



CLIMATE CHANGE MAINSTREAMING GUIDELINES

AGRICULTURE, LIVESTOCK AND FISHERIES SECTOR





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FOREWORD



Green Africa Foundation was founded in Kenya in the year 2000 with a focus of implementing practical community driven projects towards greening Africa. The organization has actively been implementing a number of projects covering: Climate Change, Policy Advocacy, Environmental Conservation, Agriculture, Water and Energy. The organization has been very instrumental in policy advocacy that has seen through a number of policies coming to fruition both at the county and the national level and with agenda of mainstreaming climate change at the county level taking precedence.

The project that enabled the formulation of these guidelines was a DFID StARCK+ Extension Programme, funded through the Act Change Transform (Act! - NRM component) and implemented by Green Africa Foundation. The project's overall goal was to consolidate prior efforts towards completion of climate change legislation and cross sectoral coordination for enhanced climate change mainstreaming. The objective was to support selected counties, namely Garissa, Marsabit and Wajir to move forward with completion of their climate change legislations and also develop the sectoral climate change mainstreaming guidelines for priority sectors with a view to help give input to the review process of County Integrated Development Plans (CIDPs) 2018-2022. This objective was achieved through a programmatic approach and in partnership between Green Africa Foundation and the county governments of Garissa, Marsabit and Wajir, as well as other stakeholders including national government agencies, the private sector and Civil Society Organizations.

These guidelines are intended to assist the County Government of Marsabit to attain climate change mainstreaming in the water and sanitation sector by providing a framework for integrating climate change responses for the sector into county planning processes, especially the 2018- 2022 CIDP, as well as other processes such as performance contracting and budget making.

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ACKNOWLEDGMENT

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Marsabit County Government wishes to thank the UK Department for International Development (DFID) for the financial support towards implementing this project together with the Act Change Transform (ACT!) through the ENRM component who closely supervised and guided the implementation process. Further gratitude to the County Government of Marsabit where this project was implemented through the County departments of: Environment & Natural Resources, Agriculture & Livestock, Water, Energy, Disaster Response Unit, Health, Office of the County Secretary, County Assembly relevant committees and all other departments involved.

To the Water Resources Management Authority, Kenya Forest Service, Kenya Wildlife Service, local Community Based Organizations, Non-governmental Organizations and Private Sector who sent representatives who contributed immensely to this process, we highly and sincerely appreciate your valuable contribution. To Mr. Mamo Abudo (MIO-NET, Marsabit), Ms. Janet Ahatho (Deputy Director, Department of Environment, Marsabit County) and Mr. Isaako Mulo (Caritas, Marsabit), may God bless you and reward your effort and commitment towards ensuring this process was a success.

We thank the following Green Africa Foundation team members for their continuous support and input to the process: Mr. Milton Ogada, Mr. John Kioli, Ms. Gladys Njeri, Ms. Monika Masinzi and Mr. Alexander Matuku. Their dedication and positive spirit made this work possible.

Finally, we are very grateful to Mr. Gerphas Opondo who was the lead consultant in this project and was instrumental in drafting the document, and Mr. Fredrick Onyango who provided research support services.

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This project was supported by Department for International Development (DFID) - UKAID through Act Change Transform (ACT!) and implemented by Green Africa Foundation in partnership with the local stake holder and the Marsabit County Government.



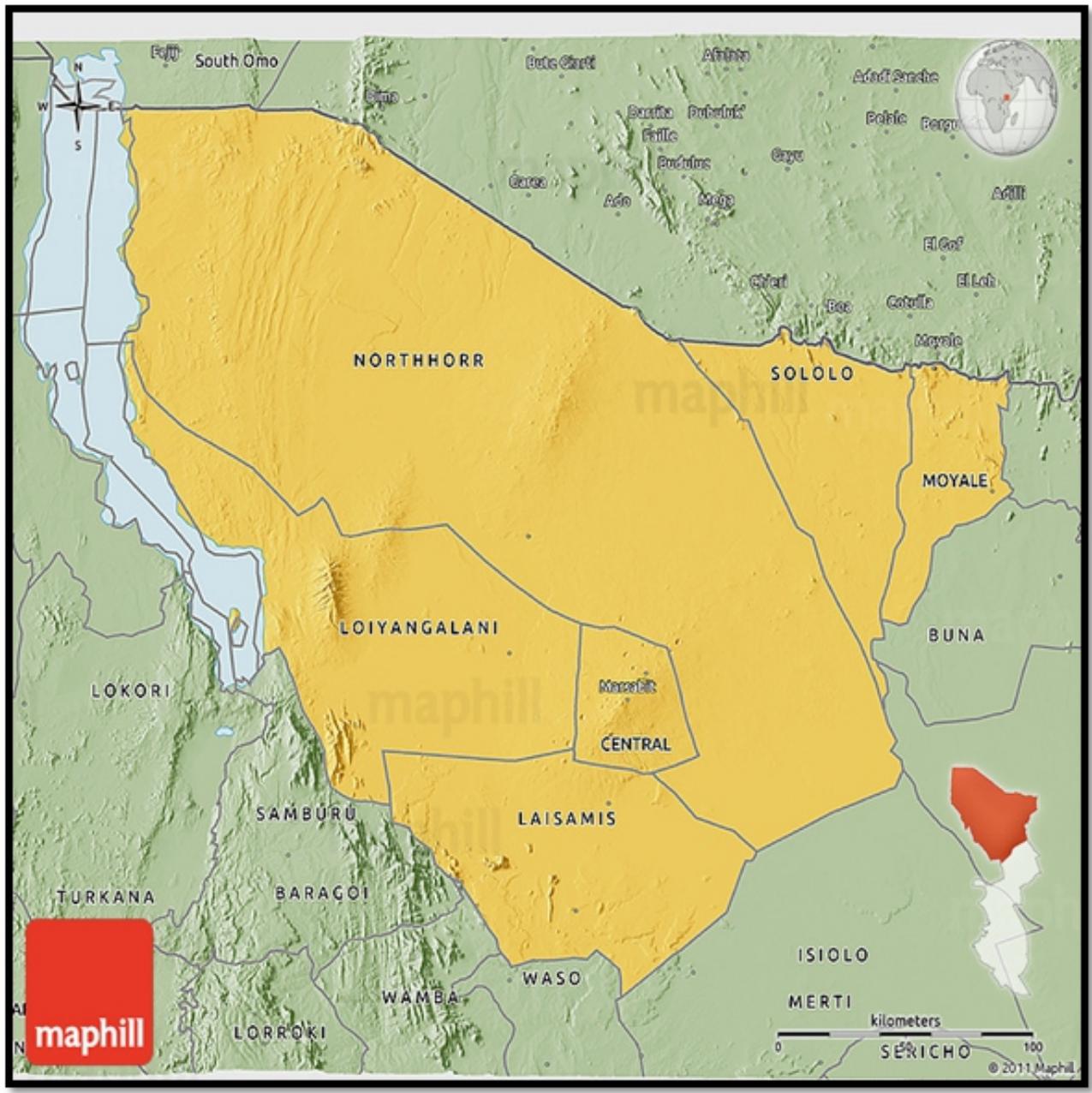
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1.0 MARSABIT COUNTY BACKGROUND INFORMATION

1.1 Location and Administrative Units

The County of Marsabit is located in northern part of Kenya and has a total area of 70,961.2Km² and. It is bordered by Ethiopia to the North, Samburu County to the South, Wajir and Isiolo Counties to the East and covers a section of Lake Turkana to the West. It lies between latitude 02° 45' North and 04° 27' North and longitude 37° 57' East and 39° 21' East.



Map of Marsabit County

The county is divided into four administrative sub-counties namely: Saku, Laisamis, North Horr, and Moyale which also form the electoral constituencies. The sub-counties are further divided into 20 wards and further into administrative locations, sub-locations and villages.

1.2 Climate and Topography

Most parts of the County are arid with the exception of high potential areas around Mt. Marsabit, Mt. Kulal, Hurri Hills and the Moyale-Sololo escarpment. Rainfall is erratic and highly variable with high evaporation rates that exceed rainfall more than 10 times. The county experiences tropical climatic conditions with extreme temperatures ranging from a minimum of 15 degrees celcius to a maximum of 26 degrees celcius, with an annual average of 2050 degrees celcius. Rainfall ranges between 200mm and 1,000mm per annum and its duration, amount and reliability increases as altitude rises. North Horr (550m) has a mean annual rainfall of 150mm; Mt. Marsabit and Mt. Kulal 800mm while Moyale receives a mean annual rainfall of 700mm.

Most of the county constitutes an extensive plain lying between 300m and 900m above the sea level, sloping gently towards the south east. The plain is bordered to the west and north by hills and mountain ranges and is broken by volcanic cones and calderas. The most notable topographical features of the county are: Ol Donyo Ranges (2066m above sea level) in the south west, Mt. Marsabit (1,865 m above sea level) in the central part of the county, Hurri Hills (1685m above sea level) in the north eastern part of the county, Mt. Kulal (2,235 m above sea level) in north west and the mountains around Sololo-Moyale escarpment (up to 1,400 m above sea level) in the north east. The main physical feature is the Chalbi Desert which forms a large depression covering an area of 948 km² lying between 435m and 500m elevation. The depression is within the Great Rift Valley and is separated from Lake Turkana, which is 65-100m lower in elevation, by a ridge that rises to 700m.

1.3 Population

According to the Kenya 2009 Population and Housing census, the county was projected to have a total population of 372,931 in 2017 with 193,544 males and 179,387 females. The projection is based on an annual growth rate of 2.74 per cent. The majority of the population in the county is confined between 0-24 years, translating to 67.8 per cent of the total population. It has an average population density of 5 persons per km² in the county with Saku Constituency has the highest population density at 25 people per Km². The county is cosmopolitan and dominantly home to the Borana, Gabra, Rendille, Samburu, Burji, Somali, Turkana and Dasanach peoples.

1.4 Education & Literacy situation

The county has 315 Early Childhood Development (ECD) centres, 179 primary schools, 35 secondary schools, 6 vocational centres and 4 youth polytechnics. There are however no commercial or public colleges and universities in the county. The proportion of primary schools that are situated within a radius of less than one

kilometre from the community is 79 per cent, less than five kilometres is 7.7 per cent while more than five kilometres is 84.4 per cent. This implies that majority of schools are located at distances that are more than five kilometres posing a challenge of accessibility to educational facilities.

1.5 Economic Activities

The main income generating activities practiced in the county includes small scale irrigation crop farming, livestock keeping, fish farming, mining, tourism, and trading. Livestock keeping is the main economic activity in the county with the main livestock bred includes being Cattle approximated at 218,755, goats at 1,186,482, sheep at 2,029,490, camels at 217,368, donkeys at 63,861, poultry at 45,857 and rabbits at 68. There are 5,887 beehives/apiaries in the entire county. The main livestock products are: milk, beef, mutton and camel meat. The population practicing agriculture is estimated to be about 2 per cent. Main crops grown in the county include vegetables, fruits, khat (miraa), maize, teff, beans, green grams, cow peas and millet.

1.6 Forest Cover and wildlife

Only about 15% of the land in Marsabit County is under vegetation cover. The County has one indigenous forest known as Mt. Marsabit forest which covers an area of 152.8 km² which is the only gazetted forest in the county. There are two non-gazetted forests namely Mt. Kulal and Hurri hills, with a total area of 750km². Reports also indicate that rural indigenous forests and woodlands have been destroyed at a rate of 5% annually posing a threat to catchment areas and land resources. The main wildlife types found in the county are rare species of black rhino and great kudu. Other main animals found in the county include: Elephants, buffalos, lions, bush bulks, baboons, leopards, zebras, gazelles, giraffes and different species of birds such as ostriches.

1.7 Water and Sanitation situation

There are no permanent rivers in the county, but four drainage systems exist. Chalbi Desert is the largest of these drainage systems. The depression receives run-off from the surrounding lava and basement surfaces of Mt. Marsabit, Hurri Hills, Mt. Kulal and the Ethiopian plateau. The seasonal rivers of Milgis and Merille to the extreme south flow eastward and drain into the Sori Adio Swamp. Other drainage systems include the Dida Galgallu plains which receive run-off from the eastern slopes of Hurri hills, and Lake Turkana into which drain seasonal rivers from Kulal and Nyiro Mountains.

Most parts of county experience acute shortage of water and only 4 per cent of the households use piped water. 60 per cent of the households rely on boreholes, springs and wells. There are nine dams, 853 shallow wells, 18 protected springs, 17 unprotected springs, 53 water pans and 60 boreholes which serve as the main sources of water in the county. The piped water is treated at the water supply plant but the others are not treated and are saline. Households with latrines account for 34.3 per cent of the population. Among the toilets used include: pit latrine which account for 25.8 per cent, uncovered pit latrines (13.5 per cent), covered pit latrine (12.3 per cent), and flush toilets (0.2 per cent), while the remaining majority use open defecation in bushes and fields.

1.8 Waste Management

Waste/garbage disposal by county authorities is only at sub-county headquarters by way of heap burning which accounts for about 20 per cent of the waste generated in these urban centres, with majority of households resorting to backyard waste burning. In the rural areas most garbage is mostly un-attended while a few households practice disposal by way of garbage pits, farm garden disposal and open burning.

1.9 Energy situation

Currently, Marsabit County depends largely on biomass, hydrocarbons, grid and isolated grid electricity, solar, wind and biogas for its energy needs with petroleum and electricity dominating the commercial energy. The supply of adequate energy for household, institutional and SME needs remains a major challenge which must be addressed through a comprehensive medium to long term plan for the sector. Key challenges include: high power infrastructure development costs, long lead time required to implement energy projects, unforgiving climate and terrain, high cost of energy, inability to deliver adequate energy to meet county needs, and low investments in the sector, among others. Marsabit county has abundant renewable energy resources in the form of wind and solar. Biomass though widely used is increasingly under pressure and extensive use has resulted in environmental and land degradation. The main source of energy is wood fuel which is used both for cooking and lighting, while kerosene is used for lighting. The proportion of households using fire wood as main source of cooking fuel is 92.6 %, charcoal is 5.6 %, and paraffin is 1.4 %, while biomass residue is 0.2 %. For lighting 57.2 % of the households in the county use firewood while 27.5% use paraffin. Marsabit County is endowed with a huge potential of renewable energy, especially wind and solar which remain largely untapped. Despite these resources the county is still by and large powered by diesel. Many upcoming urban centres lack access to electricity thus inhibiting socio-economic growth.

2.0 MAINTREAMEING CLIMATE CHANGE IN THE AGRICULTURE SECTOR IN MARSABIT COUNTY

2.1 Introduction

Like other counties in Kenya, Marsabit County's economy is highly dependent on the natural resource base, and thus is highly vulnerable to climate variability and change. Rising temperatures and changing rainfall patterns, resulting in increased frequency and intensity of extreme weather events such as droughts and flooding, threaten the sustainability of the county's development.

Key economic sectors in Marsabit County are particularly susceptible to climate change impacts and this threatens to undermine the county's recent and impressive development gains. It is therefore important that the county builds and enhances its climate resilience and adaptive capacity. Building climate resilience requires that Marsabit County's systems of governance, ecosystems and society have capability to maintain competent function in the face of climate change. This would aid a return to some normal range of function even when faced with adverse impacts of climate change. Adaptive capacity is key to improving socio-economic characteristics of communities and households as it includes adjustments in behaviour, resources and technologies, and is a necessary condition for design and

implementation of effective adaptation strategies. The sustainable development of Marsabit County therefore significantly depends on the design and implementation of mechanisms that trigger and enhance climate change resilience and adaptive capacity.

Climate change mainstreaming in the various sectors is necessary to equip various coordinating departments in the county government with the tools to effectively respond to the complex challenges of climate change. In this context, mainstreaming implies the integration of climate change policy responses and actions into county sectoral planning and management processes. This requires explicitly linking climate change actions to core planning processes through cross-sectoral policy integration. This integration operates by providing an overarching guidance system that requires all sectors of the government to implement climate change responses in their core functions. Mainstreaming is a process that encourages cooperation across government departments in planning for a longer-term period; rather than fragmented, short-term and reactive budgeting. County governments are required by the County Governments Act, 2012 to prepare and implement County Integrated Development Plans (CIDPs), through which climate change actions can be mainstreamed. These guidelines are intended to assist the County Government of Marsabit to attain this climate change mainstreaming in the agriculture sector by providing a framework for integrating climate change responses for the agriculture sector into county planning processes, especially the CIDP, as well as other processes such as performance contracting and the budget making process.

2.2 Rationale for Climate Change Mainstreaming in the Agriculture Sector

The agriculture sector, including crops, livestock and fisheries, is a priority in Kenya's Vision 2030 because it plays a critical role in improving livelihoods, enhancing food security and increasing GDP and employment. Vision 2030 aims to achieve an innovative, commercially oriented, modern agricultural sector through institutional reforms, increased productivity, land-use transformation, increased access to markets and development of arid and semi-arid lands (ASALs).

The Agricultural Sector Development Strategy 2010-2020 sets out a detailed plan to position the agricultural sector as a key driver for delivering the 10 per cent annual economic growth rate envisaged under the economic pillar of Vision 2030. The vision of the document is “a food secure and prosperous nation” and the strategy aims to increase productivity, commercialization and competitiveness of agricultural commodities and enterprises; and develop and manage key factors of production. Also important is the government's goal of 10 per cent farm forest cover on all agricultural land holding.

The agriculture sector, including crop production, livestock, and fisheries, is one of the economic sectors in Marsabit County that is most vulnerable to climate change. Over 80 per cent of the population are dependent on rain-fed subsistence crop production and pastoralism, and are therefore significantly impacted by declining agricultural production due to unpredictable rainfall, reduced soil productivity through erosion and increased evapotranspiration. Besides crop production,

Marsabit's livestock production relies heavily on natural systems such as rain fed pasture. These livestock systems are very climate sensitive, being vulnerable to the impacts of changing and irregular rainfall patterns and droughts. Greater drought frequency increases livestock morbidity and mortality because of reduced availability of forage, increased disease incidences and a breakdown of marketing infrastructure.

3.0 RISKS AND IMPACTS OF CLIMATE CHANGE IN THE AGRICULTURE SECTOR

3.1 Crop Production Sub-Sector

The major climate change-related challenges in the crops sub-sector include changes in enterprise suitability for specific areas, leading to decrease in profitability; unpredictable timing of farming operations due to seasonal weather variability and reliability, leading to lower production efficiency; losses due to yield reductions, total crop failures, enhanced postharvest losses and increased production costs arising from extreme weather events or reduced land productivity.

Climate change has led to more frequent and intense extreme weather events such as drought, floods, strong winds, hailstorms, and frosts. Droughts lead to loss of investments in crop production due to reduced yields or total crop failure as a result of water stress, inhibiting plant nutrient abstraction from the soil and the vital physiological processes of the plant. Floods lead to anaerobic soil conditions, hindering the ability of the roots to aerobically respire and abstract nutrients from the soil. This results in plant stresses that reduces yields or causes total crop failure. Strong winds lead to breakage, logging or physical injury of the crop, accelerated evapotranspiration that lead to crop stress and yield reduction. Hailstorms cause physical crop damage, reducing the photosynthetic leaf area and predisposing the plant to disease infections. Drought, floods and strong winds also lead to the destruction of infrastructure such as the silting of dams, clogging and breaking of irrigation and drainage infrastructure; destruction of farm buildings and roads; drying, storage and marketing facilities, as well as agro-based industries. Wet conditions during harvest of cereals lead to enhanced postharvest losses due to rotting and aflatoxin contamination. Strong winds, landslides and dust storms also contribute to the reduction of soil fertility through erosion and translocation of the fertile top soils. Other emerging issues in crop production include pests and invasive species which affect quality and quantity of crop yields.

3.2 Livestock Sub-Sector

Climate change is having substantial effects on ecosystems and the natural resources upon which the livestock sub-sector depends. Climate change has led to declining livestock production due to direct and indirect impacts to both livestock and their production systems. In grazing systems, the direct impacts include increased frequency of extreme weather events; increased frequency and magnitude of droughts and floods; productivity losses due to physiological stress occasioned by temperature increase; and change in water availability. The indirect impacts stem from agro-ecological changes and ecosystem shifts that lead to alteration in fodder quality and quantity; change in host-pathogen interaction

resulting in increased incidences of emerging pests and diseases; and disease epidemics. In non-grazing systems, the direct impacts include change in water availability and increased frequency of extreme weather events while the indirect impacts include increased resource prices (e.g. feed, water and energy), disease epidemics and increased cost of animal housing (e.g. cooling systems).

Extreme weather events, especially droughts and floods lead to reduced pasture and forage availability, degradation of the environment and an increase in destitution. Strong winds and dust storms also contribute to the reduction of forage availability as they erode top soil, thus making grass regeneration difficult even when it rains. Recurring droughts have caused heavy losses to livestock, forcing an estimated 30% of livestock owners out of pastoralism in the past 20 years. According to the World Bank, estimated livestock mortality as a result of drought is about 10–15% above normal in the affected areas such as Marsabit, which is equivalent to 5% of Kenya's livestock population. Extended periods of drought erode livelihood opportunities and community resilience and leads to undesirable coping strategies that damage the environment and impair household nutritional status, further undermining long-term food security situation in the County.

3.3 Fisheries Sub-sector

Extreme weather events such as heavy tropical storms and drought incidences that are projected with the changing climate affect fisheries and aquaculture through acidification of the water bodies, changes in sea temperatures, circulation patterns and associated ecological changes. These changes have the potential of altering the physico-chemical properties of the fish habitats. Consequently, fish feeding, migration and breeding behavior will be directly affected while indirectly the changes will affect growth, mortality and reproduction. The changes manifest in the fish through increased metabolism that culminates in smaller body size and a smaller brood, sex determination that favors the prevalence of females over males, expansion and/or contraction of suitable habitats. The changes also leads to shifts in the distribution of fish stocks due to alteration or reduction of feeding grounds, reduction in breeding grounds, and changes in migratory circuits that connect life stages, thereby affecting successful completion of the life cycle and successful recruitment, a factor that will translate into reduced earnings for the fisher folk. Marsabit County owns 70% of Lake Turkana which supplies up to 80% of the County's fish consumption. There are also emerging yet encouraging pockets of fish farming in the County.

4.0 STRATEGIES AND GUIDELINES FOR MAINSTREAMING CLIMATE CHANGE IN THE AGRICULTURE SECTOR IN MARSABIT COUNTY

STRATEGIC ISSUE 1: VULNERABILITIES DUE TO CHANGES IN TEMPERATURE REGIMES AND PRECIPITATION PATTERNS			
Strategic Goal: Enhanced adaptive capacity and resilience of farmers and pastoralists to the adverse impacts of climate change			
Strategic Objective: Institute measures to reduce the vulnerabilities of farmers and pastoralists to changing temperature regimes and precipitation patterns			
Mainstreaming Strategies and Guidelines		Timeline	Responsible
I	The County Government will invest in systems for provision of accurate, timely and reliable climate/weather information to inform decisions of actors in crops, livestock and fisheries value chains. This will involve collaboration with national government agencies such as the Kenya Meteorological Department and National Drought management Authority for the establishment, improvement, modernization and maintenance of weather infrastructure; integration of scientific and indigenous knowledge and technical skills and capacity building on weather data analysis, packaging, dissemination and use of early warning weather information. This will be done through local FM radios, public meetings and other media.	By 2020	Departments of Environment, Agriculture, Livestock
II	The County Government will promote and facilitate the adoption of crop varieties, livestock and agro-forestry tree species that are adapted to varied weather conditions and tolerant to associated emerging pests and diseases. This will involve breeding and promoting the use of crop and forage varieties, livestock, poultry and fish breeds and agro-forestry tree species that are tolerant to flooding, drought, strong winds, hailstorms, heat waves, frost and emerging pests and diseases.	Continuous	Departments of Environment, Agriculture, Livestock
III	The County Government will invest in the development of appropriate low-cost technology, taking into account indigenous knowledge along crops, livestock, poultry, fisheries and agro-forestry value chains. This	Continuous	Departments of Environment, Agriculture, Livestock

	will entail participatory research that includes crops and forage varieties, livestock breeds and agro-forestry tree species that are able to withstand weather variations; facilitating the adoption of crop varieties, livestock and fish breeds and agro-forestry tree species; providing efficient extension and advisory services, and improving the capacity of communities to use new or existing technologies.		
IV	The County Government will promote diversification of enterprises and livelihoods. This will include incorporation of integrated farming, agricultural and livestock enterprises, pastoral and agro-pastoral production systems based on agro-ecological zones and priorities, agro-forestry and non-agricultural enterprises such as bee keeping, aquaculture/fish farming, cottage industries for gum and resin, tree nurseries and demonstration centres.	Continuous	Departments of Environment, Agriculture, Livestock, Trade, Industry
V	The County Government will invest in enhancement of productivity and profitability of agricultural enterprises. This will entail promotion of use of improved technologies such as e.g. hydroponic technology and ensuring all necessary support for its uptake e.g. through training, seed supply and extension support, use of cold storage, construction of modern fish driers, post-harvest approaches such as improved storage and investments in distribution of agricultural products and market access.	Continuous	Departments of Environment, Agriculture, Livestock, Trade, Industry

STRATEGIC ISSUE 2: VULNERABILITIES DUE TO EXTREME WEATHER EVENTS			
Strategic Goal: Reduced vulnerabilities of farmers and pastoralists to extreme weather events			
Strategic Objective: Institute measures to reduce the vulnerabilities of farmers and pastoralists to extreme weather events			
Mainstreaming Strategies and Guidelines		Timeline	Responsible
I	The County Government will develop and implement systems for early warning and response, and ensure preparedness for extreme weather events. This will involve collaboration with the relevant National	Continuous	Departments of Environment, Agriculture, Livestock, Disaster Risk Reduction

	Government agencies in developing effective early warning systems, producing and disseminating of downscaled weather information on extreme weather events, and the preparation of contingency plans to end drought and flood emergencies, including setting up dedicated disaster response departments.		
II	The County Government will invest in the development and use index-based multi-peril agricultural insurance. This will involve collaboration with private insurance companies in the identification and development of diverse agricultural insurance products, capacity enhancement among actors to support insurance product availability, and the sensitization of product users along the value chains to take up agricultural insurance as a means of risk transfer. Existing and reliable schemes such as the Kenya Livestock Insurance Programme will be promoted.	By 2020	Departments of Environment, Agriculture, Livestock, Trade

STRATEGIC ISSUE 3: VULNERABILITIES DUE TO UNSUSTAINABLE NATURAL RESOURCE MANAGEMENT

Strategic Goal: Enhanced resilience of agriculture systems to climate change impacts through sustainable natural resource management.

Strategic Objective: Mainstream sustainable natural resource management into production systems to enhance resilience of the farmers, pastoralists and fisher-folk.

Mainstreaming Strategies and Guidelines		Timeline	Responsible
I	The County Government will establish baselines and undertake inventory of the existing natural resources that support the agriculture and livestock sector. This will entail reviewing and collating information on existing natural resources and their distribution; undertaking inventory and mapping of natural resources; and developing and maintenance of database for natural resources at County and Sub-County levels.	By 2019	Departments of Environment, Agriculture, Livestock, Forest, Wildlife, Water

II	<p>The County Government will promote sustainable management and utilization of natural resources that support the agriculture and livestock sector. This will involve the development of a framework for sustainable natural resource management. This includes integrated soil health management to include soil testing and nutrient management, soil and water conservation, conservation agriculture; restoration of degraded soils and conservation of soil biodiversity; protection of riparian reserves, wildlife corridors and stock routes; and management of invasive species in cropping and grazing systems (e.g. Prosopis Juliflora).</p>	Continuous	<p>Departments of Environment, Agriculture, Livestock, Forest, Wildlife, Water</p>
III	<p>The County Government will invest in climate smart water harvesting and storage, irrigation infrastructure development and efficient water use. This will entail incorporation of components that enhance resilience such as drip irrigation of crops, non-water intensive aquaculture, non-wasteful livestock watering, agroforestry for soil water conservation, development of water harvesting and storage structures, development of appropriate irrigation infrastructure and technologies including use of clean energy such as wind and solar for pumping irrigation water; and promotion of effective and efficient agricultural water use through spect irrigation for pasture production and drip irrigation for crops, as well as waste water management and recycling.</p>		<p>Departments of Environment, Agriculture, Livestock, Forest, Wildlife, Water</p>
IV	<p>The County Government will promote and support conservation and propagation of germplasm of local/indigenous species with adaptive capacity to the changing climate. This will involve the establishment of in-situ and ex-situ genetic resources conservation areas/centres, the identification of local species of livestock, crop and agro-forestry and fruit tree species that are adaptive and tolerant to adverse weather conditions, and using modern technologies for their breeding, multiplication and field trials and demonstrations.</p>	Continuous	<p>Departments of Environment, Agriculture, Livestock</p>

V	<p>The County Government will invest in research, technology development and dissemination for sustainable natural resource management. This will entail participatory and collaborative research towards development of suitable sustainable natural resource management technologies and innovations as well as technology packaging and transfer to end users e.g. farmer's field schools, exhibitions, demonstrations, exchange visits, ICT, and electronic and print media.</p>	Continuous	Departments of Environment, Agriculture
VI	<p>The County Government will establish and implement mechanisms for resolving natural resource use conflicts including human wildlife conflicts. This will entail the development of mechanisms for identification of potential natural resource conflict hotspots; the profiling of the natural resource conflict hotspots; and the development of mechanisms for conflict resolution, taking into account traditional natural resource management and conflict resolution mechanisms, putting into place inter-county county natural resource management and conflict resolution arrangements and strengthening the same where necessary.</p>	Continuous	Departments of Environment, Agriculture, Livestock, Forest, Wildlife, Water

