOTAL	485,627	6.3

Source: District Statistics Office, Lodwar, 2001

3.2 Human and environmental health

Common diseases in the district include malaria, upper respiratory infection, diarrhoea, skin infections, eye infections, intestinal worms others are cholera outbreaks, zoonotic diseases, florosis and infections from animal bites.

3.3 Human and environmental health

Common diseases in the district include malaria, upper respiratory infection, diarrhea, skin infections, eye infections, intestinal worms others are cholera outbreaks, zoonotic diseases, florosis and infections from animal bites. the table below shows the incidences of common environmental diseases in the district. The table 12 below shows Incidences of common environmental diseases

Table 12: Incidences of common environmental diseases

No	DISEASE	1995	1997	1998	1999	2000	2002	2006
1	Malaria	33616	34716	43344	41137	55555	66375	65290
2	URTI	25935	20717	20494	25862	37723	38524	48536
3	Diarrhea	8238	9385	9834	10225	14442	15054	19684
4	Skin infection	6845	4412	6117	7337	6610	6662	10824
5	Eye infection	6355	5333	3696	6363	9528	NR	8251

Key Environmental Issues.

- poor environmental sanitation
- congestion in urban settlements
- low level of awareness of safe and hygienic use of water
- spread of diseases
- poor refuse disposal ,environmental pollution
- lack of environmental cleanliness

Proposed Intervention

- Promotion of sanitation and hygiene standards in schools and public place
- Prevention and control of disease outbreaks
- Awareness campaigns for diseases prevention and control,
- Control of disease vectors,
- promoting environmental management through community and stakeholders participation
- Inspection and monitoring of existing water points,
- Supervision and advise on safe and proper disposal of both solid and liquid wastes,

3.4Pollution and waste generated from human settlement

The rapid population growth especially in urban areas has led to demand for urban, agricultural and industrial activities leading to an increased amount of waste to the environment. In Turkana district Some of the waste generated within the district include, Solid wastes, Liquid wastes, medical wastes, industrial wastes, radioactive wastes, excreta and urine and Poor farming activities along the two rivers.

Key environmental issues

- Poor handling of waste from homesteads that leads to environmental health related diseases
- Pollution
- Inadequate sewerage system
- Inadequate physical planning

Proposed interventions

- Introduction of waste management technologies
- Encourage public private partnership

- Enforcement of relevant legislations including EMCA, Public health act, water act and physical planning act.
- Plan and develop sewerage facilities in all urban areas
- Rehabilitation of the quarries.
- Carry out comprehensive urban /physical planning
- promote appropriate building technologies and materials

3.5 Communication networks

The sector provides the necessary road infrastructure on which the District's development depends on. The major road is class A1 road which passes through the District from neighboring District-West Pokot to southern Sudan. This road is life line to Southern Sudan and most of the district. Transportation is normally cut off whenever there is rain at point like Kalobeyei, Kalimworok kakong and Lokichar. Most roads are of earth, murrum and gravel; hence most road works carried out is by grading. Total road length in the district is 2,556.5 kms.

There are a number of airstrips in the district. Lokichiggio And Kakuma Are The Major Ones. Others are Lodwar, Kakuma, Fergusson, Gulf, Lokitaung, Kibish, Eliye Spring, Lokichar, Lokori, Kaimothia, Kangitit, Kaputir, Katilu, Kokuro, Lokamarinyang, Loreng, Oropoi, Lorgum, Todonyang, Turkwel and Kaleng'

Key Environmental Issues

no.	prioritized issue/challenges	current intervention	proposed intervention(2007-10)
1.	degradation of roads and sides due to erosion	sides of roads protection -drainage works	proper shoulder work - conc. culvert drainage works
2	insecurity within neighbouring countries and district	grading and opening more roads. -provision of security	more security roads to be upopened
3	up-grading of roads and airstrips	grading	top dress with bitumen
4.	water logged site along the a1	drifts	

The districts Access to health care services is a major challenge. The Average distance between one facility to other 50km against WHO recommendation of 5km.the general infrastructure development is Poor due to Vastness and geographical formation of the district. The average distance traveled to health facility by residents is 30km. there is high incidence of TB/HIV and low detection rate due to Lack of comprehensive diagnostic capacity. There is risk of disease out breaks due to porous international borders. The ratio of doctor to patient is 1; 100,000 and nurse to patient is 1; 30,000 and this has led to poor health service delivery in the district. Furthermore the district suffers a poor referral system. is poor

The table below shows the number of health facilities in the district.

Table 13: Number of Health Facilities

TYPE	GOK	NGO	FBO	PRIVATE	TOTAL
Hospital	3	2	1	0	6
Health Center	1	0	6	0	7
Dispensary	30	7	30	0	67
Private Clinics	0	0	0	14	14
TOTAL	34	9	37	14	94

(Source District Health reports 2006)

Table 14: Distribution of Health Facilities by Type in Divisions

Division	Type Of Facility Turkana Districts					Catchment Population
	HOSPITAL	H/CE.	DISP.	PRIV.	TOTAL	
SOUTH						
Kainuk	0	1	6	0	7	25,492
Katilu	0	1	3	0	4	14,348
Lokichar	0	1	4	0	5	24,917
Lomelo	0	1	0	0	1	-
Lokori	0	1	4	0	5	20,487
SUB TOTAL						85,244
CENTRAL						
Loima	0	0	2	0	2	39,853
Turkwel	0	1	6	0	7	67,958
Central	1	0	5	7	13	41,071
Kerio	0	0	5	0	5	17,622
Kalokol	0	1	5	2	8	32,854
SUB TOTAL						199,358
NORTH						
Kakuma	3	0	3	0	6	111,040
Lokichoggio	1	1	5	0	7	41,381
Lokitaung	1	0	7	0	0	25,827
Kaaleng	0	0	4	0	4	33,005
Oropoi	0	0	4	0	4	20,606
Lapur	0	0	2	0	2	6,394

Kibish	0	0	2	0	2	6,936
SUB TOTAL						238,189
GRAND TOTAL						515,523

(Source District Health reports 2006)

Key environmental issues

- Pollution from transportation, use and storage of petroleum products
- Destruction of roads by heavy commercial vehicles.
- Inadequate health facilities
- Long distances discourage people to seek medical attention as frequently as needed
- Long episodes of drought cause devastation on animals and human suffering in terms of diseases and hunger
- Floods cordon off settlements hence exposure outbreak of diseases
- Non utilization of health facilities at some seasons, where pastoralists move away in search of pasture and water for human and livestock
- Disease episodes and occurrence

Proposed interventions

- Setting up working and active surveillance systems
- Public education on disaster preparedness and response
- Constant monitoring on environmental and climatic changes
- Early warning and reporting on any unusual occurrence
- Putting up emergency services in disaster prone areas
- Intensify research on disasters and disease occurrence.
- Set up psychosocial support for post hazard/ disaster effects

3.6 Education facilities

The district has the following primary and secondary schools as shown in the table 15 below

Table 15: Education Facilities

Education	
Pre-primary	
Number of pre-primary schools	383
Enrolment in pre-primary schools	27,102
Teacher/pupil ratio in pre-primary	1:74
Primary Schools	
Number of primary schools	176(170 public and 6 private)
Number of boarding schools	41
Number of enrolled pupils in primary schools	56,107
Enrolment rates in primary schools	40%
Drop out rates in primary schools	62.9%
Teacher/Pupil ratio in primary schools	1:40
Average years of school attendance	5
Number of secondary Schools	
Number of secondary schools	14
Enrolment in secondary schools	4,039
Enrolment rate in secondary schools	48%
Drop-out rate in secondary schools	24.1%
Teacher/pupils/ratio in secondary	1:23

3.7 Energy sector

The main source of energy in the District is wood fuel. This has led to the clearance of most vegetation.

Key environmental issues

- Air and indoor pollution
- Cultural hindrance on conservation of trees(women are not allowed to plant trees)
- Extensive deforestation
- High initial cost of accessing energy
- Loss of biodiversity
- Loss of habitats
- Soil erosion

Proposed interventions

- Awareness creation to the community on the importance of tree planting
- Design houses with adequate ventilations
- Encourage afforestation and reforestation programmes
- Enforce relevant legislations
- Enforcement of biodiversity regulations
- Introduction of efficient and affordable energy technology
- Promote soil conservation initiatives

CHAPTER FOUR

4.0 Industry, trade and service

4.1 Industry

Industry is a very important sector as it is a source of employment, income and overall development. The districts industrial sector has not been fully exploited.

4.2 Trade

The major types of trade practiced in the district include;

- Agricultural produce
- Fabrication/Garages
- Hardware stores
- Livestock trade
- Open air markets
- Pharmaceuticals and agro – chemicals
- Petroleum outlets
- Quarrying
- Supermarkets outlets
- Wholesale and retail

4.3 Services

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

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

Key Environmental Issues

- Waste water
- Gaseous emissions

- Solid waste
- Health and safety concerns for the workers
- Ignorance and selfishness among resource users
- Lack of awareness among the public
- Inadequate personnel and financial resources

Proposed Interventions

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

4.4 Tourism

The district has potential in tourism but this has not been fully developed, mainly due to the poor road network. The main tourist attraction in the district is mainly scenery beauty and cultural activities such as edonga dance, which is yet to be exploited. Sports and leisure for instance boat ride, water skiing and sport fishing is another area that needs to be maximized.

The district has historical sites such as Nariokotome in Lokitaung and The prison cell where our first president Mzee Kenyatta was detained in Lodwar and Lokitaung which can be developed and used to promote tourism in the district.

Key environmental issues

- Bio-piracy
- Poor waste management

- Wood fuel Extraction when camp sitting
- Soil Erosion
- Cultural Erosion
- Poor Infrastructures
- Invasive Species e.g *prosopis juliflora*

Proposed interventions

- Promotion of eco tourism (dances, songs, sport fishing, indigenous foods, herbs).
- Put in place waste management systems in tourist destinations
- Rehabilitate degraded areas.
- Education and awareness on environmental conservation
- Encourage community participation in tourism management
- Improvement of the infrastructures in the tourist areas
- Improve road network and security

4.5 Mining quarrying

Turkana District is covered by a variety of rocks, which include metamorphic rocks of the Mozambiquan Belt, volcanic rocks such as basalts, andesites and rhyolites as well as sedimentary rocks that include the Turkana Grits and Quaternary to Recent deposits.

The types of minerals found in the district include gypsum, gold, gemstones and geological materials such as building stones, hardcore, ballast and building sand. Gypsum occurs in the Kabua and Lochar areas where they were mined in the past. Currently there is no official mining of the gypsum although reports indicate that small quantities are extracted.

Gold is found in the Nadwat area of Makutano and in the newly discovered Sasame area of the district. Gemstones occur in various parts of the district including Kaleng, and Nadunga. The types of gemstones include green garnets, red garnets, ruby and sapphire.

Quarrying of building stone takes place in Lokore, Makutano and Kakuma areas. The type of rock extracted is mainly volcanic tuff, which is dressed into various sizes of building stone.

4.6 Sand harvesting

Sand harvesting is one of economic activities in the district. Most of the activity takes place along the river banks and deposited areas due to wind, and it is scooped manually in all the sites. Sand harvesting is regulated by Nandi North County Council under the local government Act.

Key Environmental Issues

- Uncoordinated sand harvesting
- Land degradation
- Destruction of habitats
- Loss of biodiversity
- Accumulation of wastes
- Pollution

Proposed Interventions

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

CHAPTER FIVE

5.0 Environmental hazards and disasters

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

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

Being an arid district, the environment is susceptible to soil erosion and frequent droughts that have severe limitations on the livelihoods in the area, causing loss of livestock and crop failures. The clearing of bushes and vegetation to create settlements for frequently migrating population has resulted in severe environmental degradation. Occurrence of cattle rustling is also major development bottleneck in the region.

The disasters that are experienced within the district are drought, flooding, accidents, diseases outbreak like malaria, fire, an HIV/AIDS pandemic. Disease outbreak has also struck the district.

Status of Early Warning & Preparedness

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

Key environmental issues

- Soil erosion
- Droughts
- Diseases outbreaks
- Loss of vegetation cover
- Loss of habitats

- Destruction of food crops, dwelling structures and even loss of human life.
- Loss of biodiversity
- Destruction of the fragile ecosystem through encroachment and unsustainable farming practices.
- Loss of Biodiversity
- Destruction of property and even loss of life.

Proposed Interventions

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

CHAPTER SIX

6.0 Environmental information networking and technology

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

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

6.1. Environmental education

Information technology has become a powerful tool for environmental information dissemination. Environmental education among the Turkana population is critical for active involvement in conservation. Formal and informal education is helpful in changing people's attitudes and behaviour. It imparts skills and knowledge that enable people to strive for sustainable development through effective public participation in decision-making processes. Types of environmental education programmes which do exist in the district include the various environment related clubs including 4k club, Wildlife Club, Geography clubs and eco-schools project. A number of primary and secondary schools have eco-programmes. These are; Turkana Girls Primary, Lokichar and Turkana Secondary.

6.1.1 Public awareness and participation

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

6.2. Technology

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

6.3. Environmental information system

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

6.3.1 Status of environmental information management system

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

The main source of environmental information in Turkana district includes international Organizations (e.g.) ECHO, MERLIN, OXFAM, JICA, World Vision international, and government ministries, Parastatals NEMA, KWS ,research institutes/ centers and civil society Organizations & educational institutions. The data type available in the district is mainly biological, agricultural, physical land use and social-economic and cultural.

6.4 Indigenous knowledge

The local inhabitants have strong ties with their cultural and social life that address the well being of people, animals and the environment. Some of these beliefs and practices exist as indigenous knowledge and have been applied since time immemorial to save land, forest and animals from overexploitation.

The inhabitants of the district have been relying on biological, diversity to meet their basic needs. As a result of this reliance, the community has accumulated knowledge on the uses of various animal and Plant species and how they can be conserved. This knowledge covers areas such as animal and human health, weather and climate changes predictions and best practices for conservation of biological diversity.

The indigenous knowledge on various aspects of biodiversity has helped to great extend in environmental management, for example the protection of cultural sites for ritual performance and protection of certain tree species and animal have helped in reduction of environmental degradation in the indigenous forests.

Key Environmental Issues

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

Proposed interventions

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

CHAPTER SEVEN

7.0 Governance, legal framework, institutional arrangements and policies

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

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

7.1 EMCA structures for environmental management

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

Some of the Lead Agencies in the district

- Ministry of Water and Irrigation
- The Kenya Forest Service
- Water Resources Management Authority and related Companies and Boards
- Ministry of Works
- Ministry of Trade
- Ministry of Industrialization
- Ministry of Planning, National Development and Vision 2030
- Ministry of Home Affairs and National Heritage

- Ministry of Housing
- Ministry of Labour and Human Development
- Mines and Geology Department
- Ministry of Education, Science and Technology Development
- Ministry of Medical Services
- Ministry of Public Health and Sanitation
- Ministry of Energy
- Ministry of Agriculture
- Ministry of Local Government
- Kenya Wildlife Services
- Ministry of Livestock Development
- Ministry of Fisheries development

Committees under EMCA

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

ENVIRONMENTAL NGOs/CBOs/Private Sector Organizations

- NGOs in the District includes
 - Oxfam – Relief work, humanitarian and sanitation in Turkana North District.
 - Merlin – Medical emergencies, nutrition, sanitation and HIV/AIDs interventions in the district.
 - World Vision – Relief work, humanitarian and sanitation, educational support through sponsorship and books supplies.
 - TUDOF (Umbrella) – CBOs Forum undertaking various consultancies in small sector CBOs.
 - SNV – Netherlands NGO undertaking social and cultural dynamics of the Turkana community.

- EPARDA – Oromo community of Ethiopia and Merrille of the Turkana (Kenya) conflict mitigation programme along the Kenya/Ethiopia border.
- TUCO (Turkana Cultural Organization) – Undertaking social and culture of Turkana community and helps them market the Turkana artifacts out the district and country.
- TWADO (Turkana Women Advocacy Development Organization) – Intervention on the rights of women in the district. An associate of FIDA.
- ADRA (Adventist Development Relief Agency) – Undertaking interventions on relief work and water sanitation.
- Red Cross – Nutrition and social cultural interventions.
- IRC – Undertaking HIV/AIDs and water interventions in the district.
- VSF-Belgium – Livestock production, water interventions in the district.
- UNICEF – Children programs in education, nutrition etc.
- UNDP – DDO’s office
- Practical Action

Donors’ organizations in the district

- Donors in the District:
 - GEF - IVP
 - World Bank - Arid Lands resources management program in Turkana
 - World Food Program – Food For Assets program at Kakuma,
 - Catholic Diocese of Lodwar- Several programs
 - UNHCR- support to refugee camp at Kakuma

7.2 Regulatory and Management Tools

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

Some of the environmental tools being used in the district include:

- Environmental Management and Coordination Act of 1999
- Environmental Impact Assessment regulations of 2003
- Environmental Audit regulations of 2003
- Water Quality Regulations of 2006
- Public Health regulations
- Local Authority Regulations
- Waste Management Regulations of 2006

- Access and Benefit Sharing for Conservation of Biodiversity, 2007
- Noise pollution and excessive vibration 2009

CHAPTER EIGHT

8.0 Implementation strategy

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

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

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

8.2 Stakeholder involvement

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

8.3 Resource requirements

Implementation of the District Environment Action Plan requires a deliberate and targeted allocation of resources (financial, human, and technological) that calls for resource capacity assessment. The impacts from various interventions in integration of environmental concerns often take time to be realised hence the need for prioritisation as resources for allocation are usually scarce. Potential sources of funding should include locally available resources as well as Local

Authorities Transfer Fund; Constituency Development Fund; Government Budgetary allocations; support from NGOs; CBOs; religious originations, private sector and development partners.

It is recognized that Turkana district has considerable technical capacities in various disciplines. These capacities are found within specialized departments of government, state corporations, private sector research and learning institutions. There may be access to capacities from international research institutions and regional development organizations. It is expected that the preparation and implementation of the District Environment Action Plan may seek technical support from these sources.

8.4 Monitoring and evaluation

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

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

Division	Location	Issue Category	Problem Statement	Action No.	Actions Needed	Stakeholders	Time Frame 2009 - 2013	
District Wide	District Wide	Air	Air pollution	1	Establish air treatment systems in factories & Industries	Min. of trade		
	Turkana Town			2	Enforce air standards requirements	Min. of trade		
	District Wide	Climate related environmental hazards	& Destruction of property by thunderstorms and strong winds	3	Install lightening arresters	Min. of energy, Min. of public works		
				4	Afforestation and re-afforestation	KFS, Min. of Agric		
				5	Undertake public awareness on disaster preparedness	Dist. Disaster preparedness committee		
				6	Strengthen District Disaster Preparedness Committee	Dist. Disaster preparedness committee		

Division	Location	Issue Category	Problem Statement	Action No.	Actions Needed	Stakeholders	Time Frame 2009 - 2013	
				10	Enrich riparian areas with suitable vegetation cover	Min. of Agriculture, KFS, WRMA		
District Wide	District Wide	Crop production & Soils	Soil erosion	11	Construct terraces	Min of Agriculture,		
				12	Plant Napier grass	Ministry of agriculture		
				13	Afforestation & Re-afforestation	KFS, KVDA		
				14	Practice contour farming	Min. of Agriculture, KFS,		
				15	Build gabions	Min of Agriculture		
District Wide	District Wide	Crop production & Soils	Soil erosion	16	Rehabilitate and restore gullies	Min of Agriculture, Min of special programmes		
				17	Protect and conserve water catchments	KFS, KVDA, WRMA		
				18	Increase awareness on agriculture act	Min. of Agriculture		
				19	Construct storm drains	Min. of special programmes, local authorities		
				20	Sensitisation of community on global MEAs			
				Poor crop yields	21	Promote Agroforestry in sloppy areas	Min. of Agriculture, KFS	

Division	Location	Issue Category	Problem Statement	Action No.	Actions Needed	Stakeholders	Time Frame 2009 - 2013
				22	Undertake appropriate soil conservation measures	Min. of Agriculture, KVDA	
				23	Promote use of organic manures	Min. of Agriculture	
				24	Practice crop rotation	Min. of Agriculture	
				25	Promote Integrated Pest Management	Min. of Agriculture	
			Water Pollution	26	Promote proper use of fertilizers and farmyard manures	Min. of Agriculture	
				27	Training on safe handling of agrochemicals	Min. of Agriculture, Pesticide control board	
		Energy	Deforestation	28	Afforestation and re-afforestation	KFS, KVDA	
				29	Hold seminars on good forestry practices	KFS, KVDA	
				30	Promote use of renewable sources of energy such as Biogas, solar and wind	Min. of energy	
District Wide	District Wide	Energy	Deforestation	31	Promote use of energy efficient devices	Min. of energy	
				32	Re afforest hilltops	KFS, Local authorities	
		Environmental Education & Awareness	Low awareness on sustainable environment management	33	Establish Adult Literacy Centres with a focus on environmental issues	Min. of culture and social services	

Division	Location	Issue Category	Problem Statement	Action No.	Actions Needed	Stakeholders	Time Frame 2009 - 2013
				34	Collect data through baseline surveys on level of awareness	Min. of planning and national development	
				35	Enhance documentation of Indigenous Knowledge	National museums of Kenya	
				36	Increase community awareness on EMCA 1999 and other environmental related laws	Office of the President	
				37	Undertake training on safe use of agrochemicals and disposal containers	Min of Agriculture	
District Wide	District Wide	Fish & Fisheries	Shortage of fish	38	Construct water control structures	KVDA, WRMA, Min. of Public Works	
				39	Reclaim encroached water systems to encourage natural fish production	Min of Fisheries, Min of Lands, WRMA	
				40	Adopt modern/artificial control measures to discourage predators	Min. of Fisheries	
				41	Reclaim wetland ecosystems to ensure increased water volumes	Min of Fisheries, Min of Lands, WRMA	
				42	Apply and enforce the Fisheries Act	Min. of Fisheries	
		Forests & Trees	Deforestation	43	Plant agroforestry trees	KFS, Min. of Agriculture	
				44	Promote education awareness on good forestry practices	KFS	

District Wide	District Wide	Forests & Trees	Deforestation	45	Promote sustainable use of forests	KFS	
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Division	Location	Issue Category	Problem Statement	Action No.	Actions Needed	Stakeholders	Time Frame 2009 - 2013
				46	Afforestation and re-afforestation programmes	KFS, KVDA	
				47	Identify and rehabilitate hill tops prone to erosion	KFS, Local Authorities, Min of Agriculture	
				48	Initiate alternative income generating activities	Min of trade, Min of Youth	
				49	Protect and Re-afforest hill tops and slopes	KFS, Local Authorities	
		Health	High incidences of air and water borne related diseases	50	Promote public health education	Min of Public Health and Sanitation	
				51	Apply and enforce public health and sanitation Act	Min of Public Health and Sanitation	
				52	Promote use of treated mosquito nets	Min of Public Health and Sanitation	
				53	Apply and enforce the Physical planning Act	Min of Lands	
				54	Apply and enforce Water quality and Waste management regulations	WRMA, Local Authorities	
				55	Establish proper drainage infrastructure	Local Authorities	

				56	Improve conditions at work places particularly lighting and ventilation	Min of Industry, Min of Public Health and Sanitation	
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Division	Location	Issue Category	Problem Statement	Action No.	Actions Needed	Stakeholders	Time Frame 2009 - 2013
				57	Provide personal protective equipments	Private sector	
District Wide	District Wide	Industries and other Business Activities	Water pollution	58	Protect water springs	WRMA, Local Authorities	
				59	Promote cleaner production technologies	Min of Industry,	
			Air pollution	60	Apply and enforce Water quality and Waste management regulations	Min. of Public Health and Sanitation, Local Authorities	
				61	Promote environmental education awareness among business community	Min. of Public Health and Sanitation, Local Authorities	
				62	Incinerate industrial waste	Local Authorities	
			63	Apply and enforce Waste management regulations	Min. of Public Health and Sanitation, Local Authorities		
			64	Afforestation and Re-afforestation	KFS		

				65	Enforce air quality regulations	Min. of Public Health and Sanitation, Local Authorities	
			Land degradation resulting from brick making activities	66	Improve brick making production technology	Min of industry, Civil Society	
Division	Location	Issue Category	Problem Statement	Action No.	Actions Needed	Stakeholders	Time Frame 2009 - 2013
				67	Restore/rehabilitate degraded sites	Local Authorities	
				68	Standardize the brick sizes	Min. of Industry, KEBS	
				69	Encourage formation of brick making groups	Min of Culture and Social services	
District Wide	District Wide	Livestock & Grazing	Soil erosion	70	Control livestock numbers	Min. of Livestock a	
		Mining & Quarrying	Land Degradation	71	Rehabilitate and restores mined sites	Mines and Geology Dept	
				72	Apply and enforce EMCA 1999	Mines and Geology Dept, local Authorities	
			Accidents & Deaths	73	Apply and enforce mining Act	Mines and Geology Dept	
				74	Fence mining areas	Mines and Geology Dept	

	Urban areas	Settlements & Infrastructure	Poor sanitation	75	Construct pit latrines	Min. of Public Health and Sanitation, Local Authorities	
				76	Construct sewerage systems/septic tanks in urban areas	Min. of Public Health and Sanitation, Local Authorities	
				77	Enforce physical planning Act	Min. of Public Health and Sanitation, Local Authorities	
Division	Location	Issue Category	Problem Statement	Action No.	Actions Needed	Stakeholders	Time Frame 2009 - 2013
				78	Promote proper hygiene & sanitation	Min. of Public Health and Sanitation, Local Authorities	
				79	Apply and enforce the public health and sanitation Act	Min. of Public Health and Sanitation, Local Authorities	
District Wide	District Wide	Waste Management & Sanitation	Poor waste disposal	80	Construct sanitary landfills/ garbage pits	Min. of Public Health and Sanitation, Local Authorities	
				81	Promote waste recycling	Min of Industry, Local Authorities	

			82	Apply and enforce the public health and sanitation Act	Min. of Public Health and Sanitation, Local Authorities	
			83	Apply and enforce Waste management regulations	Min. of Public Health and Sanitation, Local Authorities	
			84	Regular garbage/refuse collection in temporary holding bins	Local Authorities, Min. of Public Health and Sanitation	
			85	Apply and enforce municipal council by laws	Min. of Public Health and Sanitation,	

Division	Location	Issue Category	Problem Statement	Action No.	Actions Needed	Stakeholders	Time Frame 2009 - 2013
				86	Apply and enforce the Physical Planning Act	Min of lands	
				87	Promote public awareness on proper disposal of waste	Min. of Public Health and Sanitation, local Authorities	
				88	Promote the use of biodegradable packaging materials	Min. of Trade, Min of Industry	
				89	Privatise waste collection and recycling	Min. of Public Health and Sanitation	
		Water Resources	Shortage of water for domestic and Agriculture use	90	Promote water harvesting tanks/dams	WRMA, Local Authorities, Min of Agriculture	
				91	Plant suitable tree species along water sources	KFS, Min of Agriculture, WRMA	
				92	Establish indigenous tree nurseries	KFS	
				93	Drill wells/boreholes	WRMA	
				94	Apply and enforce the Water Act 2002	WRMA	
				95	Promote education awareness on environmental laws	Provincial Adm. KFS, Min of Agriculture, WRMA	

				96	Protect springs	WRMA	
				97	Protect and restore water catchments areas through re-afforestation	WRMA, KFS	
Division	Location	Issue Category	Problem Statement	Action No.	Actions Needed	Stakeholders	Time Frame 2009 - 2013
			Water pollution	98	Apply and enforce waste management and Water quality regulations	Local Authorities, WRMA	
				99	Construct effluent treatment plants	Local Authorities	
				100	Construct proper waste water drainage systems	Local Authorities	
				101	Protect and conserve water sources	WRMA	
				102	Increase public awareness on water pollution control	WRMA	
				103	Remove blue gum from waterways and sources	WRMA, Min of Agric., KFS	
District Wide	District Wide	Wetlands	Degradation of wetlands	104	Protect, Conserve and rehabilitate wetlands	WRMA, Local Authorities	
				105	Create public awareness on values of wetlands	WRMA	
				106	Establish District Wetland Conservation and Management committees	WRMA	
				107	Promote sustainable use of wetland resources	WRMA,	

				108	Develop and strengthen community wetland conservation programmes	Min. of Culture and Social Services, WRMA	
				109	Apply and enforce EMCA 1999	Community	
				110	Apply and enforce Water Act 2002	WRMA	

Division	Location	Issue Category	Problem Statement	Action No.	Actions Needed	Stakeholders	Time Frame 2009 - 2013
		Wildlife, Biodiversity & Tourism	Loss of biodiversity due to habitat destruction	111	Protect Hill tops	KFS, Local Authorities	
				112	Apply and enforce existing regulatory and management instruments on biodiversity	KFS, National Museums of Kenya	
				113	Practice proper land use planning	Local Authorities, Min. of Lands	
				114	Afforestation and re-afforestation	KFS	
				115	Control charcoal burning	KFS, Provincial Administration	
				116	Reclaim wetlands	Min. of Lands, Local Authorities, WRMA	
				117	Apply and enforce biodiversity regulations on access and benefit sharing	KFS, National Museums of Kenya	

Table 16: Implementation Matrices

APPENDICES

APPENDIX 1: EXTRACT FROM EMCA, 1999

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

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

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

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

38. Provisions of the National Environment Action Plan

The national environment action plan shall: -

- a) contain an analysis of the natural resources of Kenya with an indication as to any pattern of change in their distribution and quantity over time;
- b) contain an analytical profile of the various uses and value of the natural resources incorporating considerations of intergenerational equity;

- c) recommend appropriate legal and fiscal incentives that may be used to encourage the business community to incorporate environmental requirements into their planning and operational processes;
- d) recommend methods for building national awareness through environmental education on the importance of sustainable use of the environment and natural resources for national development;
- e) set out operational guidelines for the planning and management of the environment and natural resources;
- f) identify actual or likely problems as may affect the natural resources and the broader environment context in which they exist;
- g) identify and appraise trends in the development of urban and rural settlements, their impacts on the environment, and strategies for the amelioration of their negative impacts;
- h) propose guidelines for the integration of standards of environmental protection into development planning and management;
- i) identify and recommend policy and legislative approaches for preventing, controlling or mitigating specific as well as general adverse impacts on the environment;
- j) prioritise areas of environmental research and outline methods of using such research findings;
- k) without prejudice to the foregoing, be reviewed and modified from time to time incorporate emerging knowledge and realities; and
- l) be binding on all persons and all government departments agencies, state corporations or other organs of Government upon adoption by the National assembly.

39. Provincial Environment Action Plans

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

40. District Environment Action Plans

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

41. Contents of Provincial and District Environmental Action Plans.

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

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