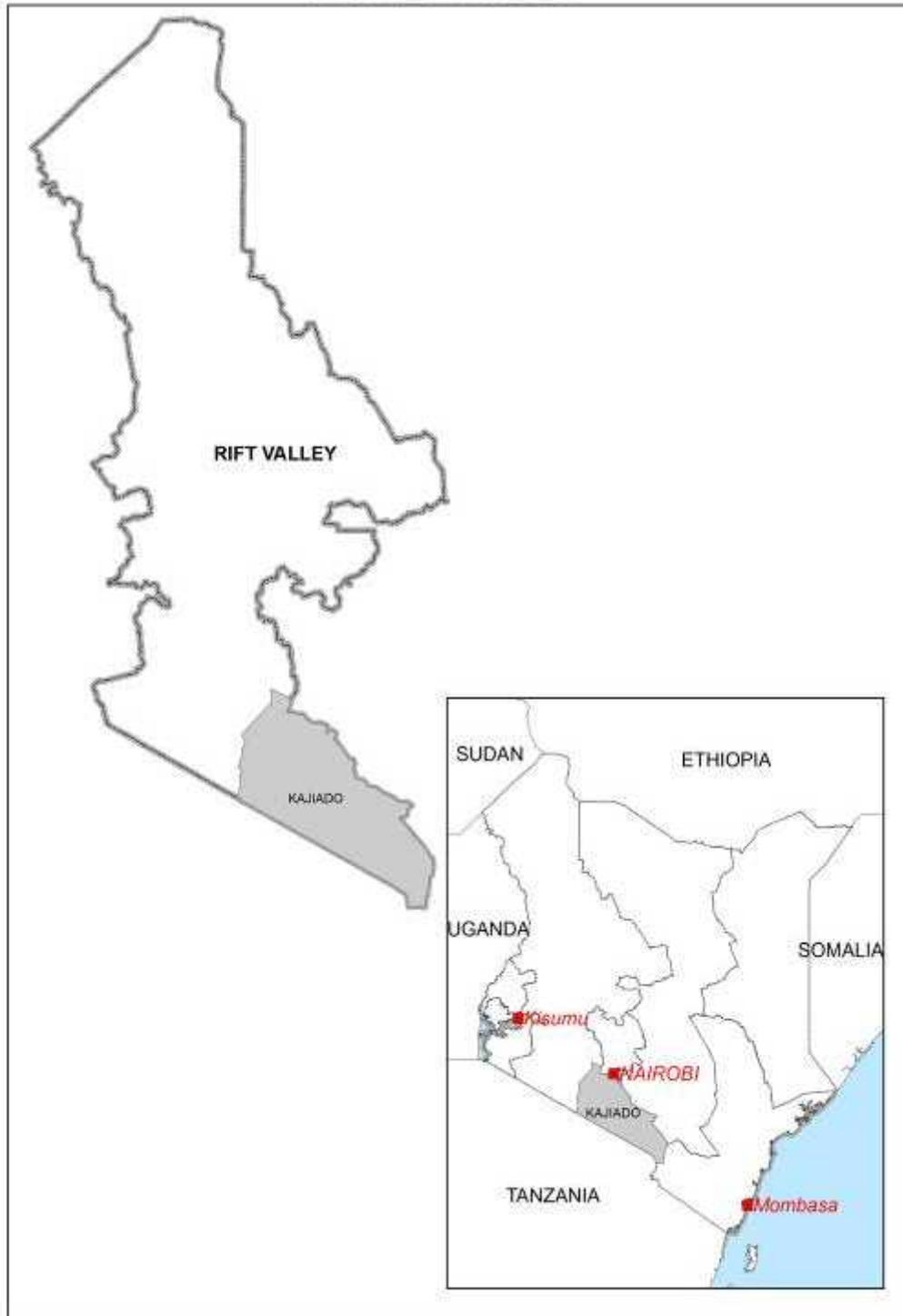




REPUBLIC OF KENYA
MINISTRY OF ENVIRONMENT AND MINERAL RESOURCES
NATIONAL ENVIRONMENT MANAGEMENT
AUTHORITY

KAJIADO DISTRICT



EXECUTIVE SUMMARY

Economic growth and environment are closely intertwined in Kenya. Environmental Action Planning is a tool that aims at enhancing the integration of environment into development planning. Kajiado District is not an exception and has to contend with these challenges with some being unique to the District. The DEAP covers three districts carved out and includes, Kajiado North, Kajiado Central and Kajiado South Districts of the Challenges experienced in the Districts include poverty that has led to the over-use and destruction of environment. Continued reliance on trees for fuel has led to deforestation. Annual flooding continues to destroy lives, property and frustrate livelihood activities.

The DEAP highlights priority themes and activities for the District towards achieving sustainable development. The report is divided into 8 Chapters. Chapter one gives the challenges of sustainable development and also describes the rationale for and preparatory process of the DEAP and presents the district's main profile covering the physical features, demographic, agro-ecological zones, and main environmental issues. Chapter two describes the District's Environment and Natural resources of Land, Water, Biodiversity (forest, wildlife, and Dry lands biodiversity), and agriculture, livestock and fisheries, land, biodiversity loss and land tenure. For each resource, major environmental issues, challenges and proposed interventions are identified.

Chapter three details the human settlements and infrastructure in Kajiado District covering situation analysis, challenges and proposed interventions. Environmental challenges addressed include; waste management, sanitation, pollution, diseases, land use, demand for water, energy, materials for construction. Chapter four addresses environmental aspects in trade, industry and services sectors. Tourism mining and quarrying is also covered under the chapter. The key issues under this chapter are high pollution levels from industrial activities and weak enforcement of relevant legislations degradation of the environment through quarrying and mining.

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

Environmental information, networking and technology are discussed in chapter six. It emerges that environmental information and networking technology are not well developed in the district. In order to achieve sustainable environmental management, it is necessary to focus on raising awareness and enhancing public participation at all levels.

Governance, Policy and Legal Framework as well as Institutional arrangements are set out in chapter Seven. The key issues addressed include; harmonization of environmental legislations and institutional mandates.

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

FOREWORD

The 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, Non Governmental Organizations (NGOs) and local communities at District and Provincial levels. These consultative meetings provided the basis also for formulation of the Provincial Environmental Action Plans (PEAPs) and finally the National Environment Action Plan (NEAPs).

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 District Environment Committee (DEC) and will be monitor through State of the Environment Reporting (SoE).

I commend the assistance provide by UNDP under the Poverty Environment for supporting the development of the EAP Manual. I wish to underscore that the 2009-2013 DEAP report is a broad-based strategy that will enable the District attain sustainable development as envisaged in Vision 2030.

Dr. Ayub Macharia (PhD)
DIRECTOR GENERAL (Ag.)
NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY

ACKNOWLEDGEMENT

The District Environment Action Plan Process is a multi disciplinary, multi stakeholder and multi-sectoral participatory process. Therefore many government departments and other agencies have contributed immensely to the preparation of this plan. I take this opportunity to acknowledge all those who contributed directly or indirectly to the preparation of this plan.

Appreciation goes to NEMA's Department of Planning and Research Coordination for their technical guidance for the whole exercise. I wish also to express my gratitude to the District Environment Action Plan Taskforce headed by the District Planning Officer that doubled up as the secretariat during the process. The groups' commitment and dedication produced this report.

Finally I applaud the District Environment Committee through its Chairman, the District Commissioner for having guided the process to fruition through their leadership and guidance.

This District Environment Action plan as provided for under the environment management and co-ordination Act 1999 section 38 is aimed at integrating environmental concerns in development planning and implementation. It is my belief that we now as a team set out to implement over the 5 year plan period the prioritized interventions in our sectors for the sound management of the environment in Kajiado District.

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

TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	ii
FOREWORD	iii
ACKNOWLEDGEMENT	iv
TABLE OF CONTENTS	v
LIST OF TABLES	vi
LIST OF FIGURES	viii
ACRONYMS	ix
CHAPTER ONE	1
1.0 INTRODUCTION.....	1
1.1 Preamble	1
1.2 The Environmental Action Planning Process.....	1
1.3 Challenges of Sustainable Development.....	2
1.4 District Profile.....	3
1.4.1 Physical environment.....	3
1.4.2 Mineral Development	5
1.4.3 Climate	5
1.4.4 Vegetation	5
1.4.5 Population	6
CHAPTER TWO	8
2.0 ENVIRONMENT AND NATURAL RESOURCE	8
2.1 Soils and Land Use.....	8
2.1.1 Soils.....	8
2.1.2 Land and Land Use Changes	10
2.1.3 Dry lands.....	12
2.2 Agriculture, Livestock and Fisheries	13
2.2.1 Agriculture	13
2.2.3 Livestock	18
2.3 Water resources.....	19
2.4 Forestry and Wildlife Resources	23
2.4.1 Forestry	23
2.4.2 Wildlife.....	24
CHAPTER THREE.....	32
3.0 HUMAN SETTLEMENT AND INFRASTRUCTURE	32
3.1 Land Tenure	32
3.2 Human and Environmental Health.....	32
3.3 Pollution and Waste generated from human settlement	33
3.4 Communication Networks.....	35
3.5 Water Supply.....	37
3.6 Energy Supply	37
3.7 Sanitation	38
3.8 Education Facilities	39
3.9 Energy Sector.....	41
CHAPTER FOUR	43
4.0 INDUSTRY, TRADE AND SERVICES	43
4.1 Industrial Sector.....	43
4.2 Trade sector	46
4.3 Tourism	47
4.4 Mining, Quarrying Sand Harvesting.....	48

4.4.1 Mining.....	48
4.4.2 Quarrying	48
4.4.3 Sand harvesting	48
CHAPTER FIVE	51
5.0 ENVIRONMENTAL HAZARDS AND DISASTERS	51
CHAPTER SIX	53
6.0 ENVIRONMENTAL EDUCATION AND TECHNOLOGIES.....	53
6.1 Public Awareness and Participation	54
6.2 Environmental Information Systems	55
6.3 Status of Environmental Information Management Systems	56
CHAPTER SEVEN	58
7.0 ENVIRONMENTAL GOVERNANCE AND INSTITUTIONAL FRAMEWORKS	58
7.1 Status of environmental governance and institutional arrangements	58
7.2 Regulatory and management tools	58
7.3 Multilateral Environmental Agreements (MEAS).....	59
CHAPTER EIGHT.....	62
8.0 IMPLEMENTATION STRATEGY.....	62
REFERENCES	66

LIST OF TABLES

Table 1: Kajiado District Population by Division (1999 Census).	6
Table 2: Distribution, use and degradation status of the major soil types	9
Table 3: Agro-ecological Zone	11
Table 4: Rainfall pattern and Agro-ecological zones in the district	12
Table 5: Land use systems	12
Table 6: Priority issues and interventions	13
Table 7: Types and status of farming systems	16
Table 8: Livestock trend in 1999 - 2000	18
Table 9: Water production (in cubic metres) by different sources per division	19
Table 10: Sources and Status of water resources	21
Table 11: Access to water	22
Table 12: Water sources	22
Table 13: Forest Resources in Kajiado district	23
Table 14:Types and status of forest	23
Table 15: Wildlife species and numbers-kipeto area	25
Table 16: Animal distribution in Central Kaputei area	26
Table 17: Animal Distribution in North Kaputei	26
Table 18: Animal Distribution in Enkorika Area	27
Table 19: Animal distribution in Torosei Area	27
Table 20: Animal distribution in Mailua area	27
Table 21: Animal distribution in Osilalei area	28
Table 22: Biodiversity Data and information	29
Table 23: Types, status and impact of invasive species	30
Table 24: Land Tenure System in Kajiado District (Km²)	32
Table 25: Diarrhoea disease as influenced by the environment	32
Table 26: Eye infection as a disease influenced by the environment	32

Table 27: Malaria as a disease influenced by the environment.....	32
Table 28: Type and source of waste.....	33
Table 29: Proportion (%) of solid waste by source and mode of disposal.....	33
Table 30: Proportion (%) of effluent waste by source and mode of disposal.....	34
Table 31: Proportion (%) of emissions by source.....	34
Table 32: Proportion of households accessing various water sources.....	37
Table 33: Average return distance to water sources.....	37
Table 34: Number and distribution of health facilities in the district, 2003.....	38
Table 35: Number of pre-primary and primary schools in the district in 1998 and 2000.....	39
Table 36: Enrolment of boys and girls in both pre-school and primary school in 2000.....	40
Table 37: Pupil/Teacher ratio in primary schools, 2000.....	40
Table 38: Enrolment of boys and girls in secondary schools.....	40
Table 39: List of industries and location.....	45
Table 40: Type and impact of industries on environment.....	45
Table 41: Types of tourism and attraction.....	47
Table 42: Types of minerals and methods of extraction.....	49
Table 43: Sector capacities for disaster preparedness and response.....	51
Table 44: Proposed interventions.....	52
Table 45: Status of Environmental programmes in schools.....	53
Table 46: Status of environmental programmes in the district.....	54
Table 47: Status of environmental awareness and participation in the district.....	54
Table 48: Information and data types in Kajiado district.....	55
Table 49: Policies, which impact on environment.....	58
Table 50: Legislation that impact on human health and environment quality.....	59
Table 51: Implementation Matrix.....	63
Table 52: Monitoring and Evaluation Matrix.....	65

LIST OF FIGURES

Figure 1: Map of Kajiado District.....	4
--	---

ACRONYMS

ALRMP II	Arid Lands Resource Management Project II
ASAL	Arid and semi Arid Lands
CBOs	Community Based Organizations
CECs	Community Environmental Committees
CP	Cleaner Production
CSOs	Civil Society Organizations
DAO	District Agriculture Officer
DC	District Commissioner
DFO	District Forest Officer
DEAP	District Environment Action Plan
DEC	District Environment Committee
DEO	District Environment Officer
DLMC	District livestock Marketing Council
DLPO	District Livestock production officer
DMO	District Drought Management Officer
EA	Environmental Audit
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Co-ordination Act
Ha	Hectares
HCDA	Horticultural Council Development Authority
KFC	Kenya Flower Council
Km	Kilometres
LA	Local Authority
MDGs	Millennium Development Goals
MEAS	Multilateral environmental agreements
NEAP	National Environment Action Plan
NEMA	National Environment Management Authority
NGOs	Non-Governmental Organization
OCC	Olkejuado County Council
PH	Public Health
SEA	Strategic Environmental Assessment
UNCED	United Nations Conference on Environment and Development
WRMA	Water Resource Management Authority
WSSD	World Summit on Sustainable Development

CHAPTER ONE

1.0 INTRODUCTION

1.1 Preamble

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

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

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

EMCA, 1999 Provision on Environmental Planning

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

1.2 The Environmental Action Planning Process

DEAP Methodology

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

Objectives of District Environment Action Plans

The objectives of District Environment Action Planning include the following:

To determine the major environmental issues and challenges facing the districts

To identify environmental management opportunities

To create synergy and harmony in environmental planning

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

To formulate appropriate environmental management strategies specific to the district

1.3 Challenges of Sustainable Development

Kajiado district is one of the 21 Arid and Semi-arid (ASAL) districts in Kenya. It is also a dormitory district to Nairobi. The economic mainstay of the district is pastoralism and is also endowed with a variety of natural resources including minerals, wildlife and forest.

From the scenario above, a number of sustainable development challenges persist. They include;

- Rapid land use changes involving subdivision of land that limit economic production of pastoral practices. This also interferes with wildlife dispersal areas and migratory routes.
- Land degradation caused by mining and quarrying activities. This is in form of land dereliction and abandoned quarrying pits. Land degradation is also caused by overstocking of livestock and the resultant soil erosion and introduction of invasive species such as *Ipomea Kitsuensis*. Charcoal burning as a form of diversification of livelihoods, has also contributed immensely towards land degradation.
- Sand harvesting activities along riverbeds and courses limit water potential in the ASAL district.
- Poor waste management in virtually all urban centres in the district present further environmental challenges in the district. This is largely attributed to inadequate waste management infrastructure and negative public attitude and behaviour.

Some of the sectoral development plans impacting on the environment include the land use plans or the physical planning maps. The current plans in the district are masterplans as opposed to strategic plans. Strategic plans are more participatory in nature and help to integrate environmental concerns in the planning process.

The district development plan impacts also on the environment. The plans are fairly old (1997-2001), and therefore they do not reflect the development trend in reality. This situation greatly

affects the environment. The development plans were also prepared with little or no regard to environmental concerns.

1.4 District Profile

1.4.1 Physical environment

Topography

The main physical features in the district are plains, and occasional hills and valleys. Several valleys dissect the plains and its physiography is influenced by geology. The land rises from 500m asl around L.Magadi to 2500m asl in the Ngong hills area.

The district's topography can be aptly outlined into four areas, viz;

- Rift Valley, which is predominantly made of volcanic, landscapes and comprise of a low depression in the western part of the district. Important features found here include Mt. Suswa, L. Magadi and L. Natron.
- Kaputiei plains consisting of volcanic rolling plains e.g. Ngong hills (2460m asl) as well as being a source of Athi river.
- Central broken ground which is a wide stretch of basement system and erosional landscape with several hills e.g. Chyulu and Maparasha. The area has permanent and dry riverbeds as important sources of sand and water for the community.
- Amboseli Plains characterised by erosional and depositional features resulting to deep reddish brown clay loams and poorly drained cotton soil. Amboseli National Park is within this basin.

Geology and Soils

The geology of an area gives rise to soil types in the district, viz;

- Quaternary sediments of mainly alluvium that occur along river valleys and lakebeds around Namanga area, L.Magadi and Nguruman areas. Arising from this sediments include, solonetz, fluvisols, solonchaks, cambisols and vertisols. These soils offer little opportunity for agricultural production.
- Quaternary volcanic found in the western side of the district, south-eastern and Chyulu hills area. Tertiary volcanic is found around Ngong, Magadi and Kajiado town. Rock developments include Olivine basalts, phonolites, pyroclastics, volcanic ash, tuffs and trachytes. The soils developed include Leptosols, Luvisols, Andosols, Nitisols, Vertisols, Cambisols and phaeozems. The soils are generally fertile and of medium to high productivity potential for crops and livestock.
- Basement system rocks comprise of various gneiss, schist, quartzite and crystalline limestone. Soils such as Ferralsols, Luvisols, Arenasols, Regosols, Leptosols, Lixisols, Cambisols and Vertisols in the low-lying areas. The soils are of poor agricultural productivity unless high input levels are added. (Soil Map of the World – FAO,1990)

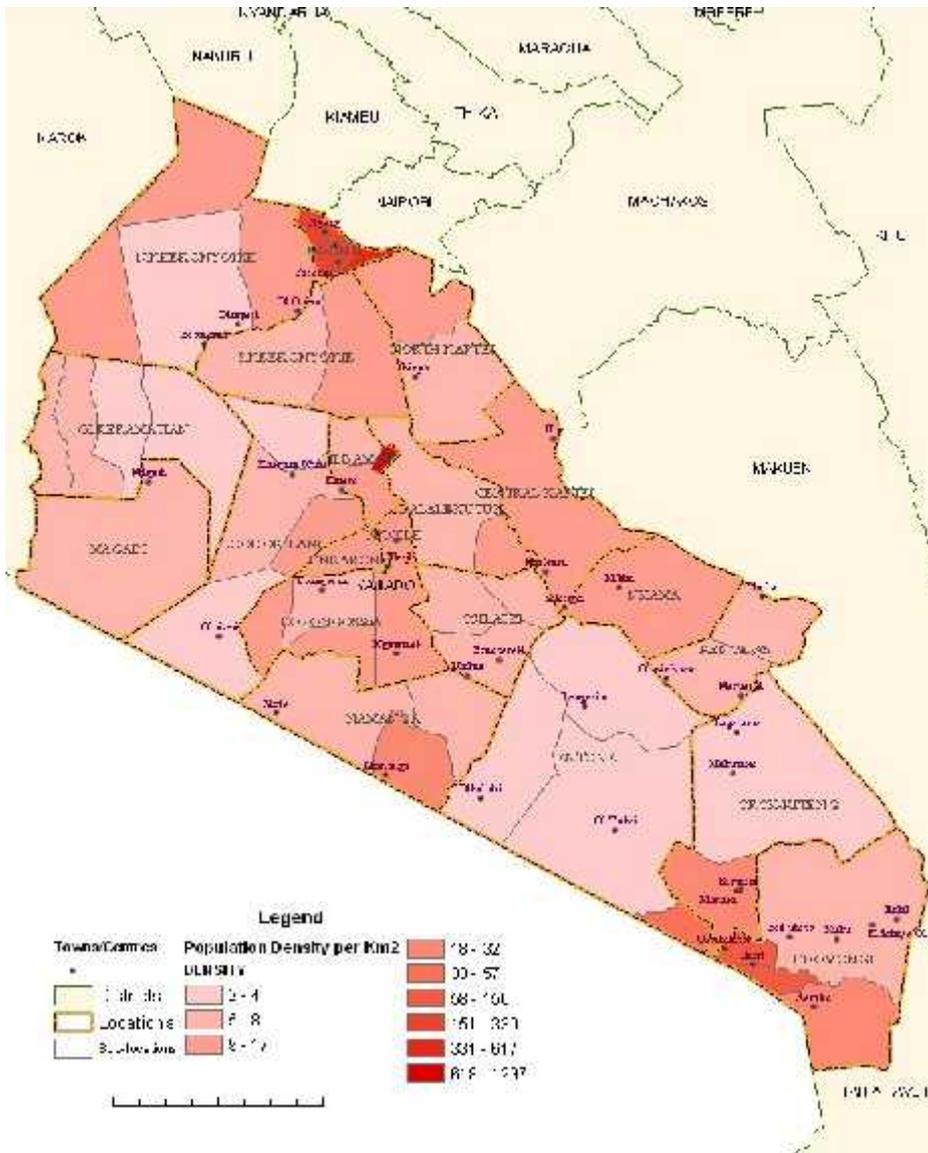


Figure 1: Map of Kajiado District

1.4.2 Mineral Development

There are various minerals developed in the district of economic importance. Gypsum is mined in Isinya and is used as an ingredient in cement manufacture at Athi River. Limestone for cement is found in Kibini, Toroka, and Ngatataek areas. Soda ash is found in L. Magadi in large deposits, as trona accumulation process is self-regulating. Quarrying of building stone is scattered all over the district with major areas being Ngong, Kitengela and Ongata Rongai. Sand harvesting is very rampant as an economic activity along riverbeds.

1.4.3 Climate

Rainfall

The district has a bimodal rainfall pattern. The short rains fall between October and December while the long rains fall between March and May. Heavy rains occur around Ngong Hills, Chyulu Hills, Nguruman escarpment and the foothills of Mt. Kilimanjaro. This is because the rainfall in the district is strongly influenced by altitude.

The temperatures in the district also vary according to altitude. Mean maximum of 34°C around L. Magadi and a mean minimum of 10°C on the foothills of Kilimanjaro have been recorded. Moisture deficit is also observed in the greater part of the year. This gives the district a dry season of between 7-9 months.

The climate scenario in the district indicates that the bulk of the area (with annual rainfall of 700-850mm), is suitable for ranching. Very small strips near Ngong, Sultan Hamud, Namanga and Chyulu Hills and a larger one on the foothills of Mt. Kilimanjaro, however, have potential for rain-fed agriculture.

Drainage

It is noted from the outset that the greater part of the district depends on ground water reserves. Limited surface water resources exist for livestock and domestic use. The major rivers in the district include; Athi, Ewaso Ngiro, Olkejuado and Noolturesh. In this case construction of water dams and pans, boreholes and shallow wells are important means of accessing water in the district. Ground water yields vary throughout the district from 0.01 to 35.77 cubic metres per hour.

1.4.4 Vegetation

The main vegetation type in the district is determined by altitude, soil type and rainfall received in the different parts of the district. However, antropogenic and animal causes have modified the status significantly. Overgrazing, charcoal burning, extraction of fuel wood, forest fires and quarrying activities are some of the leading causes of this trend. Ground cover in the district varies according to seasons while the canopy cover ranges from 1% on the densely populated areas to 30% on the steep slopes. For grazers there is need to move over large areas in order to have enough grass for the animals while subdivision of land continue to restrict grazing capacity considerably. Browsers have more potential particularly in the northern part of the district.

Presence of invader species to vegetation has been noticed in Central division (*Ipomea Kituensis*) and in Namanga – Olkiramatian area (prosopis). These species not only colonises the vegetation but also reduce the grazing potential available to the livestock and wildlife.

The main vegetation types in the district comprise wooded grassland, open grassland, wooded bush land, bushed grassland and forest.

Woody species include; *Acacia tortilis*, *Acacia xanthopholea*, *Acacia mellifera*, *Commifora schemperi*, *Balanites aegyptiaca*, *Balanites gabra*, and *Salvadora persica*. Grasses include; *Pennisetum mezianum*, *Pennisetum stramineum*, *Chroris roxburghiana* and *sporobulus angustifolia*, *Chloris guyana* and *Cenchrus ciliaris*. *Pennisetum meziniun* is good grazing grass when young but becomes stemmy and unpalatable as it grows.

1.4.5 Population

According to the 1999 Population Census, the District had a population of 406,054 inhabitants as compared to 258,659 people in the 1989 census (Table 4.1). This represents an increase of 57% over the period under review. The annual growth rate for the 1999 census is quoted as 4.51%.

Table 1: Kajiado District Population by Division (1999 Census).

Division	Area(km ²)	Population	Density (P/km ²)
Loitokitok	6,090	95,430	15
Isinya	1,066	28,324	27
Central	3,825	41,078	14
Ngong	3,692	149,771	41
Magadi	2,749	20,112	8
Namanga	2,499	35,673	16
Mashuru	2,250	35,666	12
Total	21,105	406,054	19

Source: Central Bureau of Statistics

Though there has been a general population growth in the district, there was accelerated growth in certain parts especially the centers that are considered ‘dormitory towns’ of Nairobi City. These are Ngong, Kiserian, Ongata Rongai and Kitengela. The other important centres are Kajiado, which is an administrative centre, Loitokitok, an agricultural centre, Magadi, an industrial centre and Namanga, a border-trading centre.

Distribution of Population by Gender

Both the 1989 and 1999, population distribution by gender in the district is fairly uniform with males and females being almost equal, although there are slightly more males than females. Males also dominate in the rural areas as compared to the urban which could be attributed to low levels of male education which suppresses the urge to seek for employment elsewhere.

Settlements

The settlement pattern has been influenced by proximity to Nairobi City, high agricultural potential areas and mining areas. However, changes in land ownership policies later opened up more of the district to other ethnic groups other than the Maasai. The effect of this is the encroachment of grazing land for both livestock and wildlife.

CHAPTER TWO

2.0 ENVIRONMENT AND NATURAL RESOURCE

2.1 Soils and Land Use

2.1.1 Soils

The district consists of four geological regions: Quaternary Sediments, Quaternary Volcanics, Tertiary Volcanics and Basement System. There is a close relationship between the geological formation, topography and soils.

The Quaternary Sediments consist mainly of alluvium associated with fluvial deposition. These occur mainly along river valleys and lake-beds, notably around Namanga/Amboseli area, Lake Magadi and Nguruman areas. The soils developed on these sediments are Fluvisols, Solonchaks, Solonetz, Cambisols and Vertisols (Soil Map Classification legend, FAO 1990). The Fluvisols are stratified soils and are fertile. The Solonchaks and Solonetz can only support grass and other vegetation species that are tolerant to high levels of salinity and sodicity. Vertisols are found in the low-lying areas which are subjected to seasonal water logging. As a whole these soils offer limited opportunities for both rainfed and irrigated agriculture.

The Quaternary Volcanics are found in Western side of the district, South-Eastern side (Loitokitok, Rombo, Mashuru and Kimana) and Chyulu hills. The Tertiary Volcanics are found around Ngong, Magadi and Kajiado town. The main rocks are olivine, pholonites, pyroclastics, volcanic ash, tuffs and trachytes. The soils developed on these rocks vary widely in depth, colour, texture and drainage. These include Leptosols, Luvisols, Andosols, Nitisols, Vertisols, Cambisols and Phaeozems. Leptosols are shallow and have low water holding capacity and hence low productivity potential. The other soils are relatively fertile and of medium to high productivity potential for both crops and livestock.

The Basement System rock comprising various gneisses, schists, quartzites and crystalline limestone are found mainly in Central part of the district and east of the Rift valley. These rocks give rise to a variety of soils such as Ferralsols, Luvisols, Arenosols, Regosols, Leptosols, Lixisols, Cambisols and Vertisols in low-lying areas. The Luvisols have a tendency to form a surface capping and hence are susceptible to soil erosion and high water run-off. The Cambisols and leptosols are shallow to moderately deep and their main limitation for crops and vegetation growth is shallow depth and low water holding capacity. Ferralsols are deeply weathered and are chemically poor, hence requires high input levels to improve their soil fertility for crop production.

Regulatory and institutional arrangements governing soil administration

- Agriculture Act cap 318 which stipulate guidelines on the extent and types of cultivation

on steep slopes. It also stipulates measures to be undertaken for soil conservation measures in areas prone to erosion.

- Water Act 2002 also provides for the management of the riparian leeway along river courses. It provides for the non-interference of double the distance away from the highest water mark of a river course. This is meant to protect the soils from erosion leading to siltation of rivers.
- EMCA Section 47 provides for the measures for the management of hill tops, hill sides and mountainous areas. The guidelines issued in the management include measures to curb soil erosion (Section 47 (2) c. Part IX of EMCA also provides for the Restoration and easement orders. These orders are meant to protect fragile ecosystems and restore degraded land e.g. those related to soil degradation.

Key environmental issues

- Some soils are chemically poor and require high inputs to improve their soil fertility for crop production.
- Overstocking lead to soil degradation in form of hard soil pan, soil erosion and invader species invasion due to degradation.
- Saline soils, sodic, and water logged soils offer limited opportunity for both rain fed and irrigated agriculture and are common in the district.
- Vegetation removal in the district leads to soils being prone to degradation.

Proposed interventions:

- Soil and water conservation and rangeland rehabilitation.
- Control stocking rates
- Control invader species

Table 2: Distribution, use and degradation status of the major soil types

Types of soils	Characteristics	Distribution	Land use	Degradation hazard	Proposed intervention
Leptosols	Shallow, rocky, low moisture storage	Central division	Grazing, rangeland	High run-off erosion	Destocking
Andosols	Well drained, porous, high organic matter	Kimana, Rombo, Loitokitok, Mashuru	Agriculture	Water erosion	Soil conservation practices
Vertisols	Black cotton, poor drainage, high organic matter	Namanga, Amboseli, Nguruman	Grazing, irrigation, wildlife	low gully erosion	Soil enrichment
Fluvisols	Stratified layers	Nguruman, Magadi	Dry season grazing	Moderate gully from stratification	Soil conservation measures
Solonchaks	Sodic, low organic matter	Amboseli, Namanga	Salt lick, wildlife support scanty vegetation	Wind and water erosion	Addition of organic matter

Ferralsols	Strongly weathered, porous, high moisture, low fertility	Kajiado, Isinya	Grazing, wildlife, some cropping	Moderate water and wind erosion	Enrichment with organic matter
Solonetz	Sodic, poor soil structure, poor aeration, low organic matter	Magadi, Mashuru	Support scanty vegetation, wildlife	Wind and gully erosion	Organic matter addition
Nitisols	Well drained, porous, high moisture, stable structure	Emali, Ngong, Kapiti plains, Rombo	Pasture, agriculture	low-water erosion	Soil conservation measures
Cambisols	Little weathered	Rombo, Loitokitok, Mashuru	Agriculture, wildlife, grazing	Sheet erosion	Destocking

2.1.2 Land and Land Use Changes

The total area in hectares for the district is 2,060,000ha which translates to 21,105 square kilometres and this is 3.5% of Kenya.

Prior to the introduction of land adjudication in Kajiado, land in the district was trust land. Semi-nomadic pastoralism has been the traditional Maasai mode of life carried out on land that was communally owned. Its use was closely and adequately regulated through communal rules and practices. Land tenure was vested in the local authority, the Olkejuado County Council (OCC)- which held it in trust for the local community.

Trends in land use change:

Land and land use change over the years in the district, has been marked by turbulence as a result of both man-made and nature; events. The most important changes have been the loss of land and the loss of traditional mobility and flexibility characteristic of pastoralism. The relationship between pastoralism, agriculture and hunting has been dynamic according to the environmental circumstances at any given time.

In the colonial era, Europeans occupied an area stretching along the Tanzanian border and divided the Maasai into the Northern and Southern reserves. The period between 1913 and 1950s, farming communities such as the Kamba and the Kikuyu moved in and started cropping in higher potential areas of Ngong and the foothills of Mt. Kilimanjaro. Although these areas were comparatively small, they were very important in providing the dry-season grazing and the opportunity for Pastoralist to go to agriculture during periods of drought.

Under the National Parks Ordinance of 1945, the Kajiado Maasai lost access to the Nairobi and Tsavo National Parks. It further established a game reserve in Amboseli (3248km. Sq.) restricting the use of these areas by the Maasai.

During the 1948-50 droughts, the County Council was allowed to restrict the cultivation of land through the Land Usage By-laws due to conflicts that arose between the Pastoralist and the farmers.

In the early post-colonial era, quite a junk of high potential land had been adjudicated to the political leaders in the district. The idea of the establishment of group ranches thereby emerged. This was based on the traditional communal system and the economical use of the land's carrying capacity. Human population growth was not however considered. The Groups Representative Act of 1969 limited the ownership of the group ranches to only registered members hence biased against the traditional structures. People therefore glamour for the subdivision of group ranches.

Impacts of land use and land use changes

- It has led to the subdivision of group ranches with fragmentation up to uneconomical units.
- Increased cases of land transfers, sales particularly by uninformed Pastoralist.
- Land adjudication has affected the traditional extensive livestock management system due to the diminishing resource base.
- Increased poverty among pastoralists (it is apparent that sale of land is selling wealth to buy poverty)

Table 3: Agro-ecological Zone

Agro-ecological Zone	Potential land use	Current land use	Location	Extent (ha)	Challenges/.C onstraints	proposed intervention
IV	Agricultural	Agricultural	-Ngong -	-19119	-Human settlement	Land use planning Best Farm husbandry catchment conservation
		Agricultural	-Loitokitok	-39000		
		Agro-pastoralism	-Central	-25881	Degradation	
V	High/medium potential	Agriculture/livestock/forest	-Ngong	-1711	Encroachment	Conservation of forest Protect water catchment Regulate irrigation (abstraction of water)
		-Agriculture	-Loitokitok	-24000	-water degradation	
		-Agro-pastoral	-Central	-14881	-no water	
VII	Marginal/Rangeland	Game/wildlife/livestock	Ngong Loitokitok Central;	588548 459154 956298	conflicts conflicts conflicts	Conflict resolution Review compensation policy

Source: District development plan 1979-1983 /1997-2001

Key environmental issues

- Land and soil degradation in form of soil erosion, compaction, loss of productivity, poor texture and structure, sodicity, salinity.
- Diversification of livelihoods and coping measures in the district are limited as an ASAL area. Some forms of diversification e.g charcoal burning are disastrous to the environment.
- Land use and water availability are somewhat mutually inclusive. Water stress in the district is the priority limiting factor in land use planning.

Proposed interventions

- Undertake soil and water conservation activities
- Diversify to sustainable livelihoods
- Construction of Dams and Water pans

2.1.3 Dry lands

Agro-climatic Zones

This parameter is regarded as an indicator of the ecological potential of an area. It is attributed to moisture availability and annual average temperatures. The rainfall pattern in the district has given rise to the Agro-ecological zones (Table 2.1). About 55% of the district is under ACZ V, and this makes Kajiado one of the 22 ASAL districts in Kenya.

Table 4: Rainfall pattern and Agro-ecological zones in the district

Station	Altitude	Annual Rainfall	Agro-ecological Zone
Kajiado	1738m	502mm	IV/V
Magadi	613m	429mm	VI
Konza	1655m	450mm	IV/V
Loitokitok	1960m	821mm	II
Rombo	1120m	807mm	III
Ngong	1920m	791mm	III
Sultan Hamud	1280m	615mm	IV

Table 5: Land use systems

Ecological Zone	Land Tenure	Land use type	percentage of the district area	Challenges	proposed interventions
ACZ - V	Subdivided	Agropastoral/wildlife	55%	Land degradation (soil erosion/compaction/salinity/sodicity, removal of vegetation)	Destocking, protection of vegetation cover
ACZ - VI	Group ranches	Pastoral/wildlife	37%	Land degradation, conflicts	Land use husbandry
ACZ -II-IV	Subdivided	Agricultural/settlement	8%	Soil erosion, diminishing productivity	Proper land husbandry, soil enrichment

Table 6: Priority issues and interventions

No.	Prioritised issue/challenge	Current intervention	Proposed intervention in the plan period (2006-2010)	Responsible institution
1.	Soil degradation	-Shifting cultivation -Nomadic pastoralism -Dry season grazing	-Destocking through animal off-take -Breed improvement -Introduce appropriate farming systems for ASAL	-Livestock Department -Arid Lands Resource Management Project -Agriculture Department
2.	.Vegetation cover degradation	-Farm assessment approval process	Regulated/controlled tree products removal -Afforestation	-District Environment Committee (DEC) -Kenya Forest Service
3.	Conflicts	-Compensation scheme	-Review & implement compensation scheme -Establish a district conflict resolution committee	-KWS -District Executive Committee

2.2 Agriculture, Livestock and Fisheries

2.2.1 Agriculture

The total area of the district with arable potential is about 171,000 hectares (8.1% of the total area of the district). The actual area under cultivation is about 88,000 hectares (51.3% of total acreage of arable land). The main agricultural areas are found in laces with relatively high average annual rainfall (ACZ II-IV). This includes:

- Ngong hills area

- Loitokitok area on the foot slopes of Mt. Kilimanjaro
- Slopes of Nguruman escarpment (rain fed and irrigated)
- Slopes of Oldonyo Orok hill in Namanga
- Western foot slopes of the Chyulu hills
- Scattered patches in Central and Mashuru divisions
- Scattered irrigation areas in parts of Loitokitok

Farming is carried out mainly by immigrants (non-Maasai) but recently the Maasai are also taking up farming more seriously than in the past.

The production systems range from subsistence to commercial. The commercial system is practised in only 1.5% of total farmed land in the district. It is mainly for horticulture and is oriented towards the market.

Under this system extensive use of inputs such as chemical fertilizer, certified seeds and pesticides are applied.

As for the trend, crop production has fluctuated over the past ten years due to weather uncertainties. In 1991, the production declined due to drought and in 1992-1995 the production improved and again declined due to unreliable rainfall.

The horticultural farming in the area between Kitengela and Isinya is becoming prominent and a major source of income and employment. The horticultural crops grown include onions, tomatoes and Asian vegetables.

In the recent past, there has been an increased interest in commercial farming especially of cut-flowers in Isinya division. Production of Asian vegetables also has been increasing in Magadi as well as increase in production of vegetables in Loitokitok division. Drip irrigation is gaining popularity among small scale farmers who have sunk boreholes.

The ministry of agriculture continues to be at the forefront in the management of agricultural production in the district as it offers extension and agricultural mechanization services. It also collaborates with other institutions and agencies in enhancing agricultural productivity geared towards ensuring food security for the district.

Key environmental issues include land degradation where good agricultural practices are not followed. Others include land clearing, soil erosion, air and water pollution and misuse of agrochemicals. Interventions include training farmers on good agricultural practices, ensuring that farmers practise safe and effective use of pesticides, promotion of soil and water conservation and agro forestry and collaboration with the provincial administration in curbing charcoal burning and sand harvesting.

Agro-pastoral system

There are very few Maasai who practice mixed farming. The changing lifestyle has accelerated this trend. It is seen as coping mechanisms in cases of severe drought or disease epidemics. The agro-pastoralists keep a few animals and cultivate between 0.5-2.0 acres of land. More often the production is low as no inputs are added.

Pollution, wastes and degradation associated with Agriculture

Sources of pollution in agricultural production practices include agrochemicals, fertilizers and soil. These pollute air and water (rivers and groundwater). The impact of these pollutants is that they reduce the quality of both air and water thus interfering air and marine environments. The department of agriculture carries out several interventions which include conducting intensive training on soil and water conservation and promotion of agro forestry in order to reduce soil erosion. It also trains farmers on safe and effective use of pesticides so as to reduce their misuse.

Types	Source
Agrochemicals (pesticides, herbicides, inorganic fertilizers, fungicides)	Flower farms, horticultural farms, farm chemical stores and outlets

Status and trends

Agro wastes have been on considerable increase over the years. It is appreciated that greenhouse technology has enabled many investors to adapt environmental conditions into the crop requirements. In this way ASAL districts have been the focus for this technology as there is sufficient land for such development. Furthermore, Kenya is also a net importer of fertilizer. This escalates the trend in the accumulation of these agro wastes.

Many farms relying on modified environments are taking root in Kajiado. The areas affected are Isinya, Kitengela, and Ngong.

Impacts of pollutants and wastes

- Contamination of groundwater resources arising from the seepage of soluble agrochemicals
 - Effect on human occupational health and safety especially for workers on farms who are exposed for longer periods.
 - Animal deaths resulting from drinking contaminated water or consuming pasture that is contaminated with agrochemicals
 - Loss of biodiversity (faunal/floral)

Table 7: Types and status of farming systems

Type of farming system	Extent (Ha)	Distribution(% of total)	Location	Agricultural products	Status (current production -kg/ha	Challenges (potential/optimum level kg/ ha	proposed interventions
Rain-fed agriculture	29,488	96%	District wide	-Maize -Sorghum -Millet -Beans -Cowpeas -Greengrams -Pigeon peas -Garden peas -Irish potatoes -Sweet potatoes -Cassava -Ground nuts -Sun flower	-820 -26 -18 -231 -55 -36 -61 -90 670 -24 -12 -20 -121	±20 bags -5 „ -10 „ ±5 „ -5 „ -5 „ -5 „ -4 „ -15 „ -4 „ -3 „ -15 „ -10 „	Promotion of appropriate agricultural technologies including: -planting of drought tolerant varieties -Water harvesting -Soil & water conservation -Animal power -organic farming -Plant nutrition -Promotion of good agricultural practices.

Irrigated agriculture	1,242	4	Loitokitok,	-Tomatoes	-25,000	-30,000	Promotion of appropriate irrigation technologies: -Drip and furrow basin irrigation systems -Introduction of improved horticultural crop varieties -Networking with relevant agencies including exporters, agrochemical companies, HCDA, research institutions on marketing and training.
			Magadi	-Onions	-8,000	-12,000	
			divisions	-Cabbages	-11,000	-12,000	
			Sections of	-Kales	10,000	-12,000	
			Namanga,	-Spinach	-10,000	-12,000	
			Isinya,	-Chillies	-3,500	-6,000	
			Mashuru &	-Brinjals	-6,000	-9,000	
			Ngong	-Ravaya	-6,000	-9,000	
				-Okra	-4,000	-6,000	
				-Karela	-4,000	-6,000	
				-Lettuce	-5,000	-6,000	
				-Capsicum	-6,000	-7,000	
				-Cucurbits	-4,000	-10,000	
				-Carrots	-6,000	-8,000	
				-Oranges	-8,000	-10,000	
				-Lemons	-6,000	-8,000	
				-Tangarine	-8,000	-10,000	
				-Mangoes	-15,000	-15,000	
				-Bananas	-8,000	-10,000	
				-Pawpaws	-6,000	-10,000	
	-Avocado	-7,000	-10,000				
	-Passion	-10,000	-12,000				

Regulatory and institutional arrangements

The importation of fertilizer is controlled by the Agriculture Act Cap 318 while its quality is controlled by the Kenya Bureau of Standards (KBS) and the Kenya Plant Health Inspectorate Service (KEPHIS).

The Agrochemical Association of Kenya (AAK) in conjunction with the government of Kenya has put in place procedures for the safe disposal of the agrochemical wastes. The Kenya Flower Council (KFC) also regulates the standards for operations by flower farms. These include agro waste management. There are codes of practices which are voluntarily followed by members of these associations. However though not enforceable, they form the basis for sound management practices for agro waste. The EMCA 1999 provides elaborate provisions in the management of wastes, pesticides and other toxic substances. The Act is administered institutionally by NEMA.

Key environmental issues

- Agro-waste and pollutants pose significant environmental, public health and safety risk if not well managed.
- The management capacity in most agro-waste related enterprises in the district is relatively low.
- There is need to designate disposal sites for obsolete pesticides

Proposed interventions

- Enhanced awareness on the handling, safe use and disposal of pesticides and chemicals in the agriculture sector is paramount.
- Strengthen the monitoring capacity in the regulatory agencies and key research institutions.
- Enforce the standards, regulations and legislation on pesticides, chemicals and pollutants arising from the agriculture sector.

2.2.3 Livestock

Traditionally, Kajiado district's major economic activity is Semi-nomadic pastoralism. Over 75% of the population derives its livelihood from livestock production which account for about 60% of the total labour force. The lifestyle of the majority of the population depends on livestock and livestock products for subsistence.

Three livestock production systems are identified, namely: the group ranches, individual ranches and individual parcels, being the individual parcels that emerge from the dissolution of group ranches. The group ranches range from 3,000 to 15,000 hectares in size while individual ranches average 800 hectares.

The livestock reared are cattle and shoats (sheep and goats).

Status and trend

Table 8: Livestock trend in 1999 - 2000

	1999	2000

Cattle	769,096	402,576
Goats	569,763	413,832
Sheep	655,939	438,926

In absolute numbers the livestock population is higher in relatively high potential divisions of Loitokitok and Ngong. However, in terms of relative square kilometre Ngong has the highest number. Dairy development is concentrated in the high potential zones of Ngong and Loitokitok areas. These cattle are kept in zero grazing units.

Currently a lot of diversification is being practised with the introduction of camels, poultry and apiculture (beekeeping). Apiculture has particularly gained prominence among women in Dalelakutuk, Mashuru and Magadi areas. The camel population has increased tremendously from 110 initial herds in 1989 to over 400 in 2000. Their benefit is largely associated with milk during the periods of prolonged drought.

Pollution and wastes from Livestock production

Livestock production in ASAL areas is almost regarded an environmentally friendly activity. This is relation to the vastness of the spatial area and the relatively low density settlement by the human population. The interaction of the two activities is therefore minimal.

However, various forms of pollution and wastes are witnessed in the livestock production sector. The slaughterhouses feature significantly in the urban areas as sources of pollution. Slaughterhouse effluents are discharged to the environment e.g. open drains and water courses thereby causing pollution. The effluents also emit objectionable odour to the surrounding. These are common scenarios in the urban centres in the district such as Kitengela, Isinya, Bissil and Kiserian.

During times of drought, animal deaths are reported in virtually all divisions. Carcasses litter the surrounding as they are left uncollected. As they rot, the carcasses emit objectionable odour and in some cases act as medium for transmitting vector borne diseases. Cowdung and chicken droppings among others are also major sources of pollution and by themselves wastes from the livestock sector especially in urban centres where animals are witnessed roaming in municipal waste dumping grounds.

2.3 Water resources

Kajiado district entirely depend on groundwater reserves due to limited number of permanent rivers and reliable rainfall regimes. Boreholes and shallow wells remain the most widespread methods of accessing water in the district.

Water supplied to the district is far short of the estimated demand for the district. The Table below shows the water production during dry season in the district.

Table 9: Water production (in cubic metres) by different sources per division

Division	Piped supply	Boreholes	Dams/pans	Hand dug wells	Total
Central	967 (37.1%)	1161 (44.4%)	217 (8.3%)	267 (10.2%)	2612
Loitokitok	1351 (57.3%)	997 (42.3%)	9 (0.4%)	1 (.)	2358
Magadi	1626 (94.3%)	18 (1.0%)	21 (1.2%)	60 (3.5%)	1725
Mashuru	1626 (82%)	302 (15.2%)	49 (2.4%)	7 (0.4%)	1984
Namanga	706 (53.4%)	450 (34%)	49 (0.3%)	164 (12.3%)	1324
Ngong	5780 (82%)	1020 (14.5%)	161 (2.3%)	81 (1.2%)	7042
Total	12,056 (71%)	3,948 (23%)	461 (3%)	580 (3%)	17,045

Source; Kajiado Water office.

Table 10: Sources and Status of water resources

Source	Status		Management System	Challenges	Proposed interventions	
	Quantity (m3/day)	Quality	Usage			
Groundwater	372,632	High fluoride levels > 3mg/l	Domestic, livestock, irrigation	Communal, private, GOK, NGOs	-Unregulated exploitation hence depletion of reserves -Most boreholes have no EIA	-Enforce Water Act 2002 & EMCA 1999 -Gazette groundwater conservation areas
Springs	41,639	-PH values in Magadi out of required range (6.5-9.2) -8.2% of springs are sodic -All springs are suitable for all uses	-Domestic, irrigation, livestock	-Communal, public/GOK	-Destruction of sources by tree cutting, encroachment & overgrazing -Unauthorised abstraction of springs	-Rehabilitation of catchment -Enforcement of Water Act and EMCA -Soil conservation in the catchment -Awareness raising among community -Surveillance on tree cutting at catchments
Shallow wells	646	Colour & turbidity permissible levels in most wells exceeded	Domestic, livestock, irrigation	Communal, private, NGOs	-Sand harvesting deplete shallow wells -Pollution by pit latrines and surface runoff -Poor abstraction methods	-Regulate sand harvesting and apply EIA for all new wells
Rivers	160,744	-6% of river water unsuitable for drinking (TDS-2500, Fl- > 3mg/l, Na- > 200mg/l) -Colour/turbidity is high -Good quality for livestock use -Na absorption level high (17.6%)	Domestic, livestock & irrigation	Public, GOK	- Destruction of catchment -Over-abstraction -pollution e.g. by car washing -Destruction of riverine causes by sand harvesting & agriculture	Rehabilitation of catchments with vegetation -Enforcement of Water Act & EMCA -Capacity building among water users associations -monitoring water quality
Rainwater harvesting	554	-6% of pans/dams have fluoride levels high -87% of sources have turbidity high turbidity levels	Domestic, livestock	Private, NGOs	Siltation due overgrazing -Contamination upon contact with surface or storage	-Secure water pans/dams -Enhance water retention facilities
Boreholes	3,948	-5.3% of boreholes have high Fl levels -Most sources are sodic -Good for livestock use	Domestic, livestock, irrigation	Communal, private NGOs, GOK	Unregulated exploitation leads to depletion -Most boreholes done with no EIA	-Enforce the Water Act and EMCA -Gazette groundwater conservation areas

The percentage of district population with access to portable water is given in the Table below. The water demand is calculated on the basis of the user categories i.e. domestic, livestock and commercial water use. Irrigation water demand and use of water from natural rivers, springs, pans/dams where treatment is required and is not in place is not taken into account.

Table 11: Access to water

Division	Water demand (m ³ /day)	Water availability(m ³ /d)	Percentage coverage
Central/Isinya	6,108	2,644	43
Namanga	3,936	1,342	34
Loitokitok	10,518	2,358	22
Magadi	1,951	1,732	89
Ngong	15,569	8,498	55
Mashuru	4,309	1,986	46
Total	42,399	18,560	44

Provision of water for livestock is an important aspect in Kajiado district. There are limited surface water flows in the district. The major rivers in the district are; Athi, Ewaso Ngiro, Olkejuado and Noolturesh. The greater part of the district depends on groundwater reserves in form of boreholes, dams, shallow wells and pans. Boreholes form the bulk of supply sources (Table 12). However, most of the boreholes are broken down and are not in operation.

Table 12: Water sources

Type of water source	Number	Status/Comment
Boreholes	376no	18% non-functional
Shallow wells	Over 3000(traditional)	Yields vary seasonally
Springs	234	Yields low or saline in other areas
Earth dams	35	60% storage capacity lost to silt
Pans	379	Shallow depths leads to dry-ups
Roof catchments	34	Insufficient to meet the demand

Key environmental issues

- Water scarcity/stress
- Water use conflicts
- Siltation of dams/pans
- Spring degradation
- Non-operational water facilities

Proposed interventions

- Establishment of pipelines and mobile water services
- Separate livestock watering troughs and domestic draw off points
- De-silting
- Vegetation of the embankments and catchments

- Protection by fencing off the source
- Rehabilitation and maintenance of water facilities

2.4 Forestry and Wildlife Resources

2.4.1 Forestry

The forest resources in the District largely comprise of the indigenous cover. Forested areas are found in Ngong, Loitokitok and Namanga hills (Table 21). Exotic afforestation programmes are gaining ground within homes and build-up areas e.g. Kajiado town. Tree farms for commercial exploitation are undertaken in Isinya and Ngong divisions. Due to the shallow soils and high rock pan, this venture may prove experimental.

Forestry activities are being practised in the district. This is mainly a combination of indigenous and exotic tree species. Afforestation programmes are limited to Ngong and Loitokitok. Agro forestry activities are being undertaken in areas where agriculture is practised. Forested areas are found in Ngong, Loitokitok and Namanga hills. These areas also act as water catchments.

Table 13: Forest Resources in Kajiado district

Name	Area(Ha)	Type of Vegetation	Status
Ngong Hills	3077.0	Indigenous/Exotic	Gazetted (For Game)
Namanga	11784.0	Indigenous	Gazetted (As a Forest)
Loitokitok	765.8	Indigenous/Exotic	Gazetted (As a Forest)
Embakasi	573.0	Indigenous/Exotic	Gazetted (For Game)
Ololua	661.6	Indigenous/Exotic	Gazetted (As a Forest)
Total	16861.4		

Source: Forest Department 2003.

Major threats to forest in the district include human encroachment for habitation, fuel wood, charcoal burning and illegal tree felling for curving.

Table 14:Types and status of forest

Type of forest	Extent (Ha.)	Distributi on (% of total)	Location	Forest uses	Status				Proposed intervention
					Gazett ed	Tru st land	Privat e	% degradatio n	

Indigenous/ exotic	3077.0	0.14%	Ngong	Grazing, fuel wood, wildlife	*			7%	- Demarcation -Community involvement -Law enforcement
Indigenous	11784.0	0.56%	Namanga	Grazing, water catchment , wildlife	*			3%	- Demarcation -Community involvement
Indigenous/ exotic	765.8	0.03%	Loitokitok	Fuel wood, wildlife,	*				
Indigenous/ exotic	573.0	0.02%	Embakasi		*				
Indigenous/ exotic	661.6	0.03%	Ololua		*				
Total	16861.4	0.8%							

2.4.2 Wildlife

Wildlife habitat is a major land occupation in the district. The areas designated for game reserves include Amboseli 392Km square and Chyulu conservation area 445Km square which are within the range lands. Others are Athi Ngong area and western part of the district in Magadi division.

This is one of the districts richest natural endowments. The district is rich in wildlife of all types including elephants, buffalo, zebra, rhino cheetah, gazelles, hyenas, wildebeests, warthogs, giraffes, lions, leopards and elands. High concentrations of wildlife are found around the swamps in Amboseli and Chyulu areas.

. The wildlife dispersal areas in the district include:

- Dry dispersal grazing zones habited in the dry season
- Wet season grazing and is extensive due to park boundaries
- Arable potential areas and have been encroached by cultivation.

Migratory routes are:

- Kaputiei plains to Nairobi National Park through Kitengela area
- Amboseli National Park to Tsavo West National Park through either Kuku Group Ranch or Chyulu Game Conservation area
- Amboseli National Park to Kilimanjaro area in Tanzania

In the dry season, the game migrates to higher areas and swamps where forage is still available. Although wildlife density and foraging consumption are not available, it is assumed that the density of wild animals is lower and less damaging to the environment than livestock. Apart from the Amboseli National Park where land degradation is high due to the larger number of wildlife (Elephants) leading to vegetation degradation, soil erosion and compaction. Common wildlife

found in the district include; wildebeest, Gazelles, Zebras, Warthogs, Hyenas, Giraffes, Elephants, Lions, Leopards and Elands.

The Kenya Wildlife Service is mandated under the Wildlife (Conservation and Management) Act, Cap 376 to manage wildlife since this resource has both monetary and aesthetic values. Wildlife is faced with challenges related to human/wildlife conflict, encroachment of protected areas, transmission of wildlife diseases to man and livestock (zoonoses), land use changes, habitat fragmentation and degradation and poaching.

Apart from the common free movement of wildlife in the district, there are also dispersal zones, which are dictated by climate. This increase has caused pressure on the existing grazing areas, which has caused problems in degradation of vegetation cover.

The kind of wildlife found in the district includes Elephants, Buffaloes, Giraffe, Thomson Gazelle's Warthogs, Ostrich, Impala, Kongoni, and Wildebeest among others.

There are a number of problems that are associated with wild life in the district. This include competition with livestock for water and grazing resources, spread of wild diseases to livestock (particularly malignant catarrhal fever) tick bone diseases and predation of domestic animals and destruction of cultivated crops.

Wildlife Distribution in Kajiado District

The Tables below displays the number of animals per species found in different ecological niche within the district. Thompson's gazelle and zebras are the common species most widely distributed in the district.

Kitengela conservation area and Environs

The area is characterized by numerous human activities including settlements, quarrying, flower farming, subsistence crop farming and *eucalyptus grandis* plantations. Several farms have been fence barring wild animals from traversing them. Although remnants of wildlife could be seen around the farms they were relatively few compared to less settled areas. The habitat of the uncultivated areas is generally open grassland dominated by *Themeda triandra* and *Cenchrus ciliaris*. Table below displays the number of species recorded in the area.

Table 7.2.: Animal distributions in Kitengela Conservation are (Embakasi, Kisaju, Oloosirkon, Sholinke and Olooitikoshi)

Table 15: Wildlife species and numbers-kipeto area

Species Name	October 2005 Count
Thomson Gazelles	221
Grant Gazelle	60

Kongoni	101
Zebra	261
Impala	39
Giraffe	17
Ostrich	13
Wildebeest	43
Guinea Fowl	19
Kori-Bustard	4
Marabou Stork	8
Totals	786

Kipeto area

Despite subdivision of Kipeto ranch to individual owners, have formed a wildlife forum to address key issues relating to wildlife conservation and management. The vegetation of the area is generally open grassland occupying 80% of the area with acacia bush land along the valleys extending to the Northwest. Of the dominating species during the count Kipeto area recorded the highest numbers that is zebras, *T.gazelles* and *G.gazelles*.

Table 16: Animal distribution in Central Kaputei area

Species Name	October 2005 Count
Thomson Gazelle	468
Grant Gazelle	406
Kongoni	61
Zebra	428
Impala	21
Giraffe	8
Ostrict	47
Wildebeest	229
Dik-Dik	1

Table 17: Animal Distribution in North Kaputei

Species Name	October 2005 Count
Thomson Gazelles	75
Grant Gazelle	70
Zebra	156
Impala	13
Giraffe	17
Ostrich	24
Warthog	105
Waterbuck	56
Wildebeest	4
Dik-Dik	1
Reedbuck	10

Bushbuck	50
----------	----

Table 18: Animal Distribution in Enkorika Area

Species Name	October 2005 Count
Thomson Gazelles	67
Grant Gazelle	59
Kongoni	60
Zebra	123
Impala	21
Giraffe	26
Ostrich	14
Eland	2
Wildebeest	106
Dik-Dik	20
Gerenuk	1
Guinea Fowl	109

Table 19: Animal distribution in Torosei Area

Species Name	October 2005 Count
Thomson Gazelles	158
Grant Gazelle	141
Kongoni	8
Zebra	257
Giraffe	34
Ostrich	12
Wildebeest	43
Dik-Dik	12
Gerenuk	3
Guinea Fowl	56
Kori-Bustard	18

Table 20: Animal distribution in Mailua area

Species Name	October 2005 Count
Thomson Gazelle	118
Grant Gazelle	86
Zebra	68
Impala	24
Giraffe	5

Ostrich	16
Eland	5
Warthog	5
Dik-Dik	166
Common Duiker	9
Gerenuk	6
Kori-Bustard	5

Table 21: Animal distribution in Osilalei area

Species Name	October 2005 Count
Thomson Gazelles	18
Grant Gazelle	39
Impala	11
Giraffe	10
Ostrich	1
Eland	3
Dik-Dik	4
Gerenuk	1
Guinea Fowl	64

Observation

Water availability, human activities and vegetation types largely influence wildlife distribution in Kajiado district. Previous counts in Kajiado district were based on group ranches particularly to establish cropping quotas during the cropping pilot project but most of these group ranches have been subdivided to individuals.

Some of the ranches included in the 2000 and 2001 counts were Rinpa, Ole Kena, Ole Tukai Olobelbel Oloontulgum and Kipeto.

In a large part of the district tenure system have changed from communal to private ownership, coupled with land use changes these land reforms are significantly impacting on wildlife distribution and numbers in the district. However unlike human beings animals do not recognize boundaries unless barriers such as fences are enacted hence they still roam widely in the Kajiado plains as long as they can find pastures and water for survival. Ultimately this results to increased human wildlife interface and conflicts manifestation.

The land in Kajiado has been partitioned and fenced due to land subdivision and various human activities were observed including farming of food crops, flowers and tree planting of exotic species of *Eucalyptus grandis* and *Grevillia*. Infrastructure such as school, electricity, wells with generator run pumps have increased. Mining of gypsum and quarrying, charcoal burning - all these activities have interfered with the natural habitat and subsequently with the animal behaviour and natural movements. Most of the area in Sultan Hamud is overgrazed and vegetation cover was very low.

Regulatory and management

Categories of wildlife areas outside Protected Areas

1. Priority wildlife areas adjacent to Parks. These are dispersal areas and migratory corridors critical to sustainable conservation of protected areas.
2. Non-adjacent areas, unconnected with any protected areas but with high wildlife population and high conservation/wildlife-based economic potential.
3. Areas where wildlife in unmitigated conflict with other land uses, whether adjacent to parks or not. The aim here is to separate wildlife from human activities using physical barrier which is cost effective
4. Non-adjacent areas with limited conservation value. The management option in this case is to encourage landowner with sufficient land to practice conservation as an alternative land use. These areas are not KWS national priority as much of the wildlife may eventually be lost due to increase human population.

.Categories of land ownership

1. Large ranches owned or leased by individuals. KWS has move towards granting private landowners the right to use and benefit from many wildlife species of wildlife on their land.
2. Group ranches or other large ranches owned or leased by a group of residents. As in other private land, use rights may be granted to a body representing all the members of the communal ownership group.
3. Small-holding. Since wildlife conservation requires large rangelands, KWS is encouraging small land owners to cooperate and merge their land for wildlife conservation. Thereafter, they will be granted user-right like the other categories above.
4. Trust Land. This category of land is managed by local authority. KWS has developed models for joint management for some of the authorities.
5. State land.
6. Management Regimes for Various Categories of Wildlife Areas

It is noted that human activity has largely contributed to the destruction of wildlife habitats including changing of migratory routes which often results in human-wildlife conflicts.

2.4.3: Biodiversity Conservation

Table 22: Biodiversity Data and information

Ecosystems	Location & size (ha)	Key species	Threats	Status	Proposed Interventions
------------	----------------------	-------------	---------	--------	------------------------

Gazetted Forests	- Indigen enous	Namanga (11784), Ngong (1320), Embakasi(283) Loitokitok(540 Ololua(300)	Acacia spp (mellifera, ballanites, tortilis,senegal, aegentica) Euphorbia, Olea africana,Crotons	-Charcoal burning -Forest fires -Human settlement/en croachment -Demand for wood fuel	Degraded	-Law enforcement -Forest boundary demarcation -Land use policy formulation
	Planta tion	Ngong(1757), Embakasi(290) Loitokitok(225) , Ololua(361)	Eucalyptus, Grevillea Robusta, cypress, Casuarina	-Pests and diseases , demand for construction materials	Progressive	-Afforestation & re- afforestation -Tree nursery establishment

Table 23: Types, status and impact of invasive species

No.	Name of invasive species	Ecosystem affected	Size of area affected	Environmental impact	Proposed interventions
1.	<i>Prosopis Chilensis</i>	Pasture land	200 ha	-Vegetation degradation -Limited pasture -Loss of biodiversity	- Proper land use/ land husbandry
2.	<i>Ipomea Kituensis</i> (Itameletei-Maasi)	Pasture land	320,000ha	-Limited pasture -Loss of biodiversity	-removal by grabbing -Proper land husbandry

Key environmental issues

- Poor land husbandry
- Invasive species
- Human encroachment in wildlife habitats
- Over harvesting of forest/trees for fuel wood, charcoal burning
- Illegal tree felling for curving.
- Poaching
- Human wildlife conflict

Proposed interventions

- Control overgrazing
- Afforestation, soil erosion control
- Grabbing of invasive species
- Control charcoal burning
- Promote tree planting and afforestation
- Enhance protection of wildlife from poaching
- Initiate community partnerships in wildlife conservation

CHAPTER THREE

3.0 HUMAN SETTLEMENT AND INFRASTRUCTURE

3.1 Land Tenure

Unregistered land is the dominant land tenure situation in the district (Table 26). As the population grows and immigration accelerates, it is likely that conflict over this unregistered land will increase. Similarly, land invasions of the National parks will probably increase.

Table 24: Land Tenure System in Kajiado District (Km²)

Type	Area
Freehold	-
Alienated land	948
Registered Trust land	197
Unregistered trust land	16,684
Forest Reserves	13
National Parks & Game reserves	3,142
Townships	16
Total Area demarcated	21,010
Total Water area	142

Source: Land Adjudication office, Kajiado.

3.2 Human and Environmental Health

Table 25: Diarrhoea disease as influenced by the environment

Location	'90	'00	'05
Isinya Division	3,714	5,475	6,637
Central Division	5,735	9,801	13,894
Loitokitok Division	4,343	7,593	9,543
Magadi	3,876	6,271	8,453

Table 26: Eye infection as a disease influenced by the environment

Location	'90	'00	'05
Loitokitok Division	2,542	5,743	6,631
Central Division	1,734	3,532	4,654
Magadi Division	3,134	5,632	7,238

Table 27: Malaria as a disease influenced by the environment

Location	'90	'00	'05
Isinya Division	41,231	48,453	58,653

Central Division			
Loitokitok Division			
Magadi Division			

Key environmental issues

- Eye infection as a disease influenced by the environment
- Malaria as a disease influenced by the environment

Proposed interventions

- Support and empower communities to establish local level institutions to manage health facilities and monitor drug supplies and utilisation.
- Support the establishment of community based health care services.
- Sensitise communities on hygiene and sanitation measures.
- Enforce the adherence of environmental audits and environmental management plans for boreholes.

3.3 Pollution and Waste generated from human settlement

Table 28: Type and source of waste

Source	Type of waste
Households	Domestic (organic, plastics, bones, textile, glass)
Shops/commercial area	Paper, metals, glass, rubber, textile, metals, building & demolition debris
Markets	Organic, plastics
Garages	Oil, grease, metals, rubber
Petroleum outlets	Oil, grease
Slaughterhouses	Effluents, sewage, blood
Hospitals/clinics	Hazardous (swabs, sharps, blood, glass, bandages, syringes, placenta, wool)
Industries	Effluents, smoke, particulates, metals, plastics
Schools/Institutions	Paper, organic
Quarries	Excavation debris

Table 29: Proportion (%) of solid waste by source and mode of disposal

Source		Rural		Urban			Current	Disposal	Practice		
	'90	'00	'05	'90	'00	'05	Incineration	Landfill	Open dumping	Burning	Remarks
Domestic-rural	46%	49%	54%						*	*	Effect insignificant

Domestic--urban				50%	51%	52%			*	*	Quarries used as dumpsites
Commercial				14%	15%	15%			*	*	
Industrial				10%	11%	11%	*		*	*	Incinerators not upto standards, just burners
Medical				2%	3%	3%	*			*	
Slaughterhouses				14%	15%	15%					use of soak away pits
Garages				1%	2%	2%					
Jua kali				2%	2%	2%					
Total											

Table 30 Proportion (%) of effluent waste by source and mode of disposal

Source	Rural			Urban			Disposal	Practic e		
	'90	'00	'05	'90	'00	'05				
							Septic tanks	Sewer	Open drains	Pit latrines
Domestic-rural	1%	1%	3%							*
Domestic-urban				53%	60%	63.5%	*			*
Commercial				1%	2%	3%	*			*
Industrial				4%	4%	6%	*			
Medical						0.5%	*			
Slaughterhouses				17%	21%	25%	*			
Garages				1%	1%	1%	*			
Jua Kali				1%	1%	1%				*

Table 31: Proportion (%) of emissions by source

Source	'90	'00	'05	'90	'00	'05	Chimneys	Stacks	Dust arrestors
Domestic-urban							*	*	
Industrial							*	*	*
Medical								*	
Slaughterhouse									
Garages									
Jua Kali							*		

Key impacts of pollutants to the environment

- Solid waste indiscriminately disposed of causes nuisances and environmental eyesore
- Waste harbour rodents and vermin's that causes diseases

- Waste contaminate surface and groundwater resources
- Emissions and particulates pollutes the air quality
- Effluents causes objectionable odour
- Poor waste disposal poses high risk to public health
- Effluents discharge kill biodiversity in rivers, dams or lakes.
- Poor waste disposal can harm wildlife resources

Proposed Interventions

- Public education and awareness creation on waste management issues.
- Behavioural and attitudinal change towards waste
- Establishment of waste management infrastructure by local authorities e.g. landfill sites for Ngong, Ongata Rongai, Kajiado and Kitengela towns. Other includes provision of litterbins and sewer systems.
- Enforcement of legislation (laws/bylaws) on waste. They include Public health Act, the building code and EMCA.
- Promote environmental best practices in waste management e.g the use of plastic fencing posts and compost manure in farming through competitions and awards.
- Encourage recycling, re-use and
- Slaughterhouses should employ the use of effective micro-organisms (EM) technology in the treatment of their effluents
- All industries should be encouraged through incentives mechanisms to embrace cleaner production technologies in their processes.
- Corporate bodies should formulate and environmental policies and as well as practising Corporate Social Responsibility (CSR)
- Enforcement of environmental audit orders, standards and regulations on waste management
- Introduce through the curriculum environmental education in schools and colleges.

3.4 Communication Networks

Roads

In Kajiado district, the major roads tend to follow the north-south direction connecting to the Nairobi-Mombasa road. With Nairobi outside Kajiado as the focal point, three major road networks emerge: to Magadi; to Namanga through Athi River and Kajiado to Loitokitok through Sultan Hamud and Emali on Mombasa road. The Athi River-Namanga road is connected to the Magadi road by a tarmac road from Isinya to Kiserian.

The only tarmac roads in the whole district are the Nairobi to Namanga (153kms), Nairobi Magadi roads, which passes through Ongata Rongai/Kiserian or Ngong/Kiserian (102kms) and the Kiserian Isinya road. The roads leading to the divisional headquarters of Mashuru, and Loitokitok divisions are not tarmacked. Most of the roads leading to upcoming market centres

with potential for industrialisation like Mile 46, Mashuru, Rombo and Ewaso Kedong are not all weather. More access roads are required especially in the newly subdivided group ranches to allow access of farm produce to the market. Opening up of more roads will improve agricultural and livestock produce marketing. For example during the rainy seasons, farmers in Loitokitok and Nguruman areas where horticultural crops are grown, find it difficult to get their produce to the market.

The underdeveloped intra-district communication network has resulted in poor accessibility in the district. Some of the interior parts of the district are not accessible and are consequently less developed for example Kooro area. Existing resources in such areas have not been tapped. The communities living here have inadequate social and physical facilities. Inadequate infrastructure has also inhibited exploitation of full potential for tourism in the district.

Railway line

There is only one railway line running from Magadi town joining the Nairobi-Mombasa railway line at Konza. The line is used to solely transport soda ash and related products for export through Mombasa. Magadi Soda Company maintains and manages the Magadi-Konza line.

Airstrips

There are seven airstrips in Kajiado town, Loitokitok, Olloolokitosh, Amboseli, Buffalo lodge, Olkiramatian and Namaga. Three of them are privately owned (Amboseli, Olloolokitosh and Buffalo Lodge). Loitokitok and Kajiado airstrips are owned by the government and are under-utilised. Olkiramatian and Namanga airstrips are mostly used by AMREF.

Telecommunication and Postal Network

Telecommunication and postal network in the district is still poor and most areas remaining under-served. Currently there are five departmental post offices in Kajiado, Loitokitok, Ngong, Namanga and Ongata Rongai. There are ten sub-post offices. The postal services offered are not adequate in terms of coverage in the district as well as range of services offered. Telephone services are also poor in the rural areas. Poor communication services have been a drawback against exploitation of economic resources in some parts of the district and establishment of businesses by potential investors.

Mobile phone operators are two in the district namely; Safaricom and Kencell. Kencell has a wider coverage than the former in the district.

Key Impacts of the Communication networks on the environment

- Opening of road networks and airstrips leads to loss of biodiversity (fauna and flora)
- Communication networks of roads, rails and airstrips interfere with the wildlife and livestock dispersal areas, breeding and grazing grounds.
- Mobile phone operators litter the physical environment by way of disused scratch cards and airtime vouchers.
- Road development is associated with waste such as excavation debris that require

disposal.

- Mobile phone operators' network masts create nuisances to the physical environment especially when concentrated in one place.
- Railway line development has high incidences of noise generation.

Proposed interventions

- EIA, EA processes to be enhanced
- Enforcement of EIA, EA and regulations

3.5 Water Supply

It is noted from the outset that uneven distribution of rain in the district results in large fluctuations in river flows (where applicable). Surface water in the district is very low.

The major sources of water in the district are boreholes (500) no., shallow wells (traditional wells -3000no and improved/protected wells), spring sources especially in Loitokitok, dams/pans, rock catchments (limited to Namanga hills) and piped supply (Tables 4.10 & 4.11). Roof water harvesting is also becoming popular in the district in Isinya, Central and Ngong divisions. Boreholes and shallow wells are the most widespread methods of accessing water in the district.

Table 32: Proportion of households accessing various water sources

	Boreholes and shallow wells	Rivers and springs	Pipelines	Dams and pans
% of households	20%	10%	5%	60%

Table 33: Average return distance to water sources

	Boreholes and shallow wells	springs	pipelines
Average Km. to the source	7kms	9kms	15kms

3.6 Energy Supply

The main sources of energy for households in the district are wood fuel, paraffin and charcoal. Electricity is limited to a few urban centres of Kitengela, Kajiado, Bissil, Loitokitok, Magadi, Ongata Rongai, Ngong and Kiserian.

The sources of energy are used by the population as follows:

Electricity: 30%
Wood fuel and charcoal: 40%

Paraffin: 30%

Key environmental Impacts from utilization of energy sources

- Charcoal production leads to the degradation of vegetation and associated biodiversity loss
- Indoor air pollution is common with the usage of wood fuel especially when incomplete combustion occurs
- Soil erosion is prevalent in charcoal production areas
- Encroachment and destruction of forest due to charcoal production and in search of fuel wood
- Greenhouse gas emission is exacerbated by the use of wood fuel as a source of energy.

Proposed Interventions

- Formulation and implementation of charcoal production policy
- Encourage through incentives the establishment of on farm woodlots
- Promote and encourage the adoption of alternative sources and efficient energy sources and technologies e.g. solar and wind energy in the district.
- Implementation of easements in fragile environments of the ASAL district.

3.7 Sanitation

Health Facilities

Health facilities in the District are not adequate particularly in some divisions such as Mashuru and Namanga. The average distance to health facility is about 30km compared to the national average of about 6km. The facilities available translate to about 2542 persons per a facility.

Table 34: Number and distribution of health facilities in the district, 2003

Division	Hospital		Health centres		Dispensaries		Clinics		Total
	GoK	Private	GoK	Mission	GOK	Mission	Mission	Private	
Central/Isinya	1	-	5	-	6	2	1	8	23
Loitokitok	2	3	2	2	9	2	-	4	24
Magadi	-	1	1	-	7	-	-	-	9
Mashuru	-	-	2	-	6		1	1	10
Namanga	-	-	3	-	4	-	-	-	7
Ngong	2	3	2	6	8	3	-	18	42
Total	5	7	15	8	40	7	2	31	115

Source: Kajiado district hospital information service

Key environmental impacts where health facilities are inaccessible:

- Spread of water-borne diseases such as diarrhoea, cholera and typhoid
- Breakout of water washed diseases e.g. yaws, leprosy, scabies and roundworms. Health facilities offer public education on basic hygiene as part of their mandate.
- In irrigation areas of Loitokitok and Magadi, water-based diseases such as bilharzia break out.
- Low productivity of the population due to illnesses.

Proposed interventions:

- Support and empower the local community to manage health facilities through community-based resources e.g. Local authority transfer funds or the Constituency Development Funds.
- Establish community-based health care services
- Create awareness on basic sanitation and hygiene among the rural populace.

3.8 Education Facilities

Accessibility to education facilities supports the delivery of education as a service. Lack of education is known to reduce peoples' ability to take advantage of the opportunities around them, and is often associated with increased poverty. In Kajiado, there is no consistent trend in the increase of schools despite the increase in population. In some cases fewer schools are recorded from year to year indicating possible closure while in others people establish schools as a business.

Table 35 Number of pre-primary and primary schools in the district in 1998 and 2000

Division	Pre-primary		Primary	
	1998	2000	1998	2000
Central	144	105	49	50
Loitokitok	90	114	40	39
Magadi	35	21	8	8
Ngong	251	237	44	44
Namanga	57	63	20	20
Mashuru			28	29
Total	641	590	189	190

Source; Education department, Kajiado

Enrolment and retention to completion by gender in pre-primary and primary schools

A total of 66,934 pupils (56% boys and 44% girls), were enrolled in 1997 while those enrolled in 200 were 71,456 (54.2% boys and 45.8% girls). There is an increase in enrolment although drought is a major factor affecting enrolment rates in the district.

Analyses by gender show that there has been a consistent trend of having fewer girls enrolled in the district. This is attributed to parents preferring to educate boys than girls as they argue that educated girls get married and therefore benefits go to their in-laws instead.

Table 36: Enrolment of boys and girls in both pre-school and primary school in 2000

Division	Boys	Girls	Total	% girls
Central	7552	6481	14033	46.25
Loitokitok	10475	9171	19646	46.7%
Magadi	1450	809	2259	35.8%
Mashuru	4140	3575	7715	46.3%
Namanga	4248	2766	7014	39.4%
Ngong	10880	9909	20789	47.7%
Total	38,745	32,711	71,456	45.8%

Source: Education department, Kajiado

Table 37: Pupil/Teacher ratio in primary schools, 2000

Division	Pupil	Teachers	Ratio
Central	10624	389	27.3
Loitokitok	15649	394	39.7
Magadi	1468	58	25.3
Mashuru	5978	171	35.0
Namanga	4887	139	35.2
Ngong	14421	559	25.8
Total	53,027	1,710	31.0

Source: Education Department, Kajiado

Enrolment of boys and girls in secondary schools

It is noted that the student/teachers ratio in secondary schools stands at 1:14, which is much higher than the national average of 1:35. This can be attributed to the underutilization of the existing facilities.

Table 38: Enrolment of boys and girls in secondary schools

Division	Boys	Girls	Total	%Girls	Teachers
Central	787	749	1536	48.8%	97
Loitokitok	632	454	1086	42.0%	60
Magadi	92	51	143	35.7%	14
Mashuru	211	11	222	5.0%	11
Namanga	57	61	118	51.7%	5
Ngong	1307	922	2229	41.4%	199

Total	3086	2248	5334		386
--------------	-------------	-------------	-------------	--	------------

Source: Education department, Kajiado

Key environmental challenges

- High illiteracy rates and ignorance as the pastoral community have limited value for education and its opportunities
- Attachment to cultural practices such as early marriages, ‘Moranism’ and female genital mutilation which lead to high dropout rate
- Child labour utilisation for herding livestock
- Poor accessibility of education facilities in some most remotest parts of the district
- Harsh weather and climatic conditions that hinder learning concentration and retention to completion

Proposed interventions

- Leaders and communities be sensitised on the on the values and importance of education and its opportunities so as to appreciate the acquisition of the same.
- Empowerment of the community to play a role school management
- Redistribution of teachers within the district more so in primary schools

3.9 Energy Sector

The provision of energy is essential for both social and economic development. The environment provides the raw materials for the energy industry. Activities related to energy production, distribution and consumption are the main sources of environmental impacts from the sector.

Kajiado district relies heavily on wood fuel and wood fuel products e.g. charcoal as the means of energy supply to households. The energy demand growth rate for wood fuel in the district is very high. This is attributed to the growing population and slow rates of reforestation. Over 93% of the households’ energy comes from the fuel wood and charcoal. Fuel wood is mainly used in the rural areas for cooking and heating while charcoal is more predominantly used in the urban households.

There are (2) two sources of wood fuel supply in the district; namely from farms forests and rangelands. Due to its proximity to Nairobi, illegal charcoal burning is high which has contributed to a great deal of tree cutting and deforestation.

There are 27 (twenty seven) petroleum products outlets in the district. The products sold include petrol and diesel fuels, paraffin, gas and heavy oils for industrial use.

The demand for wood fuel in the district could make forest resources exploitation unsustainable. The district has not embrace other alternative sources of energy e.g. wind and solar. Electricity supply is only limited to the urban areas of the district.

The trend and status of energy supply can generally be described as declining and in a very high rate.

Key environmental issues in the energy sector

- Energy production in the district is unsustainable. This is due to the fragile nature of the ASAL district that limits the fast growth and variety of tree species.
- Charcoal burning leads to the concentration of carbon dioxide in the atmosphere causing global warming.
- Indoor air pollution and related respiratory diseases and loss of eyesight, is common in the rural areas of the district.
- Land degradation results from the indiscriminate cutting of trees for charcoal burning. This gives room to the proliferation of invader species.
- Loss of biodiversity in form of habitat loss for fauna and species loss for flora is as a result of tree cutting for energy production.

Proposed mitigations measures

- Enhance establishment of wood lots for wood fuel
- Control of charcoal burning activities
- Enforce public health act and improve ventilation in houses
- Protection of wildlife habitats

CHAPTER FOUR

4.0 INDUSTRY, TRADE AND SERVICES

4.1 Industrial Sector

The district has a few industries for manufacturing, small and medium enterprises, mining, hotel, building, and flower and jua kali. The industrial sector in the district is distributed mainly in the townships but for flower sector.

Types of industries

- *Manufacturing industry:* Magadi soda is the leading manufacturing industry in the district. Based in Lake Magadi, the industry manufactures salt by extracting raw materials (trona) from the lake. The trona is a natural self-regenerating mineral and does not require very elaborate technology for extraction but mere scooping after it has accumulated.
- *Flower industry:* The trend in the flower industry in the district has been significantly on the increase. This is attributed to available vast land and labour that is drawn from the neighbouring district. The industry is largely concentrated in Isinya and Central divisions. The major environmental concerns from this sector are the use of chemicals during propagation, spraying and storage of the flowers. Cases of water contamination have been reported in the past. Again the use of methyl bromide as a fumigant in the cut-flowers contributes to ozone layer depletion.
- *Hotel industry:* Kajiado district is one of the preferred tourist destination areas. The district is endowed with a variety of wildlife and tourist attraction geographical cultural and historical features. As a result, the hotel industry has taken advantage of this opportunity. Various hotels are established in the district including Amboseli-Serena, Oltukai lodge, Kilimanjaro Safari club, Shompole camp site, Ostrich farm hotel and Kibo Safari campsite. The major environmental concern from the industry is the solid and liquid waste pollution especially from the lodges in the parks. This situation is aggravated by the fact that there is limited infrastructure for waste management in the district.
- *Mining industry:* Mining in the district is practised for various raw materials. Gypsum is mined in Isinya as an ingredient in the manufacture of cement in Athi River, limestone occur in Kibini, Toroka and Ngataek, soda ash occur in Lake Magadi. The extraction process in the industry is for raw materials only to be used outside the district mainly in Athi River in Machakos district in cement factories. The industry has led to land dereliction in form of abandoned quarries/pits and dams as well as indiscriminate disposal of the escarvated material that is waste.
- *Building industry:* The trend in this sector is tremendously on the rise because of the district's proximity to Nairobi and available building materials. Townships and settlements have skyrocketed in the past 5 years in Kitengela, Ngong, Kiserian and Ongata Rongai. This development results in the increase in waste generation and an increased demand for water and energy.

- *Slaughterhouse industry:* This is one of the vast growing industries in the district given that the district is a pastoral area. The slaughterhouses discharge effluents onto the environment. They also emit objectionable odour.

Table 39: List of industries and location

No.	Industry	Location
	Magadi soda Co	Magadi Town
	-Prime Steel Mills	Kitengela
	-Charm Flowers	Kitengela
	-Orly Park airstrip (Olloolokitosh
	-P.J. Dave flowers)	Isinya
	Amboseli Serena Lodge)	Amboseli National Park
	-Kitengela hot glass limited	Kitengela
	Carnation plants limited	-Kitengela
	-Ngong carnations	Ngong
	Slaughterhouses	Kajiado, Isinya, Bissil, Kitengela, Kiserian, Namanga, Emali, Loitokitok
	-Petroleum Stations	(Kitengela, Kajiado, Isinya, Ngong, Kiserian, Loitokitok, Sultan Hamud, Emali, Magadi, Ongata Rongai, Namanga)
	Quarrying/Crushing sites	Kitengela, Ngurunga, Isinya, Konza, Oltoroto, Kibini, KMQ (Toroka)
	KenChic poultry	Isinya

Key environmental issues in the industrial sector**Table 40: Type and impact of industries on environment**

Type of Industry	Raw Materials	Product	No of people employed	Wastes	Key environmental impact	Mitigation measure
Mining	Gypsum, Soda ash, limestone/marble, dimensional stone	Cement, Salt Cement Ballast	700	Excavation materials, dust	-land degradation -open pits are environmental hazards to wildlife, livestock and human beings	-Rehabilitation of the disused sites
Flower industry	Flower seeds/seedlings	Cut-flowers	4,800	Contaminated effluents, fumes	-Occupational health and safety Surface & ground water pollution	Effluent treatment -Periodic check-ups of workers -Protective gear at work

Salt processing	Soda ash	Salt	1050	solid waste, chemical effluents	-Corrosion of buildings -Occupational health and safety	-Dissolve the solid waste with allot of water -observe safety regulations in the work place
Construction industry	Sand, ballast, stones, cement, water, timber, metals, glass	Buildings	650	construction waste/debris	-increased demand for raw materials e.g. timber -noise emission -alteration of natural physical environment	

Key environmental issues

- Land degradation
- Waste generation
- Occupational health & safety
- Environmental Hazard

Proposed mitigation

- Total rehabilitation of the sites
- Collection, storage, treatment, recover/recycle, final disposal
- Installation of air scrubbers, air filters
- Establish cleaner production systems
- Provision and enforcement of the use of protective gear
- Mandatory periodic health check-ups
- Quality monitoring
- In case of beneficial use, proper designs be implemented

4.2 Trade sector

Types of trade in the district

- *Livestock and livestock products:* this is the most common type of trade in the district. It involves the sale of livestock (cattle, sheep, goats, poultry, and camels) and their products (hides, milk, meat, skins, eggs, honey). There is a livestock marketing council in the district (a civil society organization) that agitates for the proper governance of this type of trade.
- *Retail trade:* This is common in all urban and rural areas of the district. It is an organized form of trade where various goods are sold through established outlets such as kiosks, shops, restaurants, bars, hotels, pharmacies and supermarkets.
- *Wholesale trade:* This type of trade is not very common in the district. Due to it's proximity to Nairobi, most traders in this type end up being stockists of goods from the main wholesalers.

Namanga town however spearheads in this. This is a border town hence the Cross Border goods transaction due to d currency differentiation strives favourably.

- *Hawking*: itinerant traders are also common in the district. They are more pronounced in the urban townships than in the rural households. They trade in almost any variety of goods ranging from house-wares to electronics. Their mode of transport is on foot. In the district, the hawkers have no permanent or reserved location. They also don't pay taxes or levies to the central government or local authority.
- *Herbal medicine*: The trade in herbal medicine is common among men in Kajiado. Various concoction of herbal medicine are sold to the public for a wide range of diseases and illnesses. This is mainly from cultural and environmental endowments. They have no organized system of trading but hawk the medicine in the open. They also don't have any certification or licences.

4.3 Tourism

The ministry of Tourism and Wildlife remain the principal government agency in the regulation of the tourism sector. Other is the Kenya Tourism Board (KTB) and the Kenya Hoteliers Association. The two latter bodies are concerned with the standards for operations in the sector so as to promote the tourism trade as an enterprise.

Most of the tourism activities in the district are concentrated within the national parks and Game reserves. The national parks are managed by the Kenya Wildlife Services (KWS) while the game reserves are managed by the County council. There also exist the wildlife conservancies and sanctuaries. They are either managed by the individuals or fall under the group ranches. These include Selengei, Elangata Wuas, Entonet, Isinet/ Imbirikani and Shompole.

Table 41: Types of tourism and attraction

Type of tourism	Attraction	No of facilities	Geographical location	Environmental impact
Game viewing	Wildlife		Amboseli Tsavo West	-Soil erosion -Air and noise pollution
Nature trails	Scenic beauty		Namanga	-Ecosystem destruction and disturbance of biodiversity
Camping trails/Cave exploration	Scenic beauty Geographical features		Namanga	-Disruption of ecosystems and disturbance of biodiversity

Wildlife safaris	Wildlife, cultural heritage		Namanga, Amboseli	-Soil erosion, cultural disruption, waste generation and disturbance of wildlife
Cultural tourism	Cultural heritage of the Maasai, artefacts		District-wide cultural bomas and curios	-Cultural erosion -Waste generation

4.4 Mining, Quarrying Sand Harvesting

4.4.1 Mining

Kajiado district is endowed with natural resource which includes minerals such as gypsum, limestone, salt and soda ash. Gypsum is mined at Isinya and is used as an ingredient in cement production at Athi River cement factory. Limestone occurs at Kibini, Toroka and Ngataek and is exploited for the manufacture of Portland cement and ornamental stones. Soda ash occurs at L.Magadi through the self-generating process of trona. Some other minerals, which occur in small quantities, are; granites, diatomite, asbestos, feldspar, garnet gaylussite, kaolin, kyanite, meerscham, mica, quartzite and wollastonite.

4.4.2 Quarrying

Quarrying of building stones is carried out all over the district. The major areas are Ngong, Kitengela and Ongata Rongai. The demand for this material is high due to the immigration of people from Nairobi to these dormitory townships. Soda ash is mined at L.Magadi while limestone is mined at Kibini, Toroka and Ngataek. Gypsum is also available in the district. Quarrying leaves much land derelict.

4.4.3 Sand harvesting

Sand harvesting remains one of the very competitive ventures under mining. There are vast deposits of the material in the district but its unsustainable harvesting technology is threatening the water resources as it reduces the opportunity for ground water.

Industries are also depended upon in the district for economic growth. They include abattoirs, steel mills, stone crushers, limestone processing and flourmills. Other supporting economic activities are shops, transport services, markets, tanneries, bars, hotels, boarding and lodgings.

Table 42: Types of minerals and methods of extraction

Type of mineral	Method of mining	Material used	Land tenure	Geographical location	Size of mine (ha)	Quantity extracted p.a (MT)	Product	Waste produced	Environmental impacts
Gypsum	Open cast	-	Free hold (Lease)	Isinya division	13	250,000	Cement	excavation waste (solid)	-Land degradation/dereliction -Solid waste generation -Noise pollution -Air pollution -Loss of fauna & flora -Ground water disturbance
Limestone / marble	Open cast -Blasting	Ammonium nitrate	Group ranches (lease)	Toroka (KMQ)/Elang ata Wuas	23		Cement	Excavation materials	-Land dereliction -Vegetation loss -Groundwater disruption -Noise pollution -Air pollution -Vibrations
-do-	-do-	-do-	Freehold	Enkorien hill (Bissil)	60	120,000	Cement/ ornamental stones	-Noxious smell -Dust -Excavation waste	-Air pollution -Land dereliction -Loss of fauna/flora -Noise pollution -Vibrations
Sand	Open cast(scooping)	-	Freehold, Trust land, Group ranches	Mashuru, Illmugush, Maili Tisa, Isinya	37	1.5million	Sand		-Water pollution -Diminish water resources available -Disruption of water courses -Soil erosion -Loss of biodiversity
Soda ash	Open cast (scooping)	-	Freehold	Magadi	180	304,110	Salt	-Carbon dioxide -	-Pressure on water consumption -Dust emission -Noise pollution -Socio cultural concerns

Key environmental issues

- Disused quarries and dams are often a potential hazard to human life, livestock and wildlife. They are unsafe as drowning cases have been reported in the past. They also become hiding places for criminals and breeding grounds for vector diseases.
- Explosives are used in quarrying and mining activities. Their detonations produce noise pollution and vibration of structures. They also emit pungent smell. This has resulted in conflict between miners and residents.
- Sand harvesting along rivers have degraded the environment by lowering the waterbeds hence diminishing the water availability potential. The activity also steepens and destabilizes riverbanks thereby causing erosion and river channel widening. Sediment bed loads also increase thus destroying the habitats of aquatic community.
- Abandoned quarry pits/dams
- Absentee landownership
- Old Mining technology

Proposed interventions:

- Review land use policy with specific reference to mineral exploitation
- Enact sand harvesting bylaws for implementation by the local authorities
- Total rehabilitation of open disused quarries including backfilling and re-vegetation of the sites with suitable plant species.
- Enforcement of the EMCA, 1999 and the Mining Act (1987).
- land policy review
- Apply use of Piecemeal rock mass shatter

CHAPTER FIVE

5.0 ENVIRONMENTAL HAZARDS AND DISASTERS

Disasters are unexpected, unplanned and unpredictable occurrences, which cause damage to both human and the natural environment often causing immense negative impacts on the environment. The most frequent disaster in Kajiado is drought and famine. Other man-made disasters are forest fires and collapse of mine walls.

Drought in Kajiado has been experienced in 1994, 2000 and 2005/6. Drought has been largely attributed to environmental degradation arising from the destruction of vegetation in the natural environment. Drought creates harsh climatic conditions that are not favourable to both plant and animal life.

Some interventions measures taken include:

- Establishment of early warning mechanisms to enhance prediction of various weather conditions in order to minimize the effects of drought related disasters at both district and community levels.
- Dissemination of timely meteorological data as a key to mitigate drought occurrences. The data must also be accurate.
- A drought monitoring centre has been established in Nairobi to enhance monitoring of climate and predict early warning of climate events.

Various government ministries and agencies have within their portfolios responsibilities to take precautionary and remedial measures against impacts of disasters. In 1992, the government formulated the Drought Contingency Action Plan and in 1994, the national disaster Management Programme. There was also the same year established the Department of relief and Rehabilitation to manage famine relief operations and drought recovery programme through the relief and Rehabilitation Committees at the district up to sub-location levels. Drought can be predicted but there has been an inadequate preparation for their cyclic occurrences.

Table 43: Sector capacities for disaster preparedness and response

Sector	Type of disaster	Human resource	Technical equipment	Financial	Co-ordinating mechanism	Lead agency
--------	------------------	----------------	---------------------	-----------	-------------------------	-------------

-Agriculture	Drought	yes	no	yes	DSG	ALRMP II
-Livestock	„	yes	no	yes	„	„
-Public Health	„	yes	no	yes	„	„
-Veterinary						
-Environment	„	yes	no	yes	„	„
-Water						
-Forest	„	no	no	no	„	„
	„	yes	no	yes	„	„
	„	no	no	yes	„	„
Environment	Mines wall	no	no	no	DEC	NEMA
Public Health	collapse	yes	no	no	„	

The most prevalent disaster in Kajiado is drought/famine. On a small and sporadic scale, mine wall collapse/caving in has also been documented.

Table 44: Proposed interventions

Theme	Risk reduction/contingency plan	Resources
Conservation	Forestation, Law enforcement on tree cutting, soil and water conservation	-Seedlings (Forest dept), Personnel (agriculture/livestock), and enforcement by KWS/NEMA
Preparedness	Capacity building at all levels Mobilise resources to be at stake	All agencies in the district
Monitoring	Establish early warning system	ALRMP II, MET dept. The community (both formal and non-formal interpretation)
Early warning	-do-	ALRMP II & MET dept
Mitigation	Drill boreholes Conserve vegetation Protect water catchments/springs	Water Resources Management Authority, Forest dept NEMA and ALRMP II
Response	Animal off take Relief food operations Water provision	Livestock dept, ALRMP II, Public Health, Red Cross, World Vision, provincial Administration
Recovery	Establish socio-economic, moral & environmental support system	All departments & CSO agencies
Post recovery	-do- and monitoring	-do-

Key environmental issues

- drought/famine
- Mine collapse

Proposed interventions

- Develop a comprehensive policy, legal and institutional framework for managing disasters
- Strengthen public awareness services on disaster response and management
- Build capacity for disaster preparedness, response and management
- Install appropriate monitoring and early warning equipment in areas prone to disasters. Water provision and Environmental protection
- Develop and maintain inventories on zones prone to drought disaster in the district.
Enforce Environmental audits and other relevant laws

CHAPTER SIX

6.0 ENVIRONMENTAL EDUCATION AND TECHNOLOGIES

Environmental education, awareness and public participation among the population is critical for active involvement in conservation. Formal and non-formal education helps to change people's attitude and behaviour. It imparts people with knowledge and skills that enable people to strive for sustainable development through effective public participation in decision making.

Table 45: Status of Environmental programmes in schools

No of schools			Type of environmental programmes	Remarks
Primary	Secondary	Tertiary		
11	6	4	Eco-schools programme (tree planting, waste management, awareness creation)	Ongoing
3	12	6	4K/Wildlife clubs	Ongoing

Although environmental education has not been incorporated into the curriculum for teaching in schools, elements of environmental education in various subjects related to the environment are ongoing. These include geography, chemistry, biology, home science/economics, physics and history.

The topics taught in schools relate to actions to conserve the environment by:

- Inculcating the necessary skills for behavioural change towards environmental management
- Offering a clear perception for learners to appreciate the value and the role of environment.
- Offering the interrelatedness of the physical elements of the environment support system to life and the need to conserve it.

Key players in non-formal environmental programmes

The current status of non-formal education programme in the district is generally low. The non-formal programmes are focused on activities and enterprises that have a bearing on the environmental resources. They include artefacts groups, wood carvers, group ranch members, Borehole committees, furrow irrigation farmers, eco-tourism groups, beadwork women groups, livestock keepers bordering game parks, honey makers, sand harvesters and herbal medicine practitioners.

The players incorporate issues of environmental conservation through; in-house awareness among members, conservation of threatened/endangered plant/tree species, catchment protection, riverine conservation, pasture management, soil erosion control, basic sanitation, water pollution prevention and conservation of wildlife.

Many programmes e.g. on soil erosion control to prevent siltation of dams have been initiated by the local community. This is a direct translation of a non-formal programme translating into action to conserve the environment.

Another is the protection of the East African Saddle tree (*Osyris lanteolata*) by the herbalist against exploitation and importation to Tanzania due to its immense medicinal value. Eco-tourism groups are active in the conservation of both animal and plant species in tourism circuits so as to enable them derive livelihoods from the sector.

Table 46: Status of environmental programmes in the district

Environmental programme	key players	Challenges	Proposed interventions
Soil erosion control	Group ranches, Borehole committees	Soil erosion and/or siltation	Re-vegetation Destocking Pasture reseeding
Biodiversity conservation	Eco-tourism groups curio members Cultural boma groups	Loss of biodiversity	ecosystem protection

6.1 Public Awareness and Participation

The Table below shows the status of public awareness and participation in Kajiado.

Table 47: Status of environmental awareness and participation in the district

Programmes	Key players	Sector	Environmental benefits	Opportunities	Challenges	Interventions
Cleanup campaign	CSOs, Public Health	Environment Health	-Reduction in medical expenses -Money from sale of recyclables -Aesthetic beauty	-Clean ups -Demonstrations -Road shows	-Negative public attitude on waste -Lack of support from local authorities	-Formulate and implement an integrated waste management plan
Biodiversity conservation	CSOs, Forest dept KWS	Forest Wildlife Environment	Promotion of tourism -Ecotourism as a livelihood Herbal medicine	-Gazettment of fragile ecosystems -Community policing of environmental significant habitats -Presidential decree on threatened species	Poaching -Species extinction -Cross border issues -Weak legislation	-Community awareness raising -Intensify surveillance -Law enforcement

Tree planting	Forest, CSOs	Forest Environment	Shade, Browse for livestock, soil erosion control, biodiversity conservation, carbon sinks, wood fuel, construction materials	Tree planting campaigns -Nursery seedlings for sale as an enterprise	-Harsh weather conditions in the district -Communal land ownership	Law enforcement on tree cutting
Water conservation /protection	Water, CSOs, Agriculture	Water, Environment Public health	Habitat for biodiversity, clean water for use Minimize water use conflicts	Sale of water in households	Scarce water resources Harsh climate	Protect the springs & other sources of water Desilting of pans/dams

6.2 Environmental Information Systems

Environmental information refers to all forms of knowledge, which relates to the environment in one way or another needed to understand or manage the environment.

Table 48: Information and data types in Kajiado district

Sector	Type of information	Form of information	Institutions	Access conditions	Users	System of updating
Socio-economic & cultural	- Demographic (population)	-Maps, reports	-DDO/CBS	-Free	-General	-Census
	-Socio-economic	-Reports, maps	-CBS, NGOs, Social services	-Free	General	Field studies
	-Commerce & industry	-Reports	-Trade dept	Free	- Investors/Business people	-Annual inventory(licences)
Agriculture & land use	-Agriculture	-Reports, maps	-Min of agriculture (DAO)	-Free	-Farmers, NGOs, scholars	-Field assessment (periodic)
	-Land use	-Reports, maps	-Lands, planning dept.	-Free	-Developers	-preparation of zone maps
Forestry	-Forest	-Maps, reports	-Forest dept	-Free	-KWS, general	-Gazettment, adjudication

Water	-Water, hydrology, pollution, quality, quantity, access, distribution	-Maps, reports, electronic, books	-Water dept, NGOs	-Free (Some at a fee)	-General	-Field studies, annual reports
Wildlife	-Species, distribution, threats, habitat, status	-maps, reports, books, electronic	-KWS	-Free	- Conservationist , scholars, planners	-Census, field assessment
Environment	-Waste -Mining -Pollution -EIA/EA	-reports, electronic maps, report -reports -reports, law	-NEMA, Councils -NEMA -NEMA	-Free	-Scholars, planners, developers, local authorities	-Field assessments, SoE, DEC
Livestock	-Breeds, pasture	-reports, maps, electronic	-DLPO	-Free	-Farmers, general	-Census, field assessments
Disasters	-Frequency, types, severity	-reports, maps, electronic	-ALRMP II, NEMA	-Free	General	Field assessments

6.3 Status of Environmental Information Management Systems

Most of the information is stored in a variety of media and forms. This includes bibliographies, reports, journals, computer database and audiovisuals.

Some of the district data and information centres have inadequate physical facilities, obsolete systems, lack of back-up systems and use incompatible data and information formats. The institutional linkages and networking is also poor. There is only one documentation centre in the district and the library facilities are only institutional. There are three circulating newspapers in the district and no publications. Data collection and information dissemination is hampered by inaccessibility to remote localities.

Key environmental issues

- No deliberate funds are set aside for data and information gathering
- A lot of data/information is gathered by institutions by implication through projects, monitoring and research work.
- Existing data is spread over many organizations in the public and private sector.
- Some institutions have data categorized as classified or restricted making them inaccessible.
- Poor infrastructure for data storage and retrieval

Proposed mitigation

- Enhance the District information documentation centre with environmental materials
- Enhance the District environment office infrastructure
- There is need to establish linkages and networking with all the district agencies, CSOs and institutions.
- Access to information will facilitate prompt and informed decision making for environmental management in the district.

CHAPTER SEVEN

7.0 ENVIRONMENTAL GOVERNANCE AND INSTITUTIONAL FRAMEWORKS

The Environmental Management and Co-ordination Act 1999, vests responsibility of environmental management on NEMA

7.1 Status of environmental governance and institutional arrangements

At the district level, the highest organ bestowed with this responsibility is the District Environment Committee (DEC). The committee is composed of government departments as specified in the first schedule of the Act, four representatives from farmers, pastoralists, women and youth groups, two representatives from business community, two representatives from the NGOs and two from the CBOs active in the district.

The members from the civil society organizations are gazetted individuals into the committee. The government departments are members of the committee by virtue of their official capacities in the district. The DEC is chaired by the District Commissioner while the District Environment Officer, is the secretary. The DEC meets quarterly but for instances that warrant meeting outside this schedule.

Many organizations have joined in the environmental governance in the district including:

- Red Cross; that is involved in capacity building and relief operations
 - World vision; is engaged in natural resource management and capacity building
 - ITDG-EA; is active in appropriate technology in the ASAL district as a form of alternative livelihood
 - ORENDU; is engaged in awareness creation for environmental management especially in Ngong
 - Kitengela Heights; that lobby for adherence to zoning development plans in Kitengela.
 - Magadi Soda Co is engaged in environmental conservation in Magadi and Kajiado.
 - Rombo Environmental Group in Loitokitok is active in catchment conservation
 - Amani Youth group; based in Sultan Hamud creates awareness in environmental issues

7.2 Regulatory and management tools

Table 49: Policies, which impact on environment

Title of policy	Year of formulation	Environmental aspects addressed	Implementing agency	Co-ordinating mechanism	Challenges in enforcement	Areas of overlaps/c onflicts-EMCA
Water Act	2002	EIA	WRMA	DEC	Personnel	non

Forest Act	2005	EIA, conservation, bill of rights	KFS	DEC/DFCC	Personnel	non
Wildlife Act		Conservation	KWS	DEC	Low penalties	non
Public Health Act		Environmental health, waste management	PH dept	DEC	Weak penalties	Approval procedures
Local Government act		Waste management	Local Authority	DEC, LA committee meetings	Personnel, weak penalty	Licensing/ Approval procedures
Physical Planning Act		EIA	Planning dept	DEC, DPPLC	Lack of zoning maps/plans	Approval procedures

Table 50: Legislation that impact on human health and environment quality

Title of legislation	Year of enactment	Environmental aspects addressed	Implementing agency	Co-ordinating mechanism	Areas of overlap/conflict-NEMA
Public Health Act		Waste management	PH dept	DEC	Approval procedure
Penal Code		Nuisances, pollution	Provincial Administration	DEC	Penalty application

Environmental management tools in the district

- Environmental Impact Assessment (EIA) for all proposed developments under schedule I of EMCA
- Environmental Audits for all existing facilities as per the EIA and Audit regulations 2003
- Strategic Environmental Assessment (SEA) for policies, plans, projects or programmes
- Cleaner Production (CP) technology for industrial /factories processes
- Economic instruments for incentives and disincentives

The environmental management tools are applied through a process of consultation, public participation, field assessment, and analysis. Various Stakeholders are involved e.g. questionnaires administered to farmers, business people or the general public to ascertain the environmental performance of a facility. Usually, the Stakeholders participate in the very initial stages before the decision is made higher up in the hierarchy.

7.3 Multilateral Environmental Agreements (MEAS)

It is noted from the outset that most of the MEAS in the country have been signed but not ratified. Grass root programmes at the district level may not therefore be significant. However, day to day activities by various agencies in their inherent programmes, by implication, address the MEAS.

The forest department is undertaking forestation (afforestation & re-afforestation) programmes in the district e.g. Ngong, Loitokitok and Namanga. These programmes help to enhance the establishment of carbon sinks in line with the United Nations Framework Convention on Climate Change (UNFCCC)

NEMA in conjunction with the enforcement agencies is monitoring and undertaking the surveillance of imports of hazardous waste into the country through the border point of Namanga. This fulfils the Basel convention on trans-boundary Movement of Hazardous Waste and their Disposal.

Millennium Development Goals (MDGs)

The district programmes on health, education and environment are contributing to the MDGs. Free primary education in the district is aimed at achieving universal primary education for all. The Ministry of health has a comprehensive National Health Service at the district level that ensures the availability of affordable health service to the population in the district. There is also the post-natal and pre-natal clinical and maternal health service in the district.

For the environmental management in the district, the EMCA, 1999 is being administered at the district level by NEMA and its district, divisional and locational environmental committees. These organs co-ordinate all matters pertaining to the environment in the district.

CHAPTER EIGHT

8.0 IMPLEMENTATION STRATEGY

The objective of the Environmental Action Plan is to integrate environmental concerns in development planning and implementation. This is geared towards the attainment of sustainable development. To achieve the plan; stakeholders are involved, resources mobilised and activities monitored and evaluated.

This chapter focuses on the implementation strategy, monitoring and evaluation systems that will be used to access the project management process during the plan period. It also presents implementation, monitoring and evaluation matrix, that the district will put in place to ensure that the implementation of the plan is carried out to achieve the objectives.

The District Implementation and Monitoring Action Plans were developed from intensive consultation workshops at District level.

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

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

Monitoring and evaluation

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

Table 51: Implementation Matrix

Priority issue	Objective	Output	Activities	Timeframe	Stakeholders	Responsible institution	Costing Kshs. (millions)				
							09/10	10/11	11/12	12/13	2013
Rehabilitation of quarries	To rehabilitate all disused quarries in the district into productive land	Rehabilitated quarries	Fencing off, backfilling, vegetation establishment	5 years	Land owners, miners, consumer companies, MPs, ALRMP II, WRMA, LA, GOK depts.	NEMA/PA	11.5	21.5	10.2	11.0	15.0
Water	To protect water catchments and spring sources	protected catchments & spring sources	Perimeter fencing, establish outside watering & draw-off points, tree planting	5 years	KFS, WRMA, ALRMP II, DLPO, DAO, MPs	NEMA/WRMA	25.0	30.5	35.0	40.0	50.0
Sand harvesting	To regulate/control sand harvesting in the district	Sustainable sand harvesting in Kajiado	Public awareness, monitoring & surveillance, bylaw formulation, liaison with enforcement agencies, arrests & prosecution	5 years	LA, local leadership, WRMA, PA, MPs	NEMA/PA/WRMA	1.4	1.5	1.1	1.2	2.5
Charcoal burning	To control charcoal burning in the district	Controlled charcoal burning activities in Kajiado	Awareness creation, establish grassroots vetting committees, regulations, enforcement	5 years	Forest, KWS, PA, DLPO,DAO, WRMA,MPs 63	NEMA/PA/KFS	2.3	3.4	3.5	3.9	4.0

Priority issue	Objective	Output	Activities	Timeframe	Stakeholders	Responsible institution	Costing Kshs.				
							09/10	10/11	11/12	12/13	2013
Invader species	To eradicate invader species in the district	Invasive species eliminated	Sensitization, grabbing, pasture management	5 years	ALRMP II, DLPO, DAO, KARI, MPs		1.6	3.0	4.3	3.0	300,000
Waste	To establish an integrated waste management plan in Kajiado	An integrated waste management plan	Plan formulation, disposal sites fencing/tree planting, construct communal solid waste collection points, invite private sector participation, law enforcement, septic tanks construction, management of final disposal	5 years	LA, PH, WSB	NEMA/LA/PH	5.0m	7.0m	17.5m	18.0m	17.5m

Table 52: Monitoring and Evaluation Matrix

Activity	OVI s	MOV s	Reporting Schedule	Implementers	Responsible Institution for M&E	Remarks
Rehabilitation of quarries	-Hectares of rehabilitated land -No of quarries rehabilitated	-Site visits -Tender documents -Payments made	Quarterly	Landowners, miners, consumer companies	NEMA, Mines & Geology, WRMA, LA, PA	Depend on restoration funds
Protection of water catchments	-Length of perimeter fence established -No of trees planted No of water troughs and draw-off points constructed	-Site visits -Committee minutes -Tender documents -Payments made	Quarterly	WRMA, community	WRMA, NEMA, PA	Water users association to lead
Control of sand harvesting	-No of cases arrested and prosecuted -Amount of sand impounded	-Site visits -Copies of bylaws -Police charge sheets -Records of impounded vehicles	Monthly	WRMA, NEMA, PA, community	WRMA, NEMA, PA	Community riparian committees
Controlling charcoal burning	-No of cases arrested and prosecuted -Amount of charcoal; impounded	-Site visits -Police records -Charge sheets	Monthly	KFS, NEMA, PA, Community	KFS, NEMA, PA	
Eradication of invasive species	-Hectares of land cleared	-Tender documents -Payment schedules -Site visits	Monthly	DLPO, ALRMP II, DAO, KARI	NEMA, DLPO, DAO, KARI	
Waste management	-Tonnage of waste collected -No of receptacles in place -Level of awareness created -No of disposal sites in place -No of septic tanks constructed -Length of sewer line established	-Waste disposal records -Tender documents -Payment schedules -Tender adverts	Monthly	LA, PH, WSB	WSB, PH, NEMA, LA	

REFERENCES

GOK (1994) - National Environment Action Plan 1994

GOK (2000) - Statistical Abstract

NEMA 2004 & 2005 - NEMA State of Environment Reports for the years 2004

NEMA 2004 & 2005 - Kajiado District State of Environment Reports for the years 2003 and 2004

GOK (1999) - Sessional Paper No. 6 on Environment and Development

SARDEP (2000) - Poverty, Target groups and Governance Environment in Kajiado District Kenya

GOK (1997) - Kajiado District Development Plan 1997 - 2001

NES 1999 - Kajiado District Environmental Assessment Report

ALRMP II 1998 - Framework for District Natural Resource Use and Management, Kajiado

ESD-AFRICA (2005) - National Charcoal Survey: Exploring the potential for a sustainable charcoal industry in Kenya.

GOK (1999) - Environmental Management and Co-ordination Act, No 8

ASAL Programme (1990) - Kajiado District Atlas