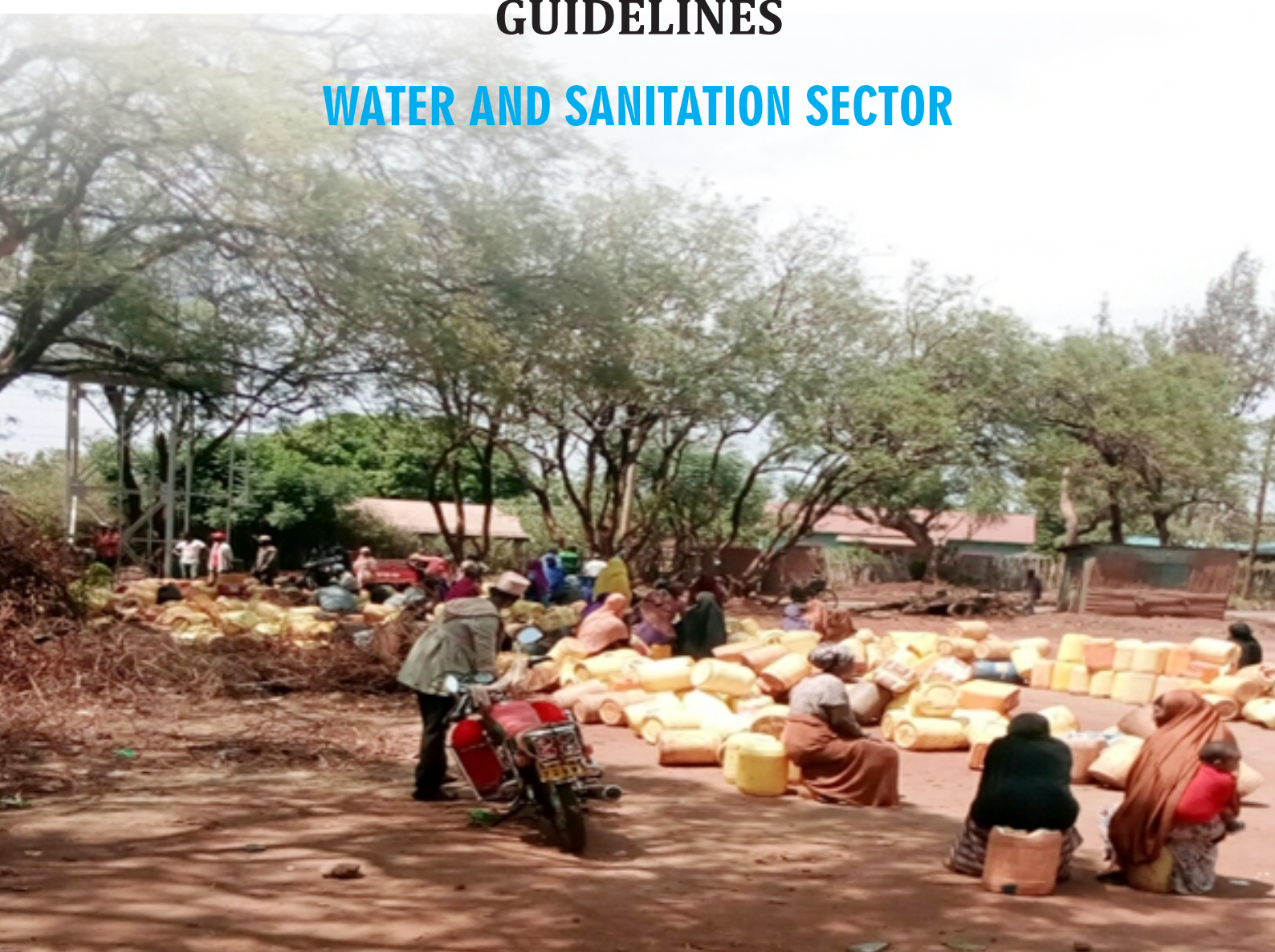




# CLIMATE CHANGE MAINSTREAMING GUIDELINES

## WATER AND SANITATION 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.

**ISAAC P. KALUA PhD, CBS | CHAIRPERSON**  
GREEN AFRICA FOUNDATION

# ACKNOWLEDGMENT

## Hon. CEC Water and Irrigation Marsabit County Government

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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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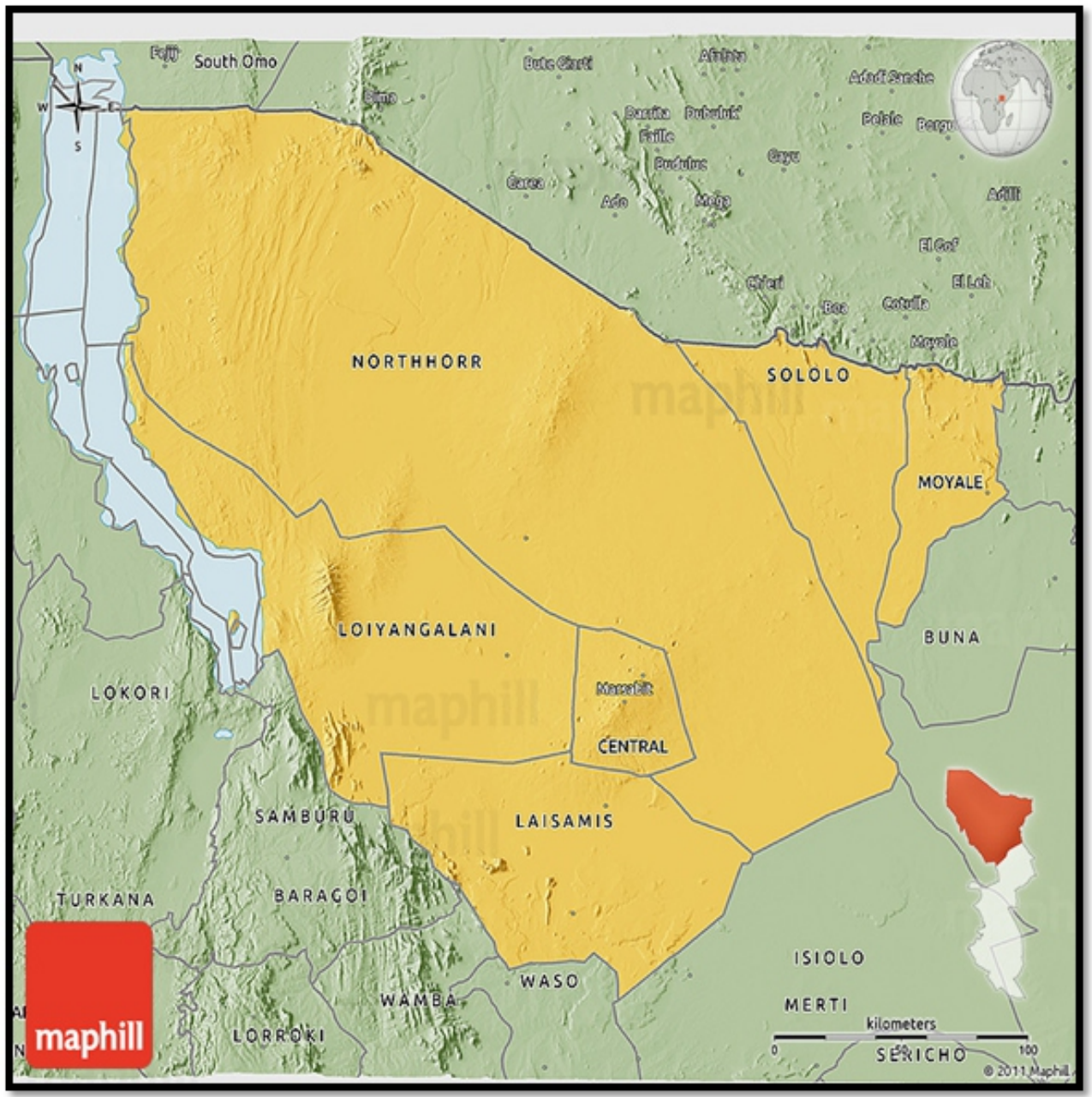
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## 1.0 MARSABIT COUNTY BACKGROUND INFORMATION

### 1.1 Location and Administrative Units

The County of Marsabit is located in northern part of Kenya and has a total area of 70,961.2Km<sup>2</sup> 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

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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 km<sup>2</sup> 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 km<sup>2</sup> in the county with Saku Constituency has the highest population density at 25 people per Km<sup>2</sup>. 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 km<sup>2</sup> 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 750km<sup>2</sup>. 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 WATER AND SANITATION 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

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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 water and sanitation sector by providing a framework for integrating climate change responses for the water and sanitation sector into county planning processes, especially the CIDP, as well as other processes such as performance contracting and the budget making.

## **2.2 Rationale for Climate Change Mainstreaming in the Water and Sanitation Sector**

Kenya is a water-scarce country. The natural endowment of renewable freshwater is low, and water resources are unevenly distributed in both time and space. Climate change will worsen this already precarious situation as it affects the main hydrological components, i.e., precipitation and runoff. This will alter the spatial and temporal availability of water resources. In recent years the Kenya Meteorological Department has attributed the phenomena of floods, increased frequency and severity of droughts, and increased food and water insecurity to climatic changes already being experienced in many parts of the country, especially in the arid and semi-arid lands (ASALs) such as large sections of Marsabit County. The meteorology department has noted that the current climate is characterized by large variability in rainfall with occurrence of extreme events in terms of droughts and floods.

Freshwater resources are already highly influenced by inter and intra-annual rainfall variability, including the extremes of flooding and drought. Climate change may further reduce the availability of this resource through altered rainfall patterns, higher evaporation, lower lake levels, accelerated loss of glaciers and rising sea level. The availability of water resources in Kenya has been decreasing over time as a result of persistent droughts and land-use patterns. The climate scenarios show that rainfall variability and increased evaporation due to higher temperatures will lead to further decreases in the available water. Rising temperatures and changing patterns of rain

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have also exacerbated the problem of disappearing wetlands and have increased food insecurity as a result of reduced crop yield.

Marsabit County being an already water stressed county due to its location in the ASAL zone will experience the impacts of climate change on its water and sanitation sector with greater severity and intensity. Climate change is expected to exacerbate these effects and it is anticipated that the frequency and impact of droughts will continue to increase, hence the need to mainstream climate change considerations into development planning for the water and sanitation sector to enhance the resilience of communities.

### **3.0 RISKS AND IMPACTS OF CLIMATE CHANGE IN THE WATER AND SANITATION SECTOR**

#### **3.1 Drought**

The term drought may refer to a meteorological drought (precipitation well below average), hydrological drought (low river flows and low water levels in rivers, lakes and groundwater), agricultural drought (low soil moisture), and environmental drought (a combination of the above). The socioeconomic impacts of droughts arise from the interaction between natural conditions and human-induced climate change factors such as changes in land use, land cover, and the demand for and use of water. In some cases the frequency of occurrence of droughts is exacerbated by human induced changes in land cover. Excessive water withdrawals can increase the likelihood and impact of drought. Droughts have both direct and indirect consequences for human livelihoods. A direct consequence is crop and pasture loss, which can cause starvation if alternative food sources are not available. Indirectly, water shortages contribute to the spread of disease, because people lack water for basic use and hygiene.

Marsabit County suffers periodic droughts, which have recently become intermittent and grave. In every seven years the county experiences severe droughts, however, regularity of this drought is becoming shorter. For example, unlike other periods, very severe droughts have been experienced in 1981, 1984, 1991, 1996, 1999, 2000, 2002, 2005, 2006, 2007/08, 2010/11 and 2017 with each successive drought having adverse impact than the previous ones. The magnitude, frequency and severity of these hazards have increased over the past decades seriously eroding the productive assets and traditional coping capacities that support livelihoods. This at times leads to over 50 per cent of the population depending on relief food. Due to persistent drought, livestock and human diseases are frequent and development resources are diverted to take care of emergencies arising from these disaster occurrences.

#### **3.2 Water Quality**

Large parts of Marsabit County already suffer from acute water shortage for domestic and livestock use. This is caused by: inadequate and unreliable rainfall, environmental degradation, poor community water management practices, and increase in human and animal population. The most affected areas are those along the mountain areas and the plain areas. This is due to the drying up of the water sources such as Aite and Karantina wells and reduction of water level at Bakuli. The

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county depends on few surface water and underground sources. Most of the boreholes drilled during the drought emergency programme have dried up. The upper regions of the county, including Sololo and Moyale, depend on boreholes at Walda and Dabel which are few and over stretched. Other parts of the county however rely on water boozers which are facilitated by the government and Non-Governmental Organizations.

Climate-related warming of water bodies has implications for freshwater ecosystems, such as changes in water salinity, water nutrient content, concentration of pesticides and other pollutants, salinization of groundwater, water chemistry and pH balance. Climate change, particularly if it is reflected in reduced rainfall as is often the case, would further compound Marsabit County's already strained water resources and lead to inability of the county to meet its people's demand for potable water.

### **3.3 Socio-Economic Impacts**

In addition to its effects on the natural hydrological cycle, climate change is associated with changes in both ground and surface water supply for domestic, agricultural and industrial uses, including irrigation, hydropower generation, navigation and fishing. Hydro-meteorological disasters such as floods and droughts have major effects on food supplies, health, economic and environmental losses, and social upheaval in communities and households. Thus, climate change impacts are complex, they can be both direct and indirect, and they can be a serious threat to achieving poverty reduction, social cohesion and sustainable development.

Empirical evidence shows that there will be changes in the supply and demand of food commodities as a result of low yields resulting mainly from drought and flooding events. The changes will also affect the profitability of agricultural activities including livestock production and the availability of food. The poor are among those who suffer particularly from the effects of water stress due to their vulnerability and inability to adapt.

### **3.4 Water resource conflicts**

A water crisis as a result of climate change will increase the probability of competition between water use sectors and, in the absence of systems regulating such competition, the likelihood of water conflict. Climate change is anticipated to increase conflicts as a result of struggles for water use if increasing supply to meet growing demand for water resources cannot be assured, in addition to other pressures on natural and human systems, e.g. from population growth. In Marsabit County where pastoralism and agro-pastoralism are major economic activities, with pastoral communities migrating in search of water and new seasonal grazing, conflicts over water and grazing fields, and between pastoralists and crop based farmers is likely to rise. Already, water crisis is a major issue in Marsabit County. There are limited water resources that are relied upon by the residents. The scenario worsens during drought period where herders with their livestock concentrate around boreholes. This often leads to competition to access water leading to potential flare ups.

### 3.5 Flooding

For millennia, humans have settled in floodplains in order to till fertile soils, use the flat terrain for settlements, gain easy and safe access to water and use rivers for transport. Whereas riverine floods are natural phenomena that have always occurred, in recent times, humans have become more exposed to flood risk as encroachment into flood plains and lack of flood response plans increase the damage potential. Some parts of Marsabit County such as the Chalbi Desert drainage system experience seasonal flooding during the rainy season. Increased incidences of flooding will adversely affect potable water sources and may also compromise sanitation situation and infrastructure in the county.

## 4.0 STRATEGIES AND GUIDELINES FOR MAINSTREAMING CLIMATE CHANGE IN THE WATER AND SANITATION SECTOR IN MARSABIT COUNTY

<b>STRATEGIC ISSUE 1: VULNERABILITIES DUE TO CHANGES IN TEMPERATURE AND PRECIPITATION PATTERNS</b>			
<b>Strategic Goal:</b> Enhanced adaptive capacity and resilience of communities and water resource users to the adverse impacts of climate change			
<b>Strategic Objective:</b> Institute measures to reduce the vulnerabilities of communities and other water resource users to changing temperature and precipitation patterns			
<b>Mainstreaming Strategies and Guidelines</b>		<b>Timeline</b>	<b>Responsible</b>
I	The County Government will invest in systems for provision of accurate, timely and reliable climate/weather and watershed information through local FM radio stations and other media to inform decisions of communities and other water resource users. This will involve collaboration with national government agencies such as the Kenya Meteorological Department, National Drought Management Authority, Water Resources Management Authority as well as NGOs and other stakeholders to establish, improve, modernize and maintain climate/weather and watershed assessment infrastructure; integration of scientific and indigenous knowledge and skills, and capacity building on weather and watershed data analysis, packaging, dissemination through community radio stations and public forums.	By 2020	Departments of Environment, Water, Sanitation
II	The County Government will establish and maintain inventories for all surface and groundwater resources in terms of quality and quantity. This will entail the identification	By 2019	Departments of Environment, Water, Sanitation

	of the available water from different sources (water supply), the water needs of different users (water demand), and the tools (facilities) to store and/or carry water to the users, as well as water quality, creation of water data bank, establishment of a system to monitor and control boreholes, and strengthening of water and sanitation service providers to effectively undertake their water and sanitation management functions.		
III	The County government will invest on capacity building of water project management committees during and after implementation of each project. That will ensure project ownership and community involvement.		
IV	The County Government will mobilize resources jointly and with other stakeholders e.g. NGOs, national government (GoK) and other stakeholders in establishing drought contingency funds.		
V	The County Government will invest in technologies aimed at reducing non-revenue water and other water vices.		
VI	The County Government will invest in increasing the number and quality of sanitation facilities within the county especially in institutions such as schools, mosques, hospitals, markets as well as community settlements.		

**STRATEGIC ISSUE 2: VULNERABILITIES DUE TO EXTREME WEATHER EVENTS**

**Strategic Goal:** Reduced vulnerabilities of communities to extreme weather events

**Strategic Objective:** Institute measures to reduce the vulnerabilities of communities and other water resource users to extreme weather events

<b>Mainstreaming Strategies and Guidelines</b>		<b>Timeline</b>	<b>Responsible</b>
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 relevant national	Continuous	Departments of Environment, Water, Sanitation, Agriculture, Livestock

	<p>government agencies such as the Kenya Meteorology Department and National Drought Management Authority 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 flooding and drought emergencies, and use of early warning weather and watershed information, including hydrologic cycle predictions, assessment of watersheds and water resource vulnerability due to hydrological cycle changes; and assessment of the potential impacts of climate change on water, waste-water and storm-water infrastructure.</p>		
II	<p>The County Government will invest in climate-proofed infrastructure for water harvesting and storage (including mega dams, pans and roof catchment at household and institutional level), waste water, storm water and sanitation. This will involve developing infrastructure designs and implementing building technologies that can withstand such weather extremes by developing water harvesting, water supply, storm water, waste water and sanitation infrastructure that are adaptable and able to withstand extreme weather events such as excessive precipitation and floods, and use of clean energy such as solar and wind for pumping water for various uses.</p>	Continuous	<p>Departments of Environment, Water, Sanitation, Public Works, Agriculture, Livestock</p>

**STRATEGIC ISSUE 3: VULNERABILITIES DUE TO UNSUSTAINABLE NATURAL RESOURCE MANAGEMENT**

**Strategic Goal:** Enhanced resilience of water resource systems to climate change impacts through sustainable water resource management

**Strategic Objective:** Mainstream sustainable water resource management into production systems to enhance resilience of communities and other water users

<b>Mainstreaming Strategies and Guidelines</b>		<b>Timeline</b>	<b>Responsible</b>
I	<p>The County Government will promote sustainable management and utilization of water resources for increased access to safe, adequate and affordable water for all. This will involve the development of policy/legal</p>	By 2019	<p>Departments of Environment, Water, Sanitation</p>

	<p>frameworks for responsible water use. This includes passing legislation for integrated water resources management entailing water conservation, water harvesting and storage; use of clean energy such as solar and wind for pumping water for various uses, protection of catchment areas and riparian reserves, controlling construction of dams and boreholes at new settlements to reduce pressure on water resources, mapping of water catchment areas and developing legal frameworks for protecting these areas.</p>		
II	<p>The County Government will invest in research, technology development and dissemination of appropriate technologies for sustainable water resource management. This will entail participatory and collaborative research towards development of suitable sustainable water resource management technologies and innovations as well as deployment of existing appropriate technologies for climate resilience in water and sanitation. Examples of such technologies already in use in Marsabit County include Open Data Kit (ODK) that captures sounds and images, as well as use of hybrid solar system in borehole pumping. Wind energy will also be explored as an option for borehole pumping, as well as use of smart card systems in water kiosks to reduce water wastage and loss.</p>	Continuous	Departments of Environment, Water, Sanitation
III	<p>The County Government will establish and implement mechanisms for resolving water resource use conflicts including human wildlife conflict. This will entail the development of mechanisms for identification and profiling of potential water resource conflict hotspots, and the development of mechanisms for conflict resolution, including capacity building and empowerment of Water Resource Users Associations on key issues of conflict management, taking into account traditional conflict resolution mechanisms.</p>	Continuous	Departments of Environment, Water, Sanitation, Agriculture, Livestock



