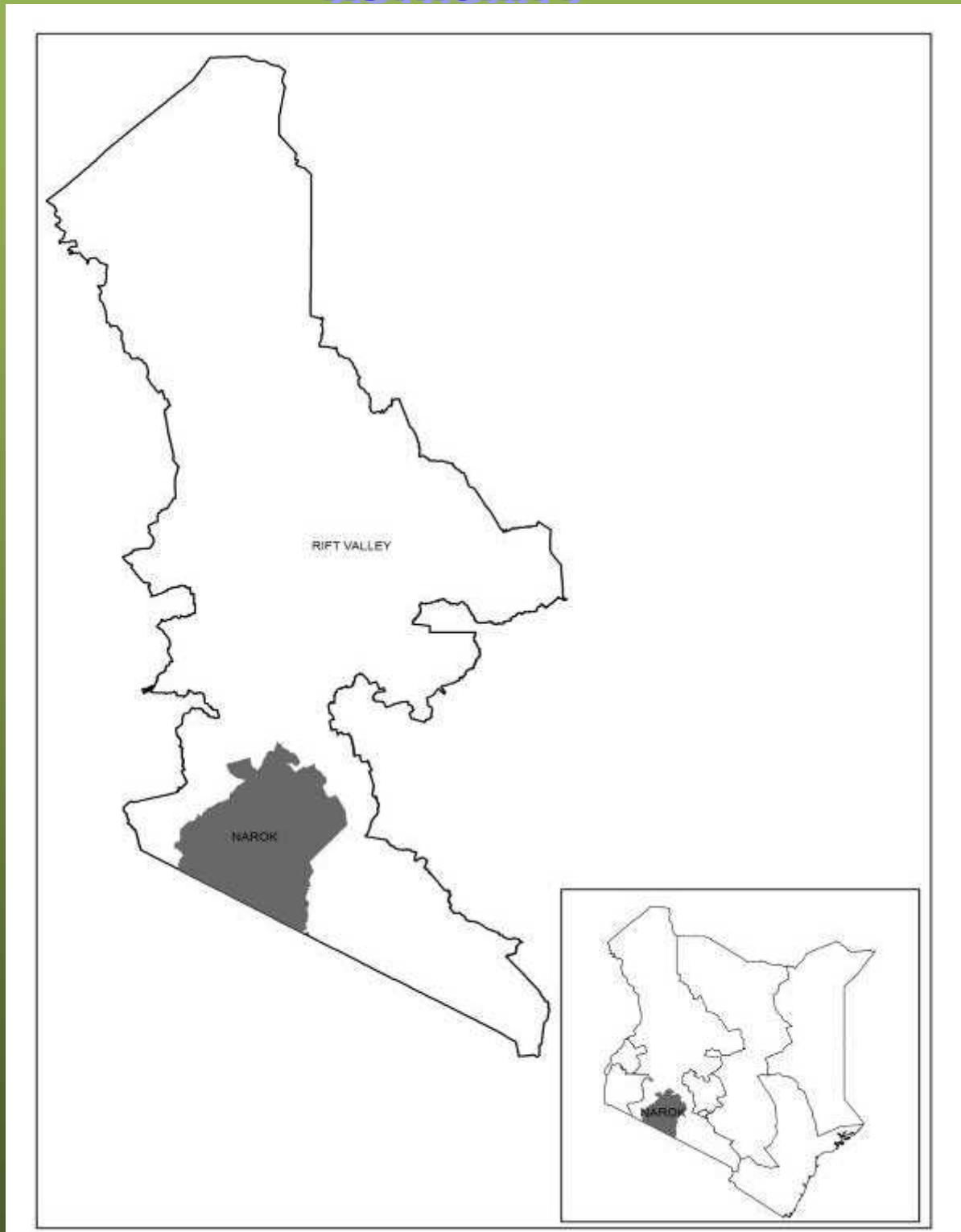




REPUBLIC OF KENYA
MINISTRY OF ENVIRONMENT AND MINERAL RESOURCES
**NATIONAL ENVIRONMENT MANAGEMENT
AUTHORITY**



**NAROK DISTRICT
ENVIRONMENT ACTION PLAN
2009-2013**

EXECUTIVE SUMMARY

The Environmental Management and Coordination Act 1999 provides for the formulation of the District Environment Action Plans every five years. This is the first District Environment Action Plan (DEAP) for Narok District. The preparation of the DEAP was undertaken through a participatory process both in the public, private and civil sectors. Further, this document has incorporated salient issues from the Divisions.

The DEAP highlights priority environmental issues requiring action to mitigate increasing environmental degradation for the district to achieve sustainable development. The report is divided into eight chapters. Chapter one gives the challenges of sustainable development and also describes the rationale for and preparatory process of the DEAP. It presents the district's main profile covering the physical features, demographic and agro-ecological zones.

Chapter two describes the District's Environment and Natural Resources of Land, Water, Biodiversity, rare, threatened and invader species, wetlands and agriculture, livestock and fisheries. For each resource, major environmental issues, challenges and proposed interventions have been identified.

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

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

Chapter five discusses environmental hazards and disasters. The major hazards covered include those related to climate/weather and drought, flood, fire, galleys, disease outbreaks like malaria, and water hyacinth infestation. Mitigations measures have been proposed for implementation.

Environmental information, networking and technology are discussed in chapter six. It emerges that environmental information and networking technology have continued to receive scanty attention. In order to achieve sustainable environmental management, it is necessary to focus on raising awareness and enhancing public participation at all levels.

Governance, Policy and Legal Framework as well as Institutional arrangements are covered in chapter Seven. The key issues addressed include, non compliance with environmental regulations, Conflicting laws and regulations, delays in approving EIA/EA, high cost of environment impact assessment and audit experts for small projects, weak enforcement of environment laws, lack of environment standards and regulations, inactive district environment committee. Chapter eight is the implementation Matrix.

FORWARD

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

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

We also acknowledge the contribution of the members of the local communities who actively participated in the identification and prioritization of the environmental issues in their location which formed part of this document. Our sincere thanks goes to the District Officers (DOs), Chiefs and Assistant Chiefs who were instrumental in mobilizing the local communities and civil society organizations. Special thanks go to the civil society organizations that were drawn from entire Narok district who were instrumental in the identification of the environmental issues across the district.

We also acknowledge the Provincial Director of Environment (Rift Valley), and the District Environment Officer (Narok) for their insights and dedication to this process.

Last but not least, we extend our gratitude to all those who contributed towards the finalization of this District Environmental Action Plan.

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TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	I
FORWARD.....	II
ACKNOWLEDGEMENT	III
TABLE OF CONTENTS	IV
ACRONYMS	VII
LIST OF FIGURES AND TABLES.....	VIII
LIST OF FIGURES.....	VIII
LIST OF TABLES.....	VIII
CHAPTER ONE.....	9
1.0 INTRODUCTION	9
1.1 PREAMBLE.....	9
1.2 PROVISIONS OF EMCA 1999 ON ENVIRONMENTAL PLANNING	9
1.3 THE ENVIRONMENTAL ACTION PLANNING PROCESS.....	9
1.4 CHALLENGES TO SUSTAINABLE DEVELOPMENT	10
1.5 NAROK DEAP SCOPE.....	11
1.6 DISTRICT PROFILE	11
1.6.1 <i>Geographical Location, Size and Administration Units</i>	11
1.6.2 <i>Population Size and Distribution</i>	11
1.6.3 <i>Climate and Physical Features</i>	12
1.6.4 <i>Social, Cultural and Economic Characteristics</i>	12
CHAPTER TWO	14
2.0 ENVIRONMENT AND NATURAL RESOURCES.....	14
2.1 LAND AND LAND USE	14
2.1.1 <i>Soil Types, Characteristics and Distribution</i>	15
2.2 LAND AND LAND USE CHANGES.....	16
2.3 AGRICULTURE, LIVESTOCK AND FISHERIES	17
2.3.1 <i>Agriculture</i>	18
2.3.2 <i>Livestock</i>	18
2.3.3 <i>Fisheries Resources</i>	19
2.4 WATER RESOURCES.....	19
2.5 FORESTRY	21
2.6 WILDLIFE	22
2.6.1 <i>Types of Wildlife</i>	22
2.6.2 <i>Status and trends of wildlife resources</i>	22
2.7 BIODIVERSITY CONSERVATION	23
CHAPTER THREE.....	25
3.0 HUMAN SETTLEMENTS AND INFRASTRUCTURE	25

3.1 HUMAN AND ENVIRONMENTAL HEALTH	25
3.2 POLLUTION AND WASTE GENERATED FROM HUMAN SETTLEMENT	26
3.3 COMMUNICATION NETWORKS.....	26
3.5 SOCIO - ECONOMIC SERVICES AND INFRASTRUCTURE	27
3.5.2 Sanitation	28
3.6 ENERGY	28
3.6.1 Types and Status of Energy Sources.....	29
CHAPTER FOUR.....	31
4.0 INDUSTRY, TRADE AND SERVICES.	31
4.1 INDUSTRIAL SECTOR	31
4.2 TRADE SECTOR	32
4.3 SERVICES SECTOR.....	32
4.4 TOURISM.....	34
4.5 MINING AND QUARRYING	35
4.5.1 Quarrying.....	35
4.5.2 Sand Harvesting.....	35
CHAPTER FIVE	37
5.0 ENVIRONMENTAL HAZARDS AND DISASTERS	37
5.1 DROUGHT/ FAMINE.....	37
5.2 DISEASE OUTBREAKS.....	37
5.3 FLOODS	37
5.4 WINDSTORMS	38
5.5 LIGHTNING AND HAILSTORM	38
5.6 LANDSLIDES	38
5.7 FIRE OUTBREAKS.....	38
5.8 ETHNIC SKIRMISHES.....	38
5.9 VOLCANIC ERUPTIONS	39
5.10 OIL SPILLAGES	39
5.11 ACCIDENTS.....	39
5.12 STATUS OF EARLY WARNING AND PREPAREDNESS.....	39
5.13 ENVIRONMENTAL ISSUES AND PROPOSED INTERVENTION	40
CHAPTER SIX	42
6.0 ENVIRONMENTAL EDUCATION, INFORMATION AND TECHNOLOGY	42
6.1 STATUS OF FORMAL ENVIRONMENTAL EDUCATION	42
6.1.1 Integration of Environmental Issues in Curriculum.....	42
6.1.2 Status of Non-Formal Education Programmes.....	43
6.2 PUBLIC AWARENESS AND PARTICIPATION	44
6.3 TECHNOLOGIES.....	44
6.4 ENVIRONMENTAL INFORMATION SYSTEMS.....	45
6.4.1 Status of Environmental Information Management Systems	45
6.5 INDIGENOUS KNOWLEDGE.....	46
CHAPTER SEVEN	47
7.0 ENVIRONMENTAL GOVERNANCE AND INSTITUTIONAL ARRANGEMENTS	47
7.1 OVERVIEW	47

7.2 EMCA STRUCTURES FOR ENVIRONMENTAL MANAGEMENT	47
7.3 OTHER PLAYERS IN ENVIRONMENTAL GOVERNANCE.....	48
7.4 REGULATORY INSTRUMENTS.....	49
7.5 MULTILATERAL ENVIRONMENTAL AGREEMENTS (MEAS).....	50
CHAPTER EIGHT.....	52
8.0 IMPLEMENTATION STRATEGY.....	52
8.1 STAKEHOLDERS INVOLVEMENT.....	52
8.2 RESOURCE REQUIREMENTS AND MOBILIZATION.....	52
8.3 MONITORING AND EVALUATION.....	60
REFERENCES.....	67
APPENDIX.....	68

ACRONYMS

ALRMP	Arid Lands Resource Management Programme
DDMC	District Disaster Management Committee
DEAP	District Environment Action Plan
DEC	District Environment Committee
DSG	District Steering Group
EMCA	Environmental Management and Coordination Act
FOC	Friends of Conservation
MDGs	Millennium Development Goals
NEMA	National environment Management Authority
SoE	State of Environment
UNCCD	United Nations Convention to Compact Desertification
UNCED	United Nations Conference on Environment and Development
UNFCC	United Nations Framework Convention on Climate Change
WRMA	Water Resources Management Authority
WSSD	World Summit on Sustainable Development
WWF	World Wide Fund for Nature

LIST OF FIGURES AND TABLES

List of figures

Figure 1: Narok district livelihood zones	13
Figure 2 : Institutional Framework for EMCA, 1999	49

List of tables

Table 1: Population projection up to 2010.....	12
Table 2: Poverty levels in the district (2006) projections	12
Table 3: Land Potential and Land Use	14
Table 4: Extent and Distribution of Soil Erosion.....	15
Table 5: Land Use Systems.....	17
Table 6: Forest types and size.....	21
Table 7: Wildlife Species.....	22
Table 8: Service sector linkage to environmental degradation.....	32
Table 9: Sector capacities for disaster preparedness and response	40
Table 10: Priority issues and interventions.....	41
Table 11: Status of environmental programmes in schools	42
Table 12: Status of Informal Environmental Programmes in the district.....	43
Table 13: IMPLEMENTATION MATRIX	54
Table 14: MONITORING AND EVALUATION MATRIX.....	61

CHAPTER ONE

1.0 INTRODUCTION

1.1 Preamble

The United Nations Conference on Environment and Development (UNCED) held in Rio-de Janeiro, Brazil in 1992 underscored the importance of developing modalities for integrating environmental concerns into development policies, plans, programmes and projects in order to sustainably protect and conserve the global environment. In order to achieve the above objective the international community developed and agreed on guiding principles and global plan of action for sustainable development commonly referred to as **Agenda 21**. The World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa in 2002 re-affirmed the commitment of the international community to the principles of sustainable development contained in Agenda 21 and the Millennium Development Goals (MDGs) of 2000.

Kenya is committed to achieve sustainable development through domestication of the Agenda 21, the Millennium Development Goals, and the Johannesburg Plan of Implementation. As part of the domestication process, the government prepared the first National Environment Action Plan (NEAP) in 1994, which recommended an appropriate legal and institutional framework to spearhead environmental management in the country. The policy on Environmental and Development (Sessional Paper No. 6 of 1999) is already in place, the Legal Framework (Environmental Management and Co-ordination Act) was enacted in 1999, while the National Environment Management Authority (NEMA) was established in 2002 as part of the recommended institutional framework.

The governments' commitment to sustainable development is also articulated in various government policy documents such as the Economic Recovery Strategy for Wealth and Employment Creation (2003 - 2007) and the National Development Plan (NDP – 2002 - 2008)

1.2 Provisions of EMCA 1999 on environmental planning

Environmental Management and Coordination Act (1999) Section 37(2) makes provision for the District Environment Committee to prepare the District Environment Action Plan (DEAP) after every five years. The contents of DEAP are stipulated in Section 41 of EMCA.

The District Environment Action Plan is incorporated into the Provincial Environment Action Plan, which is incorporated into the National Environment Action Plan (NEAP).

1.3 The environmental action planning process

i) 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.

ii) 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 district
- To identify environmental management opportunities
- To create synergy and harmony in environmental planning
- To integrate environmental concerns into social, economic planning and development
- To formulate appropriate environmental management strategies

1.4 Challenges to sustainable development

Sustainable development is commonly defined as “*Development that meets the needs of the present generation without compromising the ability of the future generation to meet their needs*”. Development is also said to be sustainable if it meets the ecological, economic and social needs.

The main challenges to sustainable development in the District include:

- High prevalence poverty levels of over 56%;
- High population growth rates which outstretches resources;
- Increasing land degradation through poor farming methods, overgrazing, encroachment of water catchment areas and riverbanks and opening up of fragile marginal areas (ASALS) for farming;
- Increasing human-wildlife conflicts arising from competition over resources and encroachment on wildlife habitats and migratory routes;
- Loss of bio-diversity through over utilization, illegal logging and charcoal burning;
- Resource use conflicts e.g. forced evictions, communities’ conflicts;
- Poor urban planning, sanitation and waste management systems;
- Poor land use planning and lack of comprehensive land use policy, conflicting policies and poor enforcement of existing legislation on environmental management;
- Livestock diseases, poor livestock breeds and lack of livestock marketing structures;
- Occurrence of natural disasters such as floods, forest fires;
- Unpredictable weather patterns occasioning frequent droughts and food insecurity;
- Poor road networks impacting negatively on socio-economic development;
- Low environmental awareness/ rights and high illiteracy levels and lack of community/stakeholder participation in environmental management;

- Inadequate funding of environmental management activities.

1.5 Narok DEAP scope

The preparation of the Narok DEAP has been realigned with Vision 2030, Midterm Plan 2008-2012 as directed by the government. The current DEAP covers the period of 2009-2013 and as per EMCA shall be revised after every five years. The DEAP will be monitored by the annual preparation of the State of Environment Reports. The environmental indicators that have been developed in the implementation matrix will be monitored by the respective lead agencies on an annual basis and incorporated in the annual State of Environment Report. The National Steering Committee and the National Environment Action Planning Committee have approved the indicators. The DEAP has been subjected to consultation.

The District Environment Action Planning Committee spearheaded the preparation of the Narok DEAP. The committee requested for sectoral environment reports from the lead agencies and compiled the DEAP. The Narok District Environment Action Plan was further enriched through participatory planning approach in which consultation workshops at the district and location level added more information. Local community consultations were held and focused on the location that ranked the poorest in the poverty index in the district. This helped in linking poverty to environmental degradation at the lowest levels. The Community Development Environmental Management Programme (CDEMP) supported these workshops both at District and location level.

1.6 District profile

1.6.1 Geographical Location, Size and Administration Units

Narok district is located in the south of Rift Valley province. It covers an area of 15,087.8km². It lies between latitudes 0°50' and 2°05' South; and longitudes 35°58' and 36°0' East. Administratively, it has eight administrative divisions, fifty-four locations and one hundred and three sub-locations. The district has two local authorities namely Narok County Council and Narok Town Council with forty-two and sixteen electoral wards respectively.

1.6.2 Population Size and Distribution

The district has a population of about 460,793 (2006 population projections), which is unevenly distributed, with high population density concentrated in high potential agricultural productive areas and on urban areas while the lower and drier areas are sparsely populated (Table 1).

Population in the district is basically rural with only about 11% residing in urban areas. This is because most of the population depends on agriculture, livestock and tourism/production systems, which are rural based.

Population density in the district ranges from 12 to 119 persons per km² with Mulot, Central, Ololulunya and Olokurto divisions being the highest densely populated areas and Mara and Loita division being least populated.

Table 1: Population projection up to 2010

1999(Actual)	2002	2004	2006	2008	2010
365,750	403,812	431,363	460,793	492,232	508,476

1.6.3 Climate and Physical Features

The district has diversified topography, which ranges from a plateau with altitudes ranging from 1000m-2350 M.A.S.L at the Southern parts to mountainous landscape ranging to about 3098 M A.S.L at the highest peak of Mau escarpment in the North.

The district has five agro-climatic zones namely humid, sub-humid, semi-humid to arid and semi-arid. Two-thirds of the district is classified as semi arid. The agro-ecological zones found in the district include: Tropical Alpine (TA), Upper Highland zones (UH) Lower Highland zones (LH) and upper-midland zones (UM).

The district experiences bi-modal pattern of rainfall with long rains (Mid March – June) and short rains (September-November). The amount of rainfall is influenced by bi-annual passage of Inter-Tropical Convergence Zone (ITCZ). Rainfall distribution is uneven with high potential areas receiving the highest amount of rainfall ranging from 1200mm – 1800mm p.a. while the lower and drier areas classified as semi-arid receiving 500mm or less p.a.

The district experiences a wide variation of temperatures throughout the year with mean annual temperatures varying from 10°C in Mau escarpment to about 20°C in the lower drier areas.

1.6.4 Social, Cultural and Economic Characteristics

The district has high poverty prevalence rate of about 64% with women being the most vulnerable (table 2). Distribution of poverty in the district is mainly influenced by socio-economic activities, market accessibility, land productivity, health status, education, technical skills, infrastructural development, governance, political will, gender disparity / empowerment, influence of traditional beliefs e.g. moranism security, occurrence of natural disasters and other externalities affecting neighboring districts.

Table 2: Poverty levels in the district (2006) projections

Name of Division	Total Population	Population below poverty	% of Population below poverty
Central	48,445	31,974	66
Mau	90,792	50,844	56
Osupuko	26,828	19,316	72
Mara	49,389	38,524	78
Olokurto	52,169	20,868	40
Mulot	80,540	53,962	67
Ololulunga	63,353	41,813	66
Loita	18,310	14,831	81
Total	460,793	294,908	64%

Narok District : Livelihood Zones

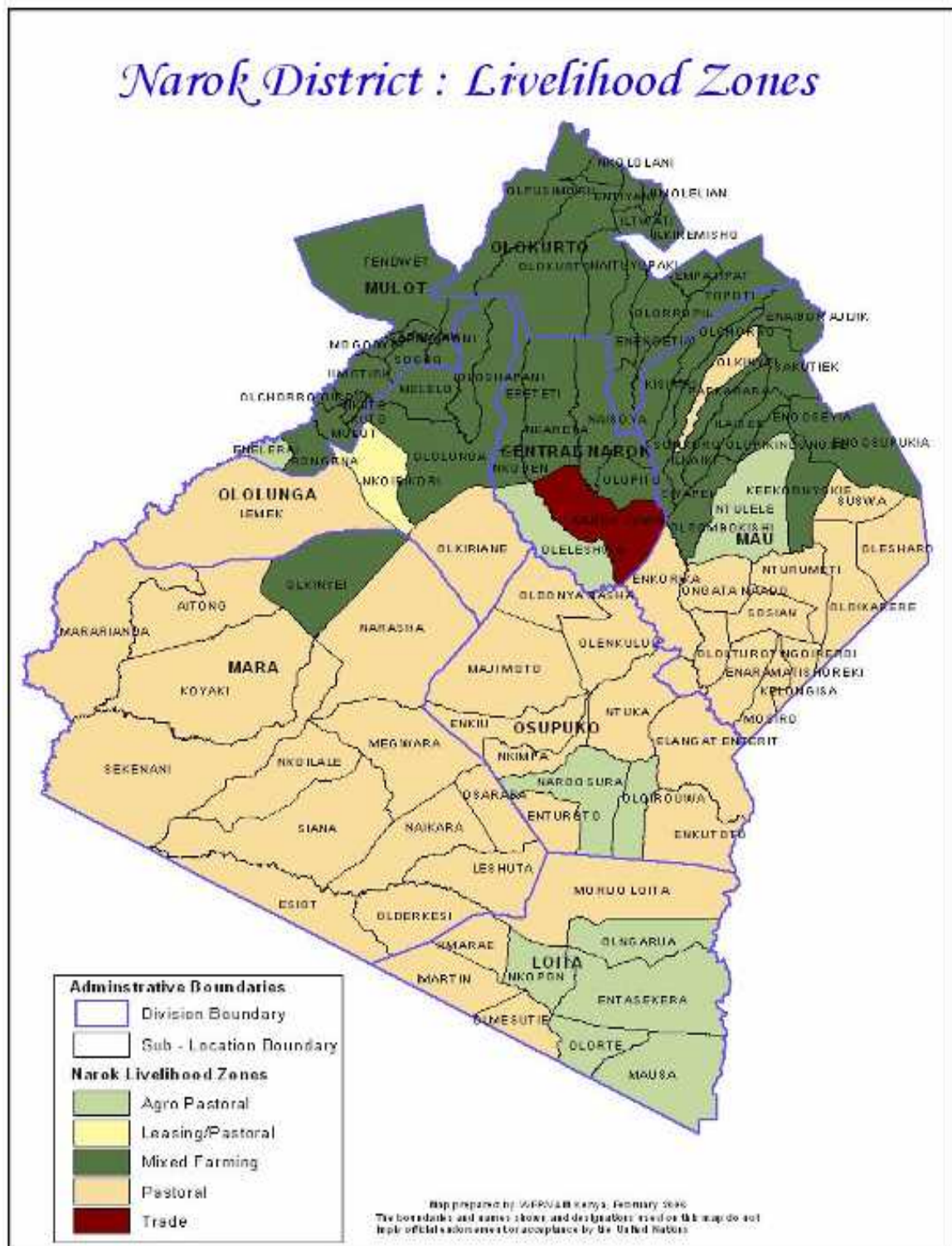


Figure 1: Narok district livelihood zones

CHAPTER TWO

2.0 ENVIRONMENT AND NATURAL RESOURCES

2.1 Land and land use

Land is the basic natural resource which forms basis on which the district’s social – economic development is built. Soil is one of the important non – renewable natural resource that supports various forms of life. It is the basic unit of production for agriculture, livestock, forestry and wildlife exploitation and production systems. The increase in population, high poverty levels and demand for resources has contributed to the over exploitation and degradation of the resource impacting negatively on the environment and sustainable development.

Dry lands in the district comprise about two thirds of the district which mainly include rangelands. The dry lands in the district serve important ecological and economic roles and support wild life, tourism, livestock, farming activities (marginal areas) and human settlements. Over 80% of the district’s livestock and wildlife population are found in these areas and support close to 20% of human population. Dry lands in the district also sustain many agricultural activities and other income generating activities, which support livelihoods (table 3).

The potential productivity of the dry land in the district is increasingly threatened by land degradation due to human activities and adverse and changing climatic conditions. It is important that strategic intervention are undertaken to minimize and mitigate negative environmental impacts affecting dry lands.

Table 3: Land Potential and Land Use

<i>Agro – Ecological zones</i>	<i>Potential land use</i>	<i>Current land use</i>	<i>Location</i>	<i>Constraints/ challenges</i>
1.Tropical Alpine Zones (<i>TA</i>)	-Eco –tourism -Forestry expansion	-Forestry	Apex of Mau escarpment	-Deforestation -Soil erosion
2. Upper Highland Zone (UH): <i>UH₀–UH₃</i>	-Forestry expansion - Farming expansion	-Forestry -Sheep/Dairy -Wheat/Barley Pyrethrum	Mainly Olorurto division	-Deforestation -Soil erosion -Illegal logging Soil loss
3. Lower High Land Zones (<i>LH₁– LH₅</i>)	- Pasture development - slaughter house/slabs development	-Tea/dairy -Maize /wheat/ - pyrethrum -Barley -Cattle/sheep -Ranching	Covers Olorurto, Mau, Mulot, Ololulunga and parts of Loita divisions.	-Encroachment of water catchment areas/river banks -Human/wildlife conflicts -Siltation -Deforestation -Land degradation -Land clearance -Charcoal burning

4. Upper Mid – land Zones (<i>UM₄ – UM₆</i>)	-Pasture development -Eco- tourism expansion	-Maize -Sunflower -Livestock -Sorghum -Ranching -Wildlife/tourism	Mainly covers Masai Mara, Osupuko, Loita, Central and parts of Mau divisions	-Soil loss -Overgrazing -Human/wildlife conflicts -Loss of biodiversity -Deforestation -Deforestation -Land clearance -Charcoal burning
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2.1.1 Soil Types, Characteristics and Distribution

Soil types in the district are determined by characteristics of the underlying basement rock and range from those developed on mountains to those developed on plains and swamps. The main soil types in the district include: Mollic andosols, luvisols, chromic luvisols, luvic and ando-luvic, phaeozems, chromic vertisols and chromic aerosols.

Majority of soils in the district are deep and well drained. Shallow and poorly drained soils are found in a few places in Masai Mara, East and South East from Narok town to Ngurumani Escarpment and on the surrounding hilly and swampy areas. Areas with deep and well-drained soils include hilly and mountainous areas of Mau escarpment, Ngorengore, Shatuka, Suswa and Loita hills (table 4).

Table 4: Extent and Distribution of Soil Erosion

Extend (Location)	Geographical areas of occurrence	Proposed intervention
1. Large scale farms (wheat,/maize/barley)	Mainly in Ngorengore, Mau, Olokurto, Ololulunga and parts of Central Division	-Laying of soil conservation -Agro – forestry -Lease agreement to include environmental conservation
2. Steep slopes , hilly and mountainous landscape	Occurrence mainly in Mau escarpment, Suswa hills, shartuka, hills surrounding Loita and other hills.	-Afforestation -Discourage farming on steep slopes -Soil conservation structures -Stopping encroachment of hills
3. River banks	Mainly along Narok, Ewaso Nyiro, Mara and Siappei riverbanks.	-Afforestation -Stopping river bank encroachment -Law enforcement
4. denuded plain/flood plains	Suswa flood plains, Loita, Osupuko and Mosiro Plains	-Controlled grazing -Discouraging overstocking -Afforestation -Pasture improvement

Key Environmental Issues

- The major environmental issue is soil erosion/degradation. This is common during drought when the soil surface cover dries and wind blows away the topsoil exposing the weaker sub-soil. When it rains the exposed soil is carried away by surface run-off causing erosion.
- Overgrazing and poor methods of farming like tilling down the slope has also accelerated soil erosion in the district.
- Poor waste management practices and excessive use of chemical fertilizers have led to soil pollution due to leaching of chemicals.
- Livestock farming has also led to soil erosion, as when they trail to the dams, ponds and the lake for water they weaken the top-soil. This eventually leads to formation of gullies
- This rapid erosion causes fast sedimentation and siltation of dams, ponds and lake.

Proposed Interventions

- Construction of terraces.
- Undertake receding and other soil conservation measures.
- Control over-grazing.
- Enhance awareness on safe use of chemicals and fertilizer.
- Control livestock movement.
- Afforestation.
- Public awareness.

2.2 Land and land use changes

Land Tenure System

There are three basic categories of land tenure/ownership in the district.

- Government land: administered under the government land Act Cap 280. This land owned by the government for its own purposes
- Trust land: administered under the trust land Act. Cap 288 and it is held under trusteeship by the local authorities.
- Private land: administered under registration Act Cap 300. This land is owned privately in freehold or lease hold tenure after registration and issuance of title deed following trust land or government allocation.

Land Use Types

The major land use types in the district include livestock, agriculture, forestry, ranching and tourism. The major land use in the district is cash crop farming (sugar cane, tobacco, sunflower, maize, horticultural crops and fruits) and subsistence crops production as indicated in figure 1 below. Other land uses include brick making and pasture for livestock rearing, settlement, sand harvesting and quarrying. Forestry is also a major land use in the district. The sandy soils near the

lakeshores, beaches and sand from the rivers are harvested for construction purposes as shown in table 5.

Table 5: Land Use Systems

Ecological Zone	Land Tenure	Land Use Type
Ecological Zone 1	-Free hold, Gazetted (GOK)	-Forestry, Cattle/sheep
Ecological Zone 11	-Free hold, Trust land, Gazetted (GOK)	-Forestry, Cattle/sheep, Wheat/barley, Pyrethrum
Ecological Zone 111	-Free hold, Communal	-Forestry, Wood land, Wheat/maize, Cattle/sheep
Ecological Zone IV	-Free hold -Communal -Trust land	-Woodland, Bush land, Wheat/maize, Beans/Vegetables, Wild life, Tourism, Ranching
5. Ecological Zone (V)	-Free hold, Trust land Communal, Gazetted (Masai Mara National Reserve)	-Ranching, Wild life, Tourism, Livestock

Key Environmental Issues

- Deforestation.
- Soil loss.
- Illegal logging.
- Encroachment into water catchment areas.
- Land clearance.
- Land degradation.
- Charcoal burning.
- Human/ wildlife conflicts.

Proposed Interventions

- Enhancing soil conservation in farms.
- Afforestation efforts on hill tops/mountainous areas.
- Increased environmental awareness.
- Sustainable land use.
- Improved drought management in dry lands (coping strategy).

2.3 Agriculture, livestock and fisheries

Livestock and agricultural production are the main sources of livelihood in the district contributing to about 90.3% of the average house hold income. The district is predominantly

occupied by the indigenous Masai community who has strong cultural attachment to livestock. However, with the changing lifestyle agricultural production is picking up with the District producing close to 60% of all the wheat produced in the country. Fisheries production in the district is very low due to negative cultural beliefs and also scarce water sources.

2.3.1 Agriculture

The main farming systems are small-scale, medium-scale, and large-scale (commercial). Both rain-fed and irrigated agriculture is practiced. The main crops grown include: Onions, cabbages, kales, tomatoes, French beans and runner beans/Maize. Wheat, Maize and barley are practiced on large-scale.

Key environmental issues

- Air pollution: Arising from dust (from farm preparation), Aerial sprays (pesticides/agro-chemicals application), smoke (burning crop residues) and vehicle emissions (farm machineries).
- Water pollution resulting from water contamination by used chemicals cans/containers, washing off/ through run-off agro- chemical /pesticides, poor disposal of used oil from garages and siltation of water bodies due to soil erosion.
- Land degradation- Soil erosion/pollution due to poor farming methods, deforestation resulting from land clearance and loss of bio diversity/crop mono-cultural practices.
- Loss of bio diversity and reduced production system.
- Global warming and depletion of ozone layer.
- Poor land husbandry practices.

Proposed Interventions

- Judicious use of agro-chemicals.
- Soil conservation programs.
- Sustainable land management practices.
- Environmental awareness on the effects of pollution.

2.3.2 Livestock

Main livestock include cattle, Poultry, and Camels.

Key Environmental Issues

- Land degradation (due to over grazing)
- Conflicts over pasture between people and wildlife.
- Loss of biodiversity.
- Frequent Droughts.
- Lack of land use policy.
- Livestock diseases and pests.
- Chemical contamination of water and land from improper use of acaricides.
- Dust generated by migrating herds/flocks.

- Effluent from slaughterhouses /slabs causes water pollution and odors.
- Increased Water & air borne diseases.
- Flies breeding on dung increase chances of trachoma.
- Overstocking.
- Poor production methods (Overgrazing/Land degradation).
- Low awareness on safe use of chemicals.

Proposed Intervention

- Appropriate siting of dipping facilities.
- Training on safe use of chemicals.
- Lobby for land use policy formulation.
- Safe disposal of effluents and other by products.
- Rehabilitation of denuded land.
- Stocking within the carrying capacity of land.
- Create awareness on safe use and disposal of acaricides.

2.3.3 Fisheries Resources

Fishing is done in ponds, dams, and rivers.

Key Environmental Issues

- Destruction of aquatic life by toxic substances resulting from mans activities e.g. fishing, aerial spray, and discharge of other effluents into rivers
- Destruction of aquatic habitat due to increasing land degradation.
- Over fishing leading to ecological imbalance.

Proposed Interventions

- Stocking of Dams ponds and rivers.
- Promote construction of ponds to increase the stocks.
- Supply of quality fingerlings.

2.4 Water resources

The district is a critical water deficit area given that two thirds of the district is classified as semi-arid and therefore water conservation and management is a critical issue. However, the district has high potential for mobilizing adequate water sources given that greater part of Mau complex water catchment area falls within the district and has also numerous water sources –rivers, springs, rain water and wetlands.

Main water catchments

The main water catchments are Ewaso Nyiro South drainage area, and Lake Victoria South drainage area. Ewaso Nyiro South is the drainage system of rivers emerging from part of Mau towers and draining into Lake Natron and comprises Rivers: Enkare Narok, Ewaso Nyiro, Siyiabei and its tributary Enkare Ngoshor. Lake Victoria South drainage area comprises all the rivers emanating from part of Maasai Mau Towers and draining into Lake Victoria. These include Amala River bordering Bomet District on the upper side and Mara River (downstream) when Amala River is joined by River / Nyangores. Mara River borders Narok District with Transmara District towards Kuria District with the Kenya and Tanzania.

Status and Trends of Water Resources

Flow measurements done along the major Rivers indicate decline in water quantity. The decline is mainly due to water catchment destruction / river bank and increased human settlement / population. Vegetation destruction and illegal logging have also contributed largely to water catchment destruction. The trend is likely to continue unless concerted efforts are put in place to reverse the negative environmental impacts resulting from human activities.

Almost all the open water sources are polluted by bacteria. Periodic physical / chemical analyses indicate high turbidity levels in most of the surface waters. The main course of water pollution is siltation (top soil erosion) as a result of destruction of vegetation cover, poor farming methods near riverbanks, discharge of raw sewage (effluent) from Narok Town and some tourist facilities in Masai Mara, agro-chemical use – (aerial spraying) and leaching of fertilizers into water sources. The decline in water quality is likely to continue unless effective pollution control measures are taken.

There are major abstractors along Mara River and part of Ewaso Nyiro. These Farms include: Olerai Ltd., Ndakaini Ltd. and Shimo Ltd. along Mara River and Tarakwai Farm owned by Olerai Ltd, along Ewaso Nyiro River.

Key Environmental Issues

- Increased water demand / exploitation as a result of population increase.
- Increased human activities leading to water catchment degradation through illegal logging, increased farming activities, charcoal burning, and encroachment leading decline to decline in water quantity in river flows.
- Reduced recharge of underground water due to water catchment interference recharges reducing.
- Water pollution arising from poor farming technologies (soil erosion / siltation and Agro-chemicals contamination – aerial sprays).
- Resource use conflicts arising from shared water sources by livestock, wildlife and human with devastating effects. Serious water conflicts have been experienced in part of Mai Mahiu resulting to damage of property of human deaths.
- Increase water borne, and water related diseases e.g. Malaria, Typhoid and Amoeba due to water sources pollution and reduced sanitary standards. (The community is slowly adopting the use of pit latrines).

Proposed Interventions

- Pegging of Riverine ecosystem / riverbanks.
- Formation of Water Resources Users Associations (WRUAs) to manage and coordinate water resource.
- Improved monitoring and regulation of water resource use / river flows.
- Enhanced enforcement of irrigation timetables drawn in water stressed areas.
- Installation of signboards in river Crossings warning against River pollution.
- Enhanced law enforcement to check pollution and illegal water obstruction.
- Sensitization to stakeholders on the need to observe the available acts e.g. Agricultural Act, Forest Act, EMCA 1999, water Act 2002 etc.
- Advocacy for enhancing development of alternative water sources and conservation.

2.5 Forestry

Forest resources are exploited mainly for timber, charcoal posts, culinary utensils, fodder, medicine and cultural purposes. Table 6 shows forest types found in the district with their sizes.

Table 6: Forest types and size

No	Forest type	Forest	Size (ha)
1	Government Forests (Gazetted)	Transmara	35270.3
		Olpusimoru	16832.7
		South Mau	136
2	Trust land Forest (Managed by Narok County council)	Maasai Mau	45,794
		Loita	20,000
		Enoosupukia	10,772
3	Private/Group Ranch Forests	Located in all administrative divisions	34,000

Key Environmental Issues

- Over exploitation (unsustainable use) of forest resources.
- Forest fires.
- Low afforestation levels.
- Corruption and ineffective monitoring and management methods.
- Lack of incentives for commercial forestry.
- Inadequate personnel and logistics in the Environment sector.
- Poor infrastructure (Hampers monitoring and farms visits).
- Settlement on fragile ecosystems and water catchment areas (Poor Land tenure). (Allocation of land on ecologically fragile and water catchments areas).

Proposed Interventions

- Intensify afforestation efforts.
- Intensification of awareness.

- Increase Personnel.
- Promote Participatory forest management.
- Equip personnel with appropriate management tools.
- Enhance law enforcement.
- Create provisional forest where trust land and private forest are mismanaged.
- Eviction of those illegally settled on such areas

2.6 Wildlife

2.6.1 Types of Wildlife

The District has a variety of wildlife species. They are categorized in table 7 below:

Table 7: Wildlife Species

Category	Species population
Mammals	Over 50
Birds	Over 300
Plants	Over 123
Insects	Not quantified
Fish	Not quantified
Amphibians	Not quantified
Reptiles	Not quantified

The wildlife habitats include: The Maasai Mara, Mau complex, Transmara forest, Ngurman Escarpment Suswa (dispersal area of the Mara region).

2.6.2 Status and trends of wildlife resources

Large numbers of roan antelopes, Kudus and Wild dogs were found in large numbers in the 1970s. However, currently these species are no longer found. The black rhino and cheetah despite been placed under appendix 1 of the CITES (endangered species) their population has continued to decline. The striped Hyena has disappeared from the Mara reserve and is traced more than 20 km in the group ranches while wild dogs which dominated the park some years ago are only found far flung areas such as Loita forest. Wildlife decline to the tune of 58% has been recorded in the district in the last two decades.

The human / wildlife conflicts have contributed to decline in some species. Other wildlife species such as birds, insects, reptiles and plants are believed to be on the decline to be on the decline due to environmental degradation as a result of human activities.

Wildlife resources are exploited for both consumptive (illegal poaching for meat and other products) and non-consumptive (tourism) uses.

Key Environmental Issues

- Deforestation
- Overgrazing
- Soil compaction leading to soil erosion
- Predation on livestock and crop destruction
- Human injuries and deaths.
- High density of some wildlife spp.
- Riverbank and water source in farmlands destruction.
- Spread of diseases from wildlife to livestock
- Clearing of farm vegetations cover for agriculture leading to erosion by wind and rain water.

Proposed Interventions

- Culling of wildlife beyond the carrying capacity
- Erection of electric fence
- Well equipped and additional personnel

2.7 Biodiversity conservation

The district is endowed with rich diversity of both flora and fauna. There are over 54 species of wildlife mammals, 300 species of birds and over 123 species of plants and several species of insects, fish, amphibious and reptiles. The district has many species of microbes, which play various important economic and ecological functions. The district also has wide varieties of crops and livestock species which contribute significantly towards socio-economic development. The variability of ecosystems in the district includes: forested, wetlands mountainous/ hilltops rangelands / conservation areas.

Key Plant Species

Olea African Albizia gumifera, Cordia ovalis, Croton dichogamus , Carrisa edulis , Diospyros obyssinica , Celtis species, Dombeya burgesiae , Teclea nobilis , Teclea simplici folia , Calodendron capense , Xymalos species, Juniperus procera(cedar), podo , prunus Africana , polycia spp, schinus mole and Agrorpus.

Invasive Species

Terco nanthus camphoratus (leleshwa) and Lantana camara are the most prominent invasive species. They affect mostly grasslands. The impacts of invasive species include:

- Reduced pasture land
- Loss of biodiversity (dominant over other species)
- Increased vegetation cover (pasture)

Key Environmental Issues

- The deforestation has led to the destruction of water catchment
- The human wildlife conflict

- Tsetse flies cause livestock killer disease such as Nagana (trypanosomiasis), and sleeping sickness in human beings
- Unsustainable utilization of key species

Proposed Intervention

- Reforestation programme
- Sensitize local people on biodiversity conservation
- Enhance community participation in conservation efforts
- Enforcement all regulations on conservation of biodiversity
- Policy formulation on biodiversity and conservation
- Promote sustainable utilization of key species

CHAPTER THREE

3.0 HUMAN SETTLEMENTS AND INFRASTRUCTURE

Human settlements and infrastructures development are important indicators of social-economic development. The status of human settlements and infrastructural development in general have strong bearing on cultural, social political, economic and environmental background of any society and its development involve changing environment from its natural status to a built one and that change can be positive or negative.

Human settlements and infrastructure dictate the location of investments, which provide employment, generate revenue and create demand for material and services. It is important that environmental concerns are put into consideration before new development of human settlements or infrastructure or before improvement of the already existing establishments. Human settlements in the district are mainly concentrated in high potential agricultural areas and urban areas where about 90% of the total population in the district resides. Generally the level of infrastructural development in the district is low and most of the existing facilities especially roads are in poor conditions while most other public utilities are inadequate.

3.1 Human and environmental health

The most prevalent diseases in the area are Malaria, respiratory infections, skin diseases, diarrhea and pneumonia. The cause of this trend has been attributed to presence of stagnant water providing suitable grounds for mosquito breeding, dust and poor sanitary conditions and diminishing environmental health status and poor environmental management practice.

Intervention measures to address the prevalence of diseases, in the District.

- Involving the business and entire community in rural and urban centers to manage their wastes.
- Health education to the community on prevention of diseases influenced by environmental factors.
- Collaboration with the community and other stakeholders in areas of good sanitation, HIV/AIDS, nutrition.
- Law enforcement on waste management.
- Health education to the community on effects/dangers of pollution in the environment.
- Formation of environment committees in schools to spearhead cleanliness in school to reduce disease incidences in schools/homes.
- Facilitate sanitation committees in urban and rural centers to enhance cleanliness in their respective areas.

3.2 Pollution and waste generated from human settlement

Liquid and solid wastes are categorized as follows:

- Garbage: decomposable wastes from food.
- Rubbish: Non-decomposable wastes, either combustible (such as paper, wood, and cloth) or non-combustible (such as metal, glass, and ceramics).
- Ashes: residues of the combustion of solid fuels.
- Large wastes: demolition and construction debris and trees.
- Dead animals. Sewage-treatment solids: material retained on sewage-treatment screens, settled solids, and biomass sludge.
- Industrial wastes: Such materials as chemicals, paints, and sand.
- Mining wastes: slag heaps and coal refuses piles.
- Agricultural wastes: farm animal manure and crop residues.

Key Environment Issues

- Health risks/impacts, diseases related to indiscriminate disposal of excrete increase in waterborne and common diseases or infections.
 - Soil and water pollution by leachates from heaps of garbage.
 - Air pollution by gases from decomposing wastes, airborne particulates like smoke.
 - Aesthetics as a result of litter, dust, junks, odour, occupation of space.
 - Land degradation and loss of recreational sites.

Proposed Interventions

- Installation or provision of a sewerage system in the district/Narok town.
- Analysis of wastes to determine the types and amounts of wastes produced in the district.
- Initiate salvage schemes in particular to salvage plastics/polythene.
- Selection of suitable storage, collection and disposal methods of solid wastes.
- Enhancing law enforcement pertaining to solid wastes and pollution
- Proper waste management from source to disposal by the community through health education.
- Separation of wastes at source.
- Collaboration with other sectors and stakeholders in an effort to preserve the environment.

3.3 Communication networks

Narok district is poorly served by road networks and the most of the existing roads are in poor conditions. The district has a total road network of 2426.3km comprising of the following categories: Tarmac – 178km (7.3%), Gravels – 188 km (7.7%), and earth – 2060.3 (85.0%). Approximately 8 airstrips are found mainly around Masai Mara both urban and rural area.

Other modes of communication include fixed line telephone, mobile telephony and postal services.

Key Environmental Issues

- Land degradation (soil erosion by a road storm drainage) neglected road section & quarrying (murram mining).
- Loss of biodiversity (new roads construction and air strips)
- Soil compaction during construction
- Air pollution (dust)
- Noise pollution (Telephone/mobile/Radio) TV & Radio calls)
- Radiation effects (mobiles)
- Visual constructs (especially telecommunication masts (base trans-receivers)
- Poor road & drainage networks
- Unsafe disposal of storm water causing serious soil erosion/gullies in nearby land /farms
- Most roads very dusty during repair construction
- Noise/ vibration
- Levels also high on roads during repair/construction
- Noise levels noted in urban / Households from radios and TV states
- Road construction on forested area leading to deforestation
- Encroachment of road reserves & steep slopes etc

Proposed Interventions

- Installation of adequate road drainage system
- EA undertaken in existing roads
- EIA undertaken on new roads before construction
- Proper road network planning
- EIA under taken before road construction
- Rehabilitation of all boroughs pits (murram mining)

3.5 Socio - economic services and infrastructure

3.5.1 Water Supply (major sources)

Main sources of water include; rivers, boreholes, dams, water pans, springs, shallow wells, roof catchments. The following are the key statistics on water supply:

- Number of households with roof catchments – 6768 (Mulot, Mau, central & Olokurto divisions
- Average distance to nearest potable water- 5km point during wet season.
- Average distance to the nearest potable water point during dry seasons – 15 km
- Number of households with access to piped water (6835) – mainly around Narok Town & other urban centres

- Number of households with access to potable water – 16750 (near springs, rivers, dams & Water pans)

3.5.2 Sanitation

Approximately 53% of people have access to sanitation facilities in Narok District. Narok town, the main urban centre in the district uses septic tanks for sewer disposal.

Key Environmental Issues

- Provides a good home and food for bacteria, protozoa, viruses, helminthes and flies which bring about diarrhea diseases, bacillary dysentery, typhoid paratyphoid, cholera, trachoma, polio etc.
- Nuisance in terms of offensive smell
- Mechanical injuries e.g. from toxic hazardous substances like broken bottles, needles and syringes.
- Fire outbreaks
- Pollution by leaches oozing from a refuse heap can cause water pollution; raw sewage can pollute water bodies and the environment.
- Uncontrolled refuse is unsightly and occupy space that could be utilized for other purposes.
- Drain blockages
- Occupational hazards infections from poor hygiene, worms and URTT's.

Proposed Interventions

- Provision of efficient and timely services and infrastructure, i.e. water supply, sewerage services. Land administration.
- Provide an enabling environment for economic growth/ poverty reduction.
- Promote community involvement in planning and delivery of services.

3.6 Energy

The main source of energy in the district is fuel wood, which is utilized by more than 99% of the households. Other forms of energy consumed in the district include hydro – electric, fossils fuel, solar, wind, electrical (generators) and biogas.

Sustainable energy production is vital for various sectors of production for sustained socio – economic development. It is therefore necessary that alternative renewable energy sources, which reduce heavy dependence on woody biomass, be explored in order to reduce environmental degradation. The exploitation of these energy sources would not only address energy demands but would also create opportunities for income and employment creation hence contributing towards poverty reduction and improving quality of life.

3.6.1 Types and Status of Energy Sources

Fuel wood (wood biomass)

This is the main source of energy consumed by over 99% of households in the district. It is readily available accessible and cheaper compared to other forms of energy. This form of energy highly contributes to deforestation leading to reduced forest cover and land degradation. The district also comprises of indigenous trees and vegetation which take long to mature (some over 200 years) and sustainable production using indigenous trees is not possible and fast growing tree species should be preferred.

Hydro – electric power

This is an important energy source vital for realization of industrialization in the district. Only a small fraction of the district is served with only about 15% of total households being connected. Rural electrification programmes should be intensified in the district to serve a wider area. The costs of electricity are comparatively high and production is directly depended on rainfall.

Fossil fuel (petroleum)

The district heavily relies on this source of energy, which is supplied at numerous points. Fossil fuels are expensive, cause pollution and not readily accessible especially to the remote areas. The district is served by 9 petrol stations and over 50 filling- stations.

Solar Energy

Consumption is very low (less than 2% H/H) in the district due to prohibitive initial cost. It is environmentally friendly and once installed, and running costs are normally very low. Solar energy is abundant, easily accessible and exploitation should be promoted including introduction of government subsidiaries to bring costs low.

Wind energy

This form of energy is utilized by very few people (<2% H/H) and is mainly used by institutions or community based projects. Wind energy is abundant, readily accessible but very costly requiring advanced technological transfer. It is environmentally friendly and should be promoted especially in the rural areas to supplement other forms of energy.

Biogas

Only less than 1% of households utilize this form of energy. The availability of cow dug from cattle biomass in the district makes this form of energy suitable especially in the livestock predominant areas. Production is inhibited by high cost of equipment/installations - biogas digester/pipes.)

Key environmental issues

- Over exploitation (wood fuel) leading to environment degradation
- Air pollution (stove fumes/vehicular emissions)

- Odour (bio gas sludge)
- Water pollution (oil spillage from genets/sludge)
- Toxicity/contamination (petroleum)
- Global warming (burning release tones of carbon dioxide among other green gases)
- Loss of biodiversity (wood biomass harvesting)

Proposed intervention

- Introduction and intensification of commercial Afforestation (woodlots) for wood fuel
- Promotions of alternative energy sources use/exploitation
- Promotion of energy saving kilns/devices
- Policy on alternative energy resources.
- Intensification of rural electrification

CHAPTER FOUR

4.0 INDUSTRY, TRADE AND SERVICES.

Trade and Industrial development are important sectors, which are key pillars for national development. As the country prepares to be industrial by the year 2020 the importance of industrial development in the district cannot be over-emphasized.

The main challenge facing the district as far as industrialization is concerned is slow setting phase, slow technological transfer and lack of industrial development plan.

The environmental challenges facing industrial, trade and service development in the district is adoption to production processes, which promotes waste minimization, recycling, re-use and waste treatment and safe disposal systems.

4.1 Industrial sector

The district has no major industrial activities. The few manufacturing activities are mainly informal or agro based which include the following:

- Quarrying & sand harvesting.
- Flour mills (maize & wheat mills).
- Bead making – clothing (Jua kali).
- Shoe making/repair (Jua kali).
- Baking industry (cakes & bread).

Key environmental issues

- Water pollution.
- Inadequate enforcement of existing legislations.
- Land degradation.
- Poor solid waste management.
- Human injuries/health risk.
- Air pollution (dust, powder/particulate matter).
- Noise/vibration (from machine/equipments).
- Effluents (oil from vehicles/machines and domestic wastes/labour force).

Proposed Interventions

- Adopting cleaner production technologies.
- Environmental monitoring to ensure compliance.
- Ensuring compliance to water quality and waste management regulations, 2006.
- Conducting research on possible alternative use of wastes and/ or better methods of waste disposal.
- Ensuring proper restoration of borrow pits.

- Adequate sensitization and awareness on environmental issues, EMCA and need for compliance.
- Offer incentives, rewards, sanctions and recognition to the best technology in use.
- Public private partnership in good environmental management.
- Reforestation/afforestation.

4.2 Trade sector

Types of trade conducted in the Districts include wholesale, Retail, Butteries, Quarries, Boutiques, Boarding & Lodgings, Insurance Agents, Shoe Repairs, Carpentry workshops, supermarkets, Bars, Dairy shops, Bookshops, Petrol stations, Garages, M.V, repairs, wiring.

Key Environmental Issues

- Uncontrolled entry of goods (some of them substandard)
- Licensing flows (some licensed goods find their way in the market).
- Floating of quality standards.
- Uncontrolled disposal of packaging materials e.g. polythene papers.
- Strict environmental and health requirements should be followed before any product is received into the market.
- Poor disposal of solid wastes (packaging) polythene papers, food, water waste, litter.
- Noise/vibration from enterprises (land mask from shops, bars)
- Poor disposal of effluents from hotels/slaughter houses.
- Lack of sewerage treatment system in urban centers especially Narok Town.

Proposed Interventions

- Installation of dustbins by all traders.
- Installation of effective sewage treating disposal system by all hotels/lodging facilities.
- More regular inspections

4.3 Services sector

The provision of adequate services, coupled with macro-economic stability and long-term development strategy is essential for sustainable socio-economic development.

Service sector consists of transport, hospitality, telecommunication, energy, banking and insurance (table 8).

Table 8: Service sector linkage to environmental degradation

No.	Service sector	Linkages (impacts) to environmental degradation	Proposed interventions
1.	Transport Roads Air / Taxis	-Land degradation -Loss of	-Proper management/maintenance of

		<ul style="list-style-type: none"> biodiversity/gulley formation -Noise/vibration -Loss loss of biodiversity (air strips) Air pollution 	<ul style="list-style-type: none"> roads. -Safe disposal of runoff/storm water - Rehabilitation of borrow pits/quantity -EIA/EA to be undertaken accordingly. Adjustment through planning
2.	Hospitability	<ul style="list-style-type: none"> -Disposal of effluents water/land pollutions. -Air pollution/odour -Disposal of solid wastes (food remains) -Poor hygiene – diseases prevalence. 	<ul style="list-style-type: none"> -Proper disposal of wastes. -High sanitation standards. EIA/EA to be undertaken accordingly.
3.	Telecommunication (Telephone/mobile)	<ul style="list-style-type: none"> -Land degradation construction. -Defforestation. -Loss of biodiversity. -Noise/vibration (operation) +mushrooming of service kiosks Celtel/safaricom +Solid waste diposal *scratd ch cards 	<ul style="list-style-type: none"> -EIA/EA to be undertaken accordingly. -Operation of telephone/mobile phones to meet noise/vibration standards/levels. Provision of dustbins by service providers
4.	Energy (Electricity supply, fuel, wood, biogas)	<ul style="list-style-type: none"> -Emergency fires outbreaks. -Land degradation (electricity lines) -Loss of biodiversity/deforestation. -Air pollution (fuel, wood) -Odour (Biogas) -Improper stocking/storage of charcoal bags 	<ul style="list-style-type: none"> -Fire fighting equipments -EIA/ EA to be undertaken accordingly. -More afforestation for supply of electricity poles -More harvesting of alternatives energy. -Isolate ,set sites for storage
5.	Banking and Insurance services	<ul style="list-style-type: none"> -Land degradation (construction, extraction of construction materials) -Loss of biodiversity -Injuries/health & safety risks (during construction) -Waste management-solid/effluents/domestic 	<ul style="list-style-type: none"> -Effective waste disposal system should be installed. -EIA/EA to be undertaken accordingly -Should support environmental conservation initiatives.

		wastes from work force/labour/- normally low	
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4.4 Tourism

Narok District serves as an important and preferred destination for many local and international tourists destination because of its strategic location of the internationally renowned Maasai Mara National game reserve. The rich diversity of wildlife both Flora and Fauna, beautiful ecological features and landscapes coupled with rich Maasai cultural practices offer unequalled potential for tourism development in the district especially eco-tourism.

Key Environmental Issues

- Water pollution threats (discharge of effluents from eco-tourist facilities river courses).
- Changing land use patterns (encroachment of wildlife habitats)-(large-scale farming & human settlements), blockage of wildlife migration corridors and breeding grounds by human activities.
- Increasing competition of wildlife/livestock in wildlife dispersal areas – reduction of wildlife habitats.
- Reducing wildlife populations.
- Increasing human/wildlife conflicts.
- Lack of land use plan/policy – mushrooming of eco-facilities.
- General land degradation/bio-diversity loss from tourist related activities.
- Inequitable utilization and sharing of benefits.

The challenges facing the district is to come up with and adopt methodologies that will ensure the various components in this sector function within sound ecological and economical framework in line with the principles of sustainable development.

Proposed Interventions

- All tourists' camps/lodges to install effective waste treatment systems.
- Land use plan for wildlife/tourist areas to be developed (conservation areas)
- ENSDA currently preparing Grater Mara Area Tourism development plan in Collaboration with other stakeholders with financial support from TTF.
- All group ranches/private land should benefit (where wildlife if found)
- Undertake EIA before development of new camps/lodges.
- Undertake EIA (annual basis)
- Observe code of ethics (tourism)
- Comply with EMP
- Involvement & benefit to local communities (corporate responsibility)

4.5 Mining and quarrying

The district has high potential for extraction of building stones (quarrying) and murrum for road surfacing. Sand harvesting potential is relatively low and the district has no known mineral resources.

Quarrying for building stones is mainly done in Narok Town Council Quarry located in Narok Town, Ewaso Ngiro (near Narok – Ololulunga bridge) pinyin, (Ntulele river) Ilmashariani (near Narok Town) and Polonga (near prisons).

Murrum extraction in the district is normally done along the road reserves or in the other isolated areas in the district. Sand harvesting in the district is normally done in areas such as Naroosura, Ngosuani, Nairasirasa, Pinyiny and Ewaso Ngiro.

4.5.1 Quarrying

Quarrying is done for extraction of building stones and murrum for road construction by the Narok County Council and privately (Ewaso Ngiro, Pinyiny, Ilmashariani, and Polonga quarries). The method used is open cast mining.

Key Environmental Issues

- Noise and excessive vibrations
- Air pollution from dust
- Occupational health and safety risks
- Risks to humans, livestock and wildlife from abandoned quarry pits
- Water pollution from silt load and dust
- Abandoned quarry sites are breeding grounds for diseases vectors like mosquitoes
- Land degradation

Proposed Interventions

- Rehabilitation of disused quarries
- Provision of safety gadgets to quarry workers e.g. first aid kits, ear muffs etc.
- Promote public awareness on the impacts of quarrying
- Dust management in quarries
- Enforcement of relevant laws and regulations
- Promote more sustainable quarrying methods and technologies
- Environmental Impact Assessments for all new quarries and annual audits for existing ones

4.5.2 Sand Harvesting

Practiced mainly in rivers using manual scooping in places like Naroosura (Osupuko Division), Ngosuani (Osupuko Division), Ewaso Ngiro River Pinyiny (Ntulele) and Nairasirasa (Central Division).

Key Environmental Issues

- Air pollution from dust and vehicular emissions
- Noise
- Water pollution from silt loads and oil leaks
- Health and safety issues to workers and residents
- Low levels of environmental awareness
- Poverty
- Land degradation
- Loss of biodiversity

Proposed Interventions

- Enforcement of relevant laws and regulations
- Tree planting along river banks
- Rehabilitation of sand harvesting sites
- Undertake annual environmental audits for existing sites and EIA for proposed ones
- Promote awareness
- Use of safety gear

CHAPTER FIVE

5.0 ENVIRONMENTAL HAZARDS AND DISASTERS

Environmental disasters can be either natural or man-made occurrences, which can have severe consequences leading to destruction of environment, life and property. Disasters or hazards whether natural or manmade are at times very difficult to predict both in frequency of re-occurrence and magnitude hence posing great challenges for effective mitigation and preparedness.

Natural disasters are normally caused by infrequent events in the biosphere, lithosphere or atmosphere triggered by climatic or geological changes while, man-made as the name suggests are caused by human error or human related development. Disaster could be caused by invasive species, droughts, floods, earth quakes, accidents, lightning, fires, and disease outbreaks, technological fault or other induced triggers.

In Narok district the most common types of disasters experienced in the past have natural orientation as frequent drought and at times disease outbreaks. Although there is a drought management strategic plan in place, disasters have adversely affected the district whenever they occur impacting negatively on households and socio economic development. There is need to establish a broad based disaster strategic plan to address the various types of disasters that are likely to occur from time to time.

5.1 Drought/ famine

The district experiences frequent and serious droughts almost after every three years and the magnitude of drought occurrence is not well understood and there is need of establishing precise, early warning system that is capable of predicting drought so that better coping strategies are adopted to reduce vulnerability.

The district is adversely affected by drought whenever it occurs resulting to loss of livestock, wildlife, displacement of communities in search of water & pasture reducing them to a state of destitution. About 30% of the population, which resides in the semi arid parts of the district, is faced with food insecurity and high levels of poverty.

5.2 Disease outbreaks

The most common livestock disease outbreaks experienced in the past include: Rinderpest, East coast fever and Foot and mouth diseases while human disease include malaria, URTI, and HIV/AIDS.

5.3 Floods

The district has several areas susceptible to floods during heavy down pour due to topographical formations. The most affected areas include areas adjacent to river valleys, low lying and flat areas. In the past floods have been recorded in areas such as Narok Town (1962, 1992, 2006)

and frequently in the Suswa Plains and are known to cause damage to buildings, vehicles, infrastructure, serious soil erosion and loss of human life, livestock & wildlife.

5.4 Windstorms

The district experiences frequent strong windstorms which cause serious damage to school buildings, homesteads, environment (uprooting/ breaking of trees) and general risk to human health & safety. Windstorms are known to cause havoc in areas such as Olokurto, Mau and Ololulunga divisions especially in open spaces – windstorms also cause massive soil erosion and air pollution (dust) especially on the bare grounds on the expansive wheat farms.

5.5 Lighting and hailstorm

Lighting and Hailstorms are common in the district, which normally occur during heavy rains. Hailstones cause serious damage to crops and vegetation while lightening is reported to have caused death to both animals and human. The most hit areas include parts of Mulot, Olokurto, Mau and Ololulunga divisions. One primary school in Mulot has been hit twice by lightings killing two pupils. Medugi area in Olokurto is also commonly struck by lightning.

5.6 Landslides

Landslides are natural phenomenon, which normally occur when soil on higher ground fall back (slides) due to increased weight of soil as a result of water absorption. Areas prone to landslides in the district include steep slopes along Amala River in parts of Mulot and Olokurto Divisions. In 2003 a woman was reportedly buried alive near Choronok primary school but the neighbours rescued her.

5.7 Fire outbreaks

Fire hazards in the district are frequent and normally occur during the dry spell ((September – December) and around January – March. Some fires are caused intentionally to clear land / tick control or pasture improvement but eventually get out hand creating havoc while other types of fires are accidentally by honey gatherers, smokers, lightening, electric faults etc.

Areas prone to fire outbreaks include Masai Mara and Masai Mau forest where they are reported to cause serious ecological damage. Forest fires have been reported to cause serious deforestation in parts of Masai Mara (1994) and parts of Masai Mau where they razed important ecosystems endemic to Lions. Irreparable damage has also been caused to homesteads and other establishment as a result of fire outbreaks. The local authorities (Narok Town Council & Narok county Council) should have adequate firefighting equipment and skilled personnel to respond to any fire outbreak in the district.

5.8 Ethnic skirmishes

Narok district enjoys peaceful environment, but it witnessed violent skirmishes in 1992, which were believed to be of ethnically, or politically instigated. In 2004 the district was again struck by ethnic conflicts over water resources in parts of Mai-Mahiu and Suswa in Mau Division. Cattle rusting conflicts are also common and occasionally occur in Bomet/Narok border and there is

need of establishment of peace building committees to foster peaceful co-existence of communities.

5.9 Volcanic eruptions

Volcanic eruptions have not occurred in the district in the recent past, but the close location of the district near active volcanic areas such as Longonot/Olkaria, places the district on risky zones. The presence of hot geysers in parts of Maji-Moto, Mulot, Mara and Suswa also suggest that the district has some remote active volcanic activities and is not totally safe from volcanic eruptions. It is important that the district develops disaster preparedness management plan to address all types of disaster eventualities including possible volcanic eruptions.

5.10 Oil spillages

The district has not witnessed any major oil spillage other than the one, which occurred in 2003 in the neighbouring Bomet District involving 200 litres of diesel spillage in Nyangores River – a tributary of Mara River. Car washing activities especially where vehicles are driven into the rivers also contribute to oil spillage although at a smaller scale. The district is a major transit route for many transportation vehicles (for petroleum products) serving the neighboring districts and its important for the district to have strategic response mechanism in case of oil spillage.

5.11 Accidents

These include road accidents, drowning and injuries resulting from wildlife attacks. Road accidents especially along Mai-mahiu – Narok-Mulot road are very common (in 2001 – 2003, 97 cases of road accidents were reported which amounted to 64% of the total road accidents reported in the district. Death resulting from human/wildlife conflict are also common in the district especially communities living around wildlife areas. Drowning cases are low and mainly occur during floods or rainy seasons and affect mainly children, the aged and people under the influence of alcohol. Domestic and occupational accidents also occur.

5.12 Status of early warning and preparedness

The district through Arid lands resource management programme (ALRMP II) has established Early warning information systems on drought. Monthly bulletins are published on monthly basis giving indication on likely drought onset, status and appropriate mitigation / response measures (table 9).

However there is need of establishing comprehensive disaster management strategy and Early warning systems to manage various types of disasters in the district. A coordinated multi-Sectoral preparedness & response mechanism should also be established to address disaster occurrences in the district and appropriate mitigation against climatic shocks and other disasters.

Table 9: Sector capacities for disaster preparedness and response

Sector	Type of Disaster	Human Resource	Technical / equipment	Financial	Coordination mechanism (Logists)	Lead agency
-Agriculture -Livestock -Heath -Water -KWS Provincial Administration -Arid- lands	-Drought -Diseases outbreaks (human &livestock) -Floods	Not adequate	Technical knowledge available -Need of more equipment (computers/ Vehicles	- No adequate financial resources	-ALRMP (DSG) -District disaster management committee (inactive) -DEC -DDC	Depends on type of Disaster – lead agency to have mandate over the respective sector
-Provincial administration -Police -Arid lands -NEMA (DEC) - Agriculture Health Livestock -Local authorities, -KWS -Forest -KPLC	-Fire outbreaks -Windstorms &Hailstorms -Lightning -Road accidents Oil - Spillage/Chemical pollution -Land slides -Ethnic skirmishes	Not adequate	-Technical knowledge Available -Need of skills development- more vehicles required	-Financial support not adequate -Need of more financial mobilization	-ALRMP (DSG) -Security Meetings -DEC -DDC	Depends on type of disaster- the lead agency to have mandate over the sector

5.13 Environmental issues and proposed intervention

Disasters will always be there since most of them are of natural origin but their impact could be greatly reduced by putting into place appropriate mitigation measures, which assist in terms of prediction, preparedness, coping and recovery strategies (table 10).

The district should develop and roll a risk reduction and contingency plan to address issues on disaster prevention (conservation), preparedness, monitoring, early warning, mitigation, response, recovery and post recovery strategies. Institutions, which will be involved in the above processes, should also be identified and working protocol and information sharing mechanism outlined.

Table 10: Priority issues and interventions

Prioritized issues/challenges	Current intervention	Proposed intervention in the plan period (2006 -2010)	Responsible institution	Remarks
1. Documentation of disasters and their impacts inventory	Existing information scattered/not adequate	Documentation and harmonization of information on disaster	ALRMP DEC District disaster management committee (DDMC)	Information useful for contingency planning or disaster preparedness
2. Development of disaster -risk reduction and contingency plan	-No existing plan on disaster mgt -Drought management strategic plan being developed by ALRMP (DSG)	-Disaster Contingency plan to be initiated -Drought Contingency Plan developed and in place/ being implemented	Prov. Adm. ALRMP DEC DDMC	The plan is to ensure all disasters are strategically planned for quick response
3. Disaster preparedness & coping strategies	uncoordinated interventions for disasters -Only drought interventions coordinated	Establishment of coordinated disaster management body/policies in places	ALRMP DEC ADMC	The district should have disaster preparedness and response mechanism
4. Adequate firefighting equipment, skills & personnel	-Limited (Narok Town Council has only 2 fire extinguishers trucks.	-2 additional fire fighting trucks -Adequate skills/personnel	NTC NCC	Adequate fire fighting equipments should be installed not only by local authority but also by all institutions /homesteads.

CHAPTER SIX

6.0 ENVIRONMENTAL EDUCATION, INFORMATION AND TECHNOLOGY

6.1 Status of formal environmental education

Environmental education is vital tool in the management of environment. Environmental awareness or education in the district is quite low and there is dire need of enhancing awareness and strengthening institutional capacities for both formal and informal education set up as shown in table 11. Use of appropriate technology ensures that there is little wastage of resources, minimal waste generation and better management of environment. Effective communication at all levels is necessary in addressing ecological and social-economic needs for sustainable development to be realized in the district.

Table 11: Status of environmental programmes in schools

No.	No. of schools			Types of environment programmes	Remarks
	Primary	Secondary	Tertiary		
	150	20	1	<ul style="list-style-type: none"> - Wildlife clubs - Young farmer 4K clubs. - Girl guide & scouts. - Tree planting and agriculture clubs. - Geographical society. - Science clubs. - Road safety clubs. 	<ul style="list-style-type: none"> - Most clubs are found mainly in secondary schools and colleges (e.g.) Narok Teachers college. - There is need of encouraging formation of environmental clubs in primary schools and tertiary institutions.

Source: Ministry of Education

6.1.1 Integration of Environmental Issues in Curriculum

In primary education, subjects such as science, agriculture and home science address issues related to environment and public health. Other subjects in primary school curriculum also have strong indirect bearing on environment as they enable the pupils to better understand their physical, socio-economic and spiritual world.

In secondary schools additional subjects are introduced and taught at depth, which relate to environment. These include; Chemistry, Physics, Geography, Biology, Agriculture, Home Science and technology among others. The scope of these subjects assists the candidates to

understand biological, physical, geological, geographical, chemical and socio-cultural and economic dimensions of environment. The tertiary colleges could serve as hubs for sharpening environmental skills, as the emphasis is mainly application of technical education, skills and knowledge acquired in the past. Colleges such as Narok-Teachers College have technical subjects with direct bearing on environmental education.

Translation of environmental knowledge acquired in schools and tertiary institutions into environmental conservation is low not only in the district but also countrywide. Few schools have managed to adopt good environmental management practices in their environs and there is need of enhancing environmental conservation in schools in the district.

6.1.2 Status of Non-Formal Education Programmes

The district has about 97 informal education centers distributed within the district with an average attendance list of about 656 adults and total enrolment of about 430 adults. The centres are fairly distributed around Central, Mulot, Mau, Osupuko, Olokurto and Ololulunga divisions with Loita and Mara divisions having none.

The key players in provision of adult education in the district include: GOK (Department of Adult Education), NGOs (*world vision, World concern, Action Aid*) and Churches (*Catholic, PCEA/AIC*). Environmental issues in informal education are integrated in subjects such as agriculture, environment & health, science, history & ethics and in field demonstrations (table 12).

Table 12: Status of Informal Environmental Programmes in the district

No.	Environmental Programme	Key players	Challenges	Proposed intervention
1	Enhancing Adult literate education	GOK NGOs Churches	- Poverty - Low enrolment -Poor facilities -Few teachers/facilitators -Low incentives salaries. -Poor equipment / learning, material -Cultural barriers.	- Employment of more adult teachers. -Improvement of learning facilities/ Equipping centres.
2.	Enhancing post literate education development.	GOK NGOs Churches	- Poverty - Low enrolment -Poor facilities -Few teachers/facilitators -Low incentives salaries. -Poor equipment / learning, material -Cultural barriers.	- Employment of more adult teachers. -Improvement of learning facilities/ Equipping centres.
3.	Development of cultural education centers.	GOK NGO Churches	Poverty Cultures, barriers High Cost.	Construction of 1- cultural education centre per location

Source: Ministry of Education

6.2 Public awareness and participation

At the district level this is normally done through integration of environmental concerns into various plans, policies and programmes. This is normally done through collaboration of the District Environment committee with other actors within the public sectors, civil societies, private sector and the local communities. The environmental impact assessment and audits are tools to ensure projects or programmes are implemented or operated within environmental guidelines to minimize adverse environmental impact. There is need of enhancing and harmonizing integration of environmental concerns at all levels from the local to the national and to the global levels for sustained production systems.

The district has several awareness creation materials with strong bearing on environmental conservation. These include; District development plans, state of environment reports, droughts monitoring bulletin (Arid lands), NEMA magazines, WRMA Magazines and several posters produced from time to time to address specific issues.

Key challenges in environmental awareness creation.

- Lack of facilitation (Vehicle, fuel for the District Environment Office)
- Lack of extension services (few GOK field staff, no vehicles)
- High poverty levels
- High illiteracy levels
- Low perception/appreciation of environmental conservation
- Weak institutional framework at the grass-root levels to champion for environment
- Vastness of the district / Poor road network / poor terrain
- Conflicting legislations
- Weak law enforcement
- Lack of incentives

6.3 Technologies

Technologies when used appropriately can contribute to environmental conservation and socio – economic development. The district though richly endowed with natural resources it has not embraced on large scale appropriate technologies in the management of its resources. These include clean production technologies such as use of energy saving devices, use of alternative energy sources, recycling and resource recovery, waste minimization or reuse, constructed wetlands among others. There is very narrow application of these technologies in the district.

The use of indigenous technologies though not documented should also be encouraged to provide such technologies that are not harmful to environment or are not obsolete.

Challenges in facing out polluting technologies

- Lack of funds/ incentives and high poverty levels

- Inadequate monitoring/analysis systems
- Lack of technology transfer
- Limited capacity / technical
- Policy / weak legislation
- Lack of cheap alternatives, technology.

Proposed Interventions

- Inventory of all indigenous technology and patent rights legislation
- Capacity building/ training
- Formulation and gazettement of various quality standards
- Incentives (economic Instruments)
- Socioeconomic empowerment

6.4 Environmental Information Systems

Information is an important tool in any management system. In order for any information to be meaningful, credible information systems have to be applied in its collection and analysis. Documentation, safe storage, access and dissemination of information are crucial if it is to benefit its end users.

The district has variety of environmental information in various forms scattered among different Public sectors, NGO's, CBO'S and other institutions including research and Learning institutions. The much challenge the district is facing is to enhance its information systems and to streamline and enable already existing information to be accessible.

6.4.1 Status of Environmental Information Management Systems

Information sharing

Information sharing/ communication between institutions/ lead agencies, committees & task forces within the district is easy, unless in instances where confidentiality is required. Information sharing might however be hindered by lack/ inadequate information at institutional level.

Adequacy of Institutional skills

Most of the public institutions do not have adequate skills in data collection, analysis, storage, retrieval & dissemination. Most Institutions also lack basic equipments required for information management systems.

Number of documentation centres, archives & libraries

The District has limited documentation centres (mainly Institutional) and has no archive. The district has no public library, has few institutional libraries (mainly in schools or other institutions) and most libraries are poorly equipped.

Number of circulating newspapers/ magazine/local publication

Newspapers/magazines & local publications are common in urban centres (e.g. Narok Town & major Trading centres). The circulation of t information materials is scarce in the rural areas where over 80% of the districts population resides.

Constraints/ Challenges in Environmental management of system

The main challenges to EMS include: high Poverty levels, high literacy levels, poor road network, poor skills & equipment, low funding levels (Institutions), lack of electricity (rural electrification), lack of data or poor information gathering and storage.

Proposed Interventions

- Increased funding (institutions) for data collection, analysis, storage and dissemination.
- Regular training on environment information system (CIS, remote sensing and related fields)
- Enhancing facilitation /capacity building

6.5 Indigenous knowledge

Narok district is cosmopolitan and comprises of multi ethnic communities. The cultural diversity already existing in the district if tapped could contribute huge indigenous knowledge in environment management (Information system). Information on 1K in the district has not been well documented for reference and for utilization by both present & future generation.

Constraints/Challenges in the utilization, documentation of (1K)

These include; High literacy level of poverty, lack of information/ data on 1K, limited funds for research and high preference to acquired Technological knowledge.

Proposed Interventions

- Documentation of 1K
- Research on 1K
- Intellectual rights protection

CHAPTER SEVEN

7.0 ENVIRONMENTAL GOVERNANCE AND INSTITUTIONAL ARRANGEMENTS

7.1 Overview

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

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

7.2 EMCA structures for environmental management

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

Some of the Lead Agencies in the district

- Ministry of Water and Irrigation
- The Kenya Forest Service
- Water Resources Management Authority and related Companies and Boards
- Ministry of Works
- Ministry of Housing
- Ministry of Labour and Human Development
- Mines and Geology Department
- Ministry of Education, Science and Technology Development
- Ministry of Medical Services

- Ministry of Public Health and Sanitation
- Ministry of Energy
- Ministry of Agriculture
- Ministry of Local Government
- Kenya Wildlife Services
- Ministry of Livestock Development
- Ministry of Fisheries development

Committees under EMCA

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

7.3 Other players in environmental governance

- Environmental NGO's: These include Friends of Conservation (FOC), African Conservation Centre (ACC), Ilkerin Loita Integrated Development Programme, Wild Wide Fund for Nature Conservation (WWF), Maasai Mara Hyena Project, World Vision, Action Aid, Narok Conservation and Development Programme (NACODEP) and Nile Basin Initiative.
- Environment CBO's: These include Narok conservation & Drought Recovery project (NCDRP), Koiyaki Lemek Wildlife Trust, Loita Council of Elders, Siana Wildlife Trust, Olchorro Oruiwa Wildlife trust.
- The role of the NGO's/CBO's is soliciting Public support, mobilization, lobbying and public participation in crosscutting issues including issues related to environment. Some NGO's/CBO's in the District work closely with government departments to realize their objectives.
- Ministry of Youth Affairs through registered youth groups work closely with NEMA staff in the district for awareness creation and cleanup activities, including investing the waste recycling activities
- Schools and tertiary colleges have infused Environmental Education in their curriculum
- Since EMCA gives *mwananchi*, a *locus standi*, the public has been blowing the whistle on anybody defiling the environment and NEMA has always acted on such cases appropriately
- Some environmental related cases have ended in the Law Courts and prosecuted successfully

- Some cases of environmental degradation have been reported to Public Complaints Committee and investigated thoroughly and action taken.
- Other Committee dealing with environmental issues at the district level include Physical Liaison Committee, Forest, Health and Environment Committee, District Agricultural Committee, DDC, District Executive Committee, District Health Board.



Figure 2 : Institutional Framework for EMCA, 1999

Source: NEMA Strategic Plan, 2005-2010

7.4 Regulatory instruments

Some environmental tools being employed in the district include.

- Environmental Management and Coordination Act of 1999
- Environmental Impact Assessment of 2003
- Environmental Audit of 2003.
- Water Quality Regulations of 2006.

- Waste Management Regulations of 2006.
- Access and benefit sharing for conservation of biodiversity 2007.

Other Sectoral Legislations for Environmental Management

Public Health Act Cap 242, Forest Act No 7 of 2005, Wildlife Act Cap 376, Water Act No 8 of 2008, Mining Act Cap 306, Physical planning Act No 6 of 1996, Factories Act Cap 514.

7.5 Multilateral environmental agreements (MEAs)

Some of these MEAs have been domesticated in Kenya. A number of donor agencies have released funds towards environmental management through these instruments.

Key areas where community are involved in domestication of MEAs include:

- Poverty eradication programme.
- Natural resource conservation.
- Environmental health.

International Agreements

- Convention on Biological Diversity (CBD).
- Cartagena Protocol on Biosafety.
- United Nations Framework Convention on Climate Change (UNFCCC).
- The Vienna Convention on the Ozone Layer Protection.
- The Montreal Protocol of the Vienna Convention on Ozone Layer Protection.
- Kyoto Protocol to the UNFCCC.
- United Nations Convention to Combat Desertification (UNCCD).
- Convention on International Trade in Endangered Species (CITES).
- Convention for the Protection of the World Cultural and Natural Heritage.
- Convention on the Wetlands of International Importance especially as Waterfowl Habitats (Ramsar Convention).
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).
- United Nations Convention on the Law of the Sea (UNCLOS).
- Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal (Basel Convention).

Regional Agreements

- Bamako Convention on the hazardous Wastes in Africa.

- African Convention on the Conservation of Nature and natural Resources.
- Tripartite Environmental Management Program for Lake Victoria.
- The Nile Basin Treaty of 1929.

Key Environmental Issues

- Inadequate capacity to interpret and enforce environmental legislations
- Conflict of environmental legislations and institutional mandates
- Undefined pre-existing ownership rights and utilization of natural resources
- Use of incentives to strengthen compliance for environmental management
- Introduction and acceptance to pay for ecosystem services and goods
- Over-reliance on elaborate and lengthy court system
- Formal institution in deliberating environmental cases.
- Inadequate capacity to domesticate MEAs.

Proposed Interventions

- Build capacity on interpretation and enforcement of environmental legislations
- Incorporation of community pre-existing rights in natural resource utilization
- Raise awareness on environmental legislations
- Devolve court systems up to the village council level and local environmental courts to help in fast tracking environmental decisions / cases
- Devolve funds for environmental management
- Build capacity to domesticate MEAs
- Institutionalize democratic, transparent, accountable and enforceable environmental management rules and regulations
- Synergies in institutional partnership
- Institutionalize participatory, consultative and community inclusive environmental management
- Use of incentives to promote compliance
- Incorporate trans boundary environmental management into existing environmental laws
- Enhance enforcement of EMCA, 1999 and other legislations for natural resource utilization
- Valuation of ecosystem services and goods in monetary terms
- Devolvement of funds with specific percentage for environmental management.

CHAPTER EIGHT

8.0 IMPLEMENTATION STRATEGY

The preparation of this District Environment Action Plan (DEAP) is based and guided by the national and district priorities as contained in major policy documents as spelt in the ERSWEC, the District development plans, Annual District state of Environment Reports, Ministries sectoral plans, policies and programmes, The objective of this environmental action plan is to integrate environmental concerns into development during the planning and implementation of policies, programmes , projects and activities during the plan period.

We all appreciate that environmental concerns are crosscutting in nature and their impacts are felt at all levels locally, nationally, regionally and globally. The integration of environmental concerns into development process at all levels is essential hence this District Environment Action Plan seeks to solicit for incorporation of many stakeholders as possible including the local communities, civil societies and the private sector for ownership and successful implementation to bring into fore the anticipated ecological and socio economic benefits.

8.1 Stakeholders involvement

The implementation strategy of this District Environment action plan is stakeholder centered and seeks to involve as many stakeholders as are available in all sectors of socio-economic development within the government departments or institutions including state corporations and agencies, civil society organizations / NGO's /CBO's groups, private sector and individuals.

The existing statutory frameworks, stakeholders' mandate, capacities, priorities and general commitment to the principles of sustainable development guide the participation of various stakeholders in the implementation of this environmental action plan.

For effective and participatory implementation of this District environment action plan, various stakeholders need to define collaborative mechanisms in conjunction with the District Environment Committee and how they intent to integrate the implementation of this environment action plan into their policies, plans, programmes and projects.

8.2 Resource requirements and mobilization

The implementation of this district environmental action plan requires a deliberate and sustained mobilization of resources to achieve the planned targets. These include: adequate allocation of financial, human and technological resources to the prioritized issues and calls for identification of resources needs and their allocation to the identified priorities.

The implementation of this action plan require financial resources mobilization to the tune of Kshs. 1.137 B for five years translating to about Kshs. 227.4M annually. For successful implementation of this plan, the report seeks support from various sources such as community based resources, local authorities transfer fund, constituency development fund, Government

budgetary allocation ALRMP and other existing programmes, NGO's / CBO's Religious organization, private sector, individual and development partners both at multilateral and bilateral levels.

This district environment action plan is considered viable as it only demands only about 3% of the total annual district income estimated at about Kshs.7.524 B. The implementation of this environmental action plan will put the district o the path towards sustainable development and there is no reason why the existing financial capacity of the district could not be exploited to execute and support this 5-year environment action plan (table 13).

Table 13: IMPLEMENTATION MATRIX

No	Priority issues	Objective	Output	Activities	Time Frame	Stake holders	Remarks
1.	Control of land degradation programme teleserlification control	Enhanced conservation of agricultural land / farm land in the district	Rehabilitation of 30% of 63,562.2 Ha under large scale farms (Wheat/barley maize)	Laying of soil conservation structures (12,712.5km) Establishment of agroforestry tree belts (4m seedlings) plated		Large scale farmers MOA DEC NGO/CBOs FD Provincial Administration	Rehabilitation of large - Scale wheat farms will significantly control land degradation in the district
			Conservation in small/ medium scale farms	Laying of soil conservation structures (11,483.5km) Agro forestry tree planting 3.5m seedlings planted		Small /medium scale farmers MOA DEC NGO/CBO'S FD Provincial Adm	Land degradation will significantly be reduced in small medium scale farms.

No	Priority issues	Objective	Output	Activities	Time Frame	Stake holders	Remarks	No
			Rehabilitation if dented environmentally significant areas	Conservation of demanded hill tops (2000Ha)re afforestation		Community MOA FD DEC Provincial Administration NGO's /CBO's ML & MD F CDF LASDAP WRMA ALRMP	Community CDF NGO/CBO Donors WRMA FD	Hilltops are important water catchments area

		Conservation of river banks (1000Km) 2.5m seedlings to be planted	Community MOA FD DEC Provincial Administration WRMA CDG NGOs/CBO ACRMP	Community WRMA	Encroachment of river banks especial Ewaso Nyiro Mara, Narok and Siapei is serious in the districts.
	Springs development (25 springs development)	Protection of 25 springs	- Community - WRNA - Provincial Adm. - ALRMP - DEC	- Community - WRMA - WSB - CDG	Springs serve as important watering points and capper aquatic life from existing water pans are sermons suited due to catchments description
	Wetlands/water pans conservation / protection	Catchment protection re-afforestation fencing of 70 water pans @ 100,000 cash)	- Community - WRNA - Provincial Administration - ALRMP - DEC	- Community - WRMA - WSB - CDF	

No	Priority issues	Objective	Output	Activities	Time Frame	Stake holders	Remarks	No
			Strengthened district environment committee	DEC strengthening Regular training Exchange programme Promotion of best practices		- DEC/NEMA - ALRMP - NGOs/CBOs	- DEC/NEMA A	
			Safe chemical application & handling (pesticides/agrochemical) occupational (Health & Safety.)	Provision of protective & safety gear Training on Health & Safety.		Employers Employees MOH MOA MOL & MDIF DEC AGOS/CBOS NCC NTC Provincial Administration	Employers MOH	Health & safety measures are crucial for employees working on risks environment e.g. dusty chemical contamination areas e.g. aerial chemical sprays.
4	Waste management	Enhanced waste management in the district	Installation of effluent treatment systems	Installation of sewage treatment system in Narok Town.		NTC WRMA NGO'S/CBO'S DEC Provincial Administration	NTC WRMA/WSB Private sector NGO's	Narok Town has no sewage treatment system.

No	Priority issues	Objective	Output	Activities	Time Frame	Stake holders	Remarks	No
				Installation of effective sewage treatment system in lodges Masai Mara (60 lodges)		Lodge owners Tour operators NCC DEC NGO's/CBO's RMA Provincial Adm M04 Community	Lodge owner	Most tourist lodges discharge effluent into river courses e.g. Mara river causing serious water pollution
			Improved solid waste management/ reunification of Narok Town	Installation of dust bins / waste receptacles at strategic points (15 garbage bins, 2000 dustbins & 25,000 seedlings / flowers planted)		NTC DEC NGO's / CBO's Community Private sector	NTC	Currently Narok town is in tress with solid waste and lacks dust bin The town very few flowers.
				Constructed of designated dumping site		NTC DEC MOH NRMA NGO's /CBO's	NTC	Narok town has no designated dumping site.

No	Priority issues	Objective	Output	Activities	Time Frame	Stake holders	Remarks	No
5	Wildlife management	Enhanced participation wildlife management	development wildlife conservation strategic plan	Consulter meetings Participation management of wildlife. conservation of wildlife habitats		Community KWS NCC NTC DEC provincial MOA Administration NGO's/ CBO's large scale farmer LASOAP CDF RDA	KWS NCC	The district experiences serious Home / wildlife conflicts due to poor management of wildlife & wildlife conservation areas.
6	Disaster management	Develop disaster preparedness and coping strategy	Disaster preparedness strategy Drought coping mechanism Early warning systems	Development of disaster preparation strategy plan Drought intervention mitigation measures Development of community early warning resource centre		- ALRMP - CDF - DEC - NTC - KWS - FD - MOA - MAC& MD - NGO's /CBO's - Community	ALRMP	Frequent drought re- occurrence 3 years period has devastated effects on lives hoods and environment

No	Priority issues	Objective	Output	Activities	Time Frame	Stake holders	Remarks	No
7	Energy conservation	Promotion of energy saving devices	Promotion of energy devices & energy sources	Promotion of energy saving jikos 5,00 jikos) Improved kilns introduced Establishment of wood lot (fuel wood 500Ha)		<ul style="list-style-type: none"> - FD - ALRMP - DEC - CDF - LASDAP - NGO's/CBO's - Private sector - Community 	<ul style="list-style-type: none"> - Community instillation - ALRMP - FD 	Forestry resources are rapidly being depleted in the district and energy saucing device, and planting of fast growing tree species is greatly important

8.3 Monitoring and evaluation

Monitoring and evaluation of the implementation of this district environment action plan will be carried out using participatory approaches where stakeholders will be involved at all stages. Monitoring will be carried out on a continuous basis through meetings, reports and field visits. Reporting will be on a quarterly basis through this does not support reporting of any occurrence or progress in between the indicated period.

Evaluation will be carried out periodically and preferably at an annual basis. Best practices will be documented for the purpose of replication by other players. The purpose of monitoring and evaluation of the district environment action plan is to ensure its efficient and effective implementation as well as ensuring that environmental concerns have been addressed and integrated into the development process (table 14).

Table 14: MONITORING AND EVALUATION MATRIX

	ACTIVITY	OVLS (Objectively variable indicators)	MOVs (Means of Verification)	Reporting schedule	Implementers	Responsible Institutions for M & E	Remarks
1.	Laying soil conservation structures in all large scale farms (12,712.5km)	- Length laid 2,542.5km / year - Water quality reduced (silt) No. o farms laid - Yield increase	- Annual reports (MOA) Field visits arm records / reports	Bi-annually / Annually	- Large scale farmers -MOA	- DEC - MOA	Laying of Terrace mainly done during dry sped (Sept-Dec)
2	Planting agro-forestry tree belts on all large scale farms (4m seedlings)	- No of seedlings planted:800,000 seedling, year. - No of farms - Total Ha. - Planted forest cover	- Annual reports (MOA, FD) - Field visits - Farm Report / reports	Bi-annually / Annually	- Large scale farmers - MOA - FD	- DEC - MOA - FD	Trees normally planted during long rains period (April)
3	Planting agro-forestry trees on small / medium scale farms (3.5 M seedlings)	- No. of seedlings planted 700,000 seedling / year. - No. of farms Total Ha. - Planted forest cover.	- Annual reports (MOA, FD) - Field visits - Farm Report - SOE reports	Bi-annually / Annually	- Small scale farmers. - MOA - FD	- DEC - MOA - FD	

	ACTIVITY	OVLS (Objectively variable indicators)	MOVs (Means of Verification	Reporting schedule	Implementers	Responsible Institutions for M & E	Remarks
4	Laying soil conservation structures on all small/medium scale farms (11,483.5Km)	- Length laid 2,296.5Km / year - No. of farms laid. - Yield increase - Water quality (reduced silt)	- Annual reports - Field visits - Farm records / Reports - SOE reports	Quarterly – bi-annually / Annually	- Small Scale farmers - MOA - FD	- DEC - MOA - FD	
5.	Re-a forestation of denuded hilltops (10,000 Ha)	- No. of hilltops conserved (3) - Total Ha Re-afforested (2,000 Ha / Year)	- SOE Report - FD Reports - Field visit MOA Reports	- Bi-annually - Annually	- Community - FD - ENSDA - NCC	- DEC - FD	Selection of at least 3 denuded hills.
6.	Conservation of river banks (400KM – 2.5M seedling planted)	- Length of conserved 80km / year. - No of seedlings Planed (indigenous) 500,000 seedlings / year	- Annual reports MOA/WRMA/ FD - Field Visits - SOE reports	- Bi-annual / annual	- Community - Land owners - MOA /D - ENSDA - ACRMP -NGO's/CBO's	- DEC - MOA/FD / ENSDA	

	ACTIVITY	OVLS (Objectively variable indicators)	MOVs (Means of Verification)	Reporting schedule	Implementers	Responsible Institutions for M & E	Remarks
7.	Springs protection (25 springs developed)	- No of springs developed 5 springs / year - Water quality - Reduced diseased prevalence	- Annual reports WRMA - SOE reports	Quarterly / annually	- Community - Land owners - MOA/FD - ENSDA - ACRMP - NGO's/CBO's	- DEC - WRMA	
8	Wetlands/water pans protection / conservation (59 water pans)	- No of water pans protected (12/Year) - Water quality	- Annual reports WRMA/FD - Field visits - SOE reports	Quarterly / annually	- Community - WRMA - CDF - ALRMP - NGO's/CBO's	- DEC WRMA	
9.	Gully rehabilitation (Mosoriro gully (10m x 40km)	- Length of guides rehabilitated 8km/year	- Reports MOA / FD - Field visits - SOE reports	Quarterly / annually	- Community -ENSDA - CDF - ALRMP - Donors /NGOs/CBO's - MOA - WRMA - FD	- DEC - MOA/WRMA	
10.	Construction o safe storm drainage channels on roads (1,213 km)	- No. of safe storm drains - No. of roads, - No. of complaints (reduced) - Storm harvesting structures	- Reports - Field Visits - Complaints	Quarterly/annually	- MOPN - Community	- DEC - MOPN	

	ACTIVITY	OVLS (Objectively variable indicators)	MOVs (means of verification)	Reporting schedule	Implementers	Responsible Institutions for M & E	Remarks
11	Rehabilitation of 10,000 Ha. Masai Mau forest by planting 5 million indigenous tree seedlings (indigenous)	<ul style="list-style-type: none"> - Ha planted 2,1000 Ha/Year - Seedling Planted 1 M / Year - forest cover increase tree species 	<ul style="list-style-type: none"> - Reports NCC/FD - SOE Reports 	-Bi-annually /annually	NCC ENSDA FD Donors NGO's/ CBO's	<ul style="list-style-type: none"> - DCC - FD - WCC 	Planting normally done once year during April rains
12	Re afforestation of Enosupukia trust land forest (10,000 Ha) 5 M seedlings	<ul style="list-style-type: none"> - Ha re- afforested 2,000 Ha year. - No. of seeding planted 1m/ year - Tree species 	<ul style="list-style-type: none"> - Reports NCC FD - SOE reports 	Bio annually	NCC FD WRMA ENSDA DONERS NGO's / CBO's	<ul style="list-style-type: none"> - DEC - FD - NCC 	
13	Formation / revitalization of community grass root environmental committees	<ul style="list-style-type: none"> - No. of environmental committee s formed and revitalized 	<ul style="list-style-type: none"> - Committee Reports/minutes. - SOE reports - Reports DSDO/DSO 	Quarterly annually	<ul style="list-style-type: none"> - community - ALRMP - DEC - ENSDA - NGO'S /CBO'S 	<ul style="list-style-type: none"> - DEC 	
14	Revitalization of school environmental programmes	<ul style="list-style-type: none"> - N.V.A school environmental programmes - Support programmes - Awards given 	<ul style="list-style-type: none"> - School / Reports - DEO's report - SOE report 	Quarterly annually	<ul style="list-style-type: none"> - School - DEO - DEC - NGO'S /CBOS - ACRMP 	<ul style="list-style-type: none"> - DEC - DEO (Education) 	
15	DEC Strengthening	<ul style="list-style-type: none"> - No. of trainings - No. trained - No. of programmes - Best environmental practices promoted - Environmental indicators 	<ul style="list-style-type: none"> - Puts - SOE report 	Quarterly/ annually	<ul style="list-style-type: none"> - DEC/NOWA - ALRMP - Donors - NGO's / CBO's 	<ul style="list-style-type: none"> - DEC/NEMA 	

	ACTIVITY	OVLS (Objectively variable indicators)	MOVs (means of verification	Reporting schedule	Implementers	Responsible Institutions for M & E	Remarks
16	Training of Health & safety and provision of health & safety protective gears	<ul style="list-style-type: none"> - No. of safety gears provided - Types of safety gears. - No of training - Reduced accidents 	<ul style="list-style-type: none"> - Reports mott industry - Mott records - Injury poisoning records (police) - Records employer 	quarterly annually	<ul style="list-style-type: none"> - Employers - Mott (industry) - NGO's /CBO's 	<ul style="list-style-type: none"> - DEC - WRMA/WSB 	
18	Installation of effective effluent treatment system in all lodges in Masai Mara (60 lodges)	<ul style="list-style-type: none"> - No. of lodges installed - Water quality analysis 	<ul style="list-style-type: none"> - Reports WRMA/MOH - SOE reports - Completion certificate 	quarterly annually	<ul style="list-style-type: none"> - Lodge owners 	<ul style="list-style-type: none"> - DEC - WRMA - MOH 	
19	Installation of dust bins and refuse collection structures Narok town 100 dust bins 20 refuse structures	<ul style="list-style-type: none"> - No. of dust bins 20 years - No. of refuse holding structures 4 years 	<ul style="list-style-type: none"> - Reports / NTC - SOE reports 	quarterly annually	<ul style="list-style-type: none"> - NTC - NGO'S/CBO's private sector ENSDA 	<ul style="list-style-type: none"> - DEC - NTC 	
20	Beatification programme Narok Town	<ul style="list-style-type: none"> - No. of ornamental plants / flowers planter 5000 year 			<ul style="list-style-type: none"> - NTC - FD - Community NGO's / CBO's 	<ul style="list-style-type: none"> - DEC - FD 	

	ACTIVITY	OVLS (Objectively variable indicators)	MOVs (means of verification	Reporting schedule	Implementers	Responsible Institutions for M & E	Remarks
21	Promotion o energy saving Jikos 5,000 Jikos promoted	<ul style="list-style-type: none"> - No of Jikos promoted 1,000 Jiko /year - No. of House holds - Reduced energy use 	<ul style="list-style-type: none"> - Reports DSDO/DSO - SOE reports - Fields 	quarterly annually	<ul style="list-style-type: none"> - Community - NGO's /CBO's - ALRMP - FD - ENSDA - MOA 	<ul style="list-style-type: none"> - DEC - MOA 	
22	Introduction of improved charcoal kilns 20 kilns)	<ul style="list-style-type: none"> - No of kilns introduced - Energy savings - Increased production 	<ul style="list-style-type: none"> - Reports FD - SoE reports field tours 	quarterly annually	<ul style="list-style-type: none"> - Community - FD - ENSDA - AL - MOA 	<ul style="list-style-type: none"> - DEC - FD 	
23	Establishment of community wood lets for wood fuel. (500 Ha) 0.5 m seedlings	<ul style="list-style-type: none"> - No. of selling's planted 100,000 years - Ha of wood log established 100 Ha years - Wood fuel existing 	<ul style="list-style-type: none"> - Reports FD /MOA - SOE reports - Farm reports - Site visit 	quarterly annually	<ul style="list-style-type: none"> - Community - FD - ENSDA - MOA - ACRMP - CSO 	<ul style="list-style-type: none"> - DEC - FD 	

REFERENCES

- DEAP Report – Narok District (1989)
- Departmental reports (GOK)
- District Development plan – Narok District (2002-2008)
- GOK (2004) – Economic recovery strategy for wealth and employment creation.
- GOK (2004) Millennium development goals report
- Kenya National Environment Action Plan (NEAP) 1994.
- NEMA (2005) Nema strategic plan 2005-2010
- Poverty reduction strategy paper PRSP (2001-2004)
- State of environment reports Narok District (SOE – 2003 & SOE 2004)

APPENDIX

(Extract from EMCA)

PART IV OF THE ENVIRONMENTAL MANAGEMENT AND COORDINATION ACT (1999) – ENVIRONMENTAL PLANNING

(National Environment Action Plan Committee)

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

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

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

38. Provisions of the National Environment Action Plan

The national environment action plan shall: -

- a) Contain an analysis of the natural resources of Kenya with an indication as to any pattern of change in their distribution and quantity over time;
- b) Contain an analytical profile of the various uses and value of the natural resources incorporating considerations of intergenerational equity;
- c) Recommend appropriate legal and fiscal incentives that may be used to encourage the business community to incorporate environmental requirements into their planning and operational processes;
- d) Recommend methods for building national awareness through environmental education on the importance of sustainable use of the environment and natural resources for national development;
- e) Set out operational guidelines for the planning and management of the environment and natural resources;
- f) Identify actual or likely problems as may affect the natural resources and the broader environment context in which they exist;
- g) Identify and appraise trends in the development of urban and rural settlements, their impacts on the environment, and strategies for the amelioration of their negative impacts;

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

39. Provincial Environment Action Plans

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

40. District Environment Action Plans

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

41. Contents of Provincial and District Environmental Action Plans.

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