REPUBLIC OF KENYA

MACHAKOS COUNTY CLIMATE CHANGE ACTION PLAN

2023 – 2027

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FOREWORD

Translating the ambition of the Paris Agreement into action at community level the main goal of the Machakos County Climate Change Action Plan 2023-2027. The county is faced with an accelerating climate crisis ranging from soil degradation, diminishing water resources, increased temperatures leading to water scarcity among others. It is a major challenge of our time and threatens to undermine the gains that have been made over the years. Climate change has put our survival at risk and therefore it is no longer a debatable issue: the time to act is now.

Responding to the global call to action, this Machakos County Climate Change Action Plan plan maps out the key priority areas and enabling actions that the County government, citizens and other stakeholders must take to achieve transformational action to further the achievement of Kenya's development goal of realizing low carbon climate resilient development. The action plan aligns climate change actions with the County Government development agenda; provides a framework for mainstreaming climate change into sector functions at the County level and lastly encourages participation of the private sector, civil society special interest groups (women, youth, persons living with disabilities and marginalized communities).

My focus is on high impact, feasible actions that prioritize adaptation and enhance climate resilience of the citizens of Machakos County. This plan comes to action when the world is still recovering from the Covid-19 pandemic which has affected all the facets of life. My agenda for economic empowerment of Machakos County towards will greatly be enhanced by the climate actions outlined in this action plan.

Climate change has given us ample warnings and signs, and this Action Plan is a statement that Machakos County is determined to work with other responsible stakeholders in the global village to attain to achieve low carbon development.

My government is committed to lead in this quest to take action to combat climate change.

H. E HON. WAVINYA NDETI ODUWOLE
GOVERNOR – MACHAKOS COUNTY

PREFACE

Climate change is a key development challenge that has significant effects on sustainable development in Machakos County and the country at large. Machakos County is faced with an accelerating climate crisis (Machakos County, 2023). Drought, heat stress, diminishing water resources and increased temperatures leading to water scarcity are the most problematic climatic hazards in the County. Citizens of Machakos County are often directly dependent on natural resources to sustain their livelihood with agricultural farming as the principal livelihood employing 73% of the population and contributing 70% of household incomes (Machakos County, 2023). The impact of climate change is already putting stress on these resources. Food shortage, increased food prices and lack of water are just some of the consequences of extreme weather events such as drought and flooding.

Climate change has affected all sectors and all people men and women, youth, persons living with disabilities and children though its impacts are distributed differently among the genders. As such it presents enormous challenges and opportunities for development making it essential for climate change to be tackled in an integrated manner. This County Climate Change Action Plan (the Action Plan) demonstrates how Machakos County intends to address the existing challenges and opportunities and integrating climate change across seven priority actions; working closely with other stakeholders particularly the national government, private sector, academia, civil society among others.

This Plan shall hereby serve as a significant tool for documenting timely, accurate and relevant information on various facets of the Machakos County in order to ensure its sustainable use.

HON. CATHERINE MUTANU
COUNTY EXECUTIVE COMMITTEE MEMBER WATER, IRRIGATION, ENVIRONMENT AND CLIMATE CHANGE

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ACRONYMS

AEZ	Agro Ecological Zone
ASAL	Arid and Semi-Arid Land
CBD	Climate Change Directorate
CBO	Community Based Organization
CCD	United Nations Convention on Biological Diversity
CCCF	County Climate Change Fund
CECM	County Executive Committee Member
COP	Conference of the Parties
CCCAP	County Climate Change Action Plan
CIDP	County Integrated Development Plan
CIS	Climate Information Services
COG	Council of Governors
CSA	Climate Smart Agriculture
EWS	Early Warning System
FAO	Food and Agriculture Organization
FLLoCA	Financing Locally Led Climate Actions
GCF	Green Climate Fund
GDP	Gross domestic product
GHG	Green House Gas
ICT	Information Communication and Technology
KALRO	Kenya Agriculture and Livestock Research Organization
KAM	Kenya Association of Manufacturers
KENHA	Kenya National Highways Authority
KeRRA	Kenya Rural Roads Authority
KFS	Kenya Forest Research Institute
KFS	Kenya Forest Service
KMD	Kenya Meteorological Department
KNBS	Kenya Rural Roads Authority
MCC	Kenya National Bureau of Statistics
M&E	Monitoring and evaluation
MRV	Measurement, Reporting and Verification
MSME	Micro, Small and Medium Enterprise
MTP	Medium Term Plan
NAMA	Nationally Appropriate Mitigation Action National
NAP	Adaptation Plan
NCCAP	National Climate Change Action Plan
NCCC	National Climate Change Council

NDMA	National Drought Management Authority
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
VCA	Value Chain Actors
WASREB	Water Services Regulatory Board
WRA	Water Resources Authority
WRUA	Water Resource Users Association

DEFINITION OF KEY TERMS

Adaptation: Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Adaptive Capacity: The ability or potential of a system to respond successfully to climate variability and change, and includes adjustments in both behaviour and in resources and technologies.

Capacity Building: The process of developing the technical skills and institutional capability to effectively address climate finance within mandates and responsibilities.

Carbon Credits: A financial unit of measurement that represents the removal of one tonne of carbon dioxide equivalent from the atmosphere. Carbon credits are generated by projects that deliver measurable reductions in greenhouse gas emissions, and can be sold or traded through carbon markets.

Climate Change: referred to as global warming, describes the long-term trend of a rising average global temperature or changes in global or regional climate patterns, including changes in temperature, wind patterns and rainfall

Climate Finance: the flow of funds (both domestic and foreign sources) toward activities that reduce greenhouse gas emissions or build climate resilience.

Climate Proofing: Assessing current and future climate risks and impacts, and adjusting investment and business decisions to account for anticipated harm and losses as well as opportunities.

Climate Resilience: Closely linked to adaptation, building climate resilience includes reducing vulnerability to climate change, making sure that the impacts of climate change are avoided or cushioned, and enabling people to respond to climate risks.

Enabling Environment: Robust national and county policy and institutional frameworks to effectively plan, access, disburse, absorb and manage climate funds in a transparent and accountable manner.

Greenhouse Gas (GHG): Any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include, but are not limited to, water vapour, carbon dioxide, methane, nitrous oxide, chlorofluorocarbons, hydro fluorocarbons, hydro chlorofluorocarbons, ozone, per fluorocarbons and sulphur hexafluoride.

Low Carbon Development: A national development plan or strategy that encompasses low-emission economic growth that moves towards a resource efficient economy that is as low-carbon as possible and enhancing carbon sinks.

Measurement, Reporting and Verification (MRV): A term used to describe all measures which countries take to collect data on greenhouse gas emissions, mitigation actions and support, to compile this information in reports and

inventories, report on and verify the results and impacts of mitigation, adaptation and climate finance actions, and the synergies between them.

Mitigation: human intervention to reduce the sources or enhance the sinks of greenhouse gases. Examples include using fossil fuels more efficiently for industrial processes or electricity generation, switching to solar energy or wind power and expanding forests and other "sinks".

Nationally Determined Contribution (NDC): countries national contribution to achieve the global goal of the Paris Agreement.

Natural Resources: Endowments that accrue without the input of mankind.

Public Finance Mechanism: Financial commitments made by the public sector that alter the risk-reward balance of private sector investments, with the aim of mobilising investment in climate change activities.

Results-based Financing: A modality of disbursing finance for payments for projects or interventions conditional to the achievement of previously agreed results.

Sector: a composition of departments, agencies and organizations that are grouped together according to services and products they provide. They produce or offer similar or related products and services, and share common operating characteristics.

Sustainable Development: Development that meets the needs of the present without compromising the ability of future generations to meet their needs.

Tech Transfer: A set of processes covering the flows of know-how, experiences and equipment, mitigating and adapting to climate change among different stakeholders.

Vulnerability: The degree to which a person, community or system is susceptible to, or unable to cope with adverse effects of climate change among these climate variability and extremes.

EXECUTIVE SUMMARY

This County Government of Machakos Participatory Climate Risk Assessment report is organized into six chapters, with the first chapter presenting the background, policy context, purpose/objectives of the Participatory Climate Risk Assessment report and the key steps the department of Climate Change followed in the PCRA process. Chapter two provides a comprehensive county hazard profile, exposure and vulnerability profiles, the differentiated impacts of climate trends differentiated by interest groups with a particular focus on women, youth, persons' living with disabilities, the marginalized and vulnerable groups. It also captures a clear picture of the spatial distribution of climate risk projections broken down into the ecological zones within the county/ward level that links to the main livelihoods and economic sectors in each ward.

Chapter three identifies the future county climate scenarios developed from the climate risk assessment process at the ward level. The exposure and vulnerability of key interest groups is depicted in this section. Chapter four provides an analysis of existing resilience/adaptation strategies to current and future climate risks while chapter five has the county climate strategic adaptation investment/action priorities in a cross-sectoral perspective that aligns the action priorities with the county integrated development plan. It is hoped that the strategic adaptation action shall encourage the mobilization of climate investment.

The priority actions identified through the PCRA process for Machakos County include the rehabilitation of Water Catchments, eco-system rehabilitation including the construction of 174 new earth dams, rehabilitation of 407 earth dams and water pans and construction of 548 weirs/sand dams and support towards the enhancement of micro-irrigation. Household water harvesting, as well as completion/repair and maintenance of abandoned solar powered boreholes, promotion of community irrigation schemes for enhanced diet diversification. The special interest groups will be empowered for better livelihoods through deliberate inclusion of youth, women, persons living with disabilities and the marginalized communities in decision making and development actions tailored to address their climate induced hazards. Other adaptation strategies for include improved water management, recycling and reuse of water, water conservation awareness campaigns, technology for water conservation in water services and supply, and improved watershed management.

The County government department of Climate Change will lead and facilitate the implementation of priority actions identified through the PCRA process working with partners to mobilize adequate resources and develop required laws and regulations. The strategic interventions will be operationalized by both the National and the County Government and its partners through the incorporation

of specific actions in their strategic and operational plans. Capacity development for relevant stakeholders and officers in the relevant national and county departments will be a critical element of implementation. A continuous programme for monitoring and evaluation will be developed to ensure the attendant County Action Plan is reviewed within three years to assess its effectiveness and relevance in dealing with the climate hazards identified in this county PCRA report.

STEPHEN MULEI
CHIEF OFFICER- CLIMATE CHANGE

ACKNOWLEDGMENTS

Development of Machakos County Climate Change Action Plan 2023 -2027 has been a collaborative undertaking. The plan would not have been possible without the support of the Office of the Governor – Machakos.

For their contribution, we thank MI Links Limited who undertook the initial county-level review of climate change situation in the county, the County Department of Water, Irrigation, Environment and Climate Change for facilitating leadership in this process.

Special thanks go to the County Executive Committee Members and Chief Officers for Finance; County Administration; Health; Education; Social Welfare and Infrastructure for allowing their valuable staff to team up with the Climate Change Unit for the PCRA process.

The CECM for Water, Irrigation, Environment and Climate Change together with the Chief Officer for Climate Change for their valuable leadership without which this work would not have been possible. All member of the Technical Working Group, all directors and teams from the department of Water; Environment; Citizen Engagement and all departments for the relentless efforts in mobilization of stakeholders and the all sub county and ward coordinators and Administrators for the zeal to see this project's success.

ENG. DANIEL KYALO
DIRECTOR -CLIMATE CHANGE

CHAPTER ONE

BACKGROUND AND CONTEXT

1.1 Introduction and Back ground

Machakos County covers an area of 6,208.2 km^2 and lies between latitudes 0°45´South and 1°31´South and longitudes 36°45´ East and 37°45´ East. The County is located in the southeast part of Kenya. The prevailing local climate is semi-arid, and the landscape is hilly, rising from an altitude of 1,000 to 1,600 meters above sea level. The County borders eight counties: Nairobi and Kiambu counties to the West; Embu to the North; Kitui to the East; Makueni to the South; Kajiado to the South West and Murang'a and Kirinyaga to the North West as shown in Figure 1 below. The County is largely arid and semi-arid (ASAL), receiving a mean annual rainfall of about 500 mm with variations depending on the altitude.

The County receives bimodal rainfall patterns with short rains in October and December while the long rains from March to May. Temperatures range from 18 to 29 °C (Machakos County, 2015). The long rains are normally received between March to May whereas the short rains are received from October to December. Due to the high temperatures and scarce rainfall, crops and pastures are normally affected by moisture stress, though areas along the Athi River occasionally experience floods.

Land in the County is broadly used for forestry, government reserves, townships, game reserves, agriculture, ranches, industrialization, mining, livestock keeping, housing, and sporting activities (CIDP, 2018) as illustrated in Figure 2. The absence of a county spatial planning framework has led to the proliferation of informal settlements, inadequate infrastructure services, congestion, environmental degradation, unplanned urban centres, pressure on agricultural land and increasing conflicts (CIDP, 2018).

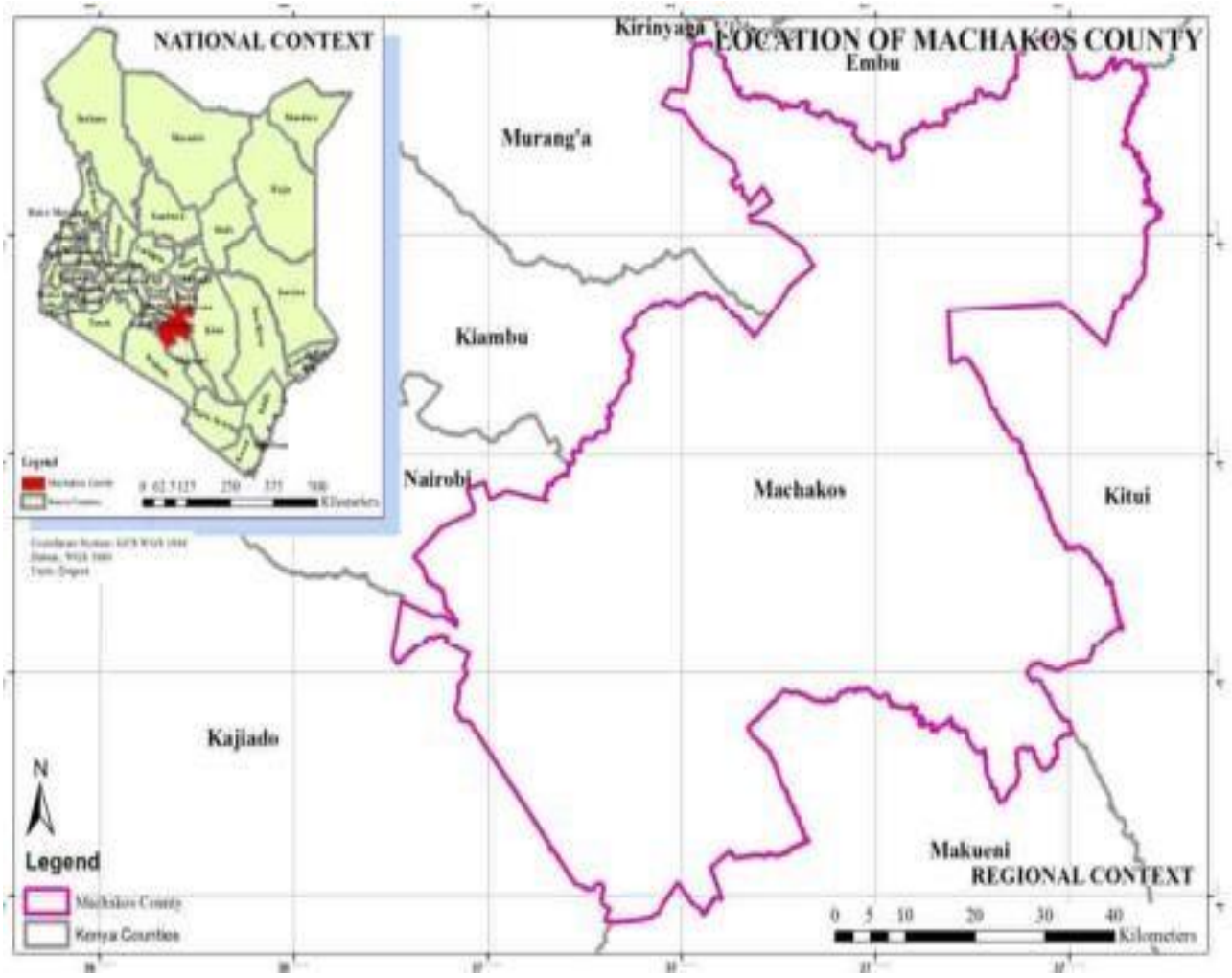

Figure 1 Geographical location of Machakos County

.(Source: CIDP, 2018)

Agriculture is the backbone for the county accounting for about 70% of income for households (Machakos County, 2015). This is despite the environmental and climatic challenges facing the county especially due to extreme weather events such as floods and drought.

1.1.2 Agro-Ecological zones

The County has seven identified Agro-Ecological Zones (AEZs) which are based on the potential for crop production.

Zone UM II-III (Lower Highland -Upper Midland) are forest zones and sub humid characterized by medium to low evaporation, are highly suitable for agricultural activities due to soil suitability.

Zone UM 1V - V (Semi Arid) has medium potential for agricultural activities and production

Zone LM III-V (Arid) characterized by shallow and stony clay loamy soils with rock outcrops and plains covered by grass. These zones have little potential for farming but may be adaptable for livestock farming.

The agro-ecological zones in Machakos County are summarized in Table 1.

Table 1 Agro-ecological Zones in Machakos County

Major agro-ecological zone	**Wards**	**Rainfall**
Lower Highlands (LH) II	Upper Kaewa, Kathiani Central, Mua	Moderate (1000 - 1250mm)
Upper midland (UM) II-III	Machakos Central, Upper Kaewa, Kathiani Central, Kangundo Central, Kangundo East, Kangundo West, Kangundo North, Tala, Matungulu East, Mutituni, Mumbuni North	Moderate (1000 - 1250mm)
Upper midland (UM)IV4	Kalama, Kola, Muvuti/Kiima kimwe, Lower Kaewa, Mitaboni, Kangundo East, Matungulu West, Matungulu East, Matungulu North, Kyeleni,	Low (500-750mm)
Upper midland (UM) V	Athi River, Kinanie, Muthwani, Syokimau/Mlolongo	Low (500-750mm)
Lower Midland (LM) III	Kangundo East, Masii (Parts)	Very low (<500mm)
Lower Midland (LM) IV	Kangundo East, Masii, Mbiuni, Muthetheni, Mwala/ Makutano	Very low (<500mm)

Lower Midland (LM) V	Wamunyu, Kibauni, Ikombe, Katangi, Matuu, Ndalani, Kithimani, Kivaa, Ekalakala, Masinga central, Muthesya, Ndithini	Very low (<500mm)

(Source: CIDP, 2018)

Citizens of Machakos County are often directly dependent on natural resources to sustain their livelihood with mixed farming as the principal livelihood employing 73% of the population and contributing 70% of household incomes (Machakos County, 2015). The impact of climate change is already putting stress on these resources

1.1.3 Purpose and Process of the MCCCAP

The County Climate Change Action Plan (CCCAP) 2021-2026 seeks to align the Machakos County Government development goals with the National Climate Change Action Plan
(NCCAP) 2018-2022 by providing mechanisms and measures to achieve low carbon climate resilient development, in a manner that prioritizes adaptation, and recognizes the essence of enhancing the climate resilience of vulnerable groups, including children, women, youth, persons with disabilities, the elderly, and marginalized and minority communities. The preparation of this MCCCAP had the active participation of 561 women. The categories of vulnerable groups are tabulated in table 2.

Table 2: Vulnerable Groups' Participation in PCRA process

Women		**Men**	
Youth	97	Youth	130
PLWD	29	PLWD	43
Others	435	Others	517
Total	**561**		**690**
Percentage of Participants drawn from vulnerable groups			**58.2%**

1.1.4 Objectives of the County Climate Change Action Plan

The objectives of the CCCAP are to:

- Align climate change actions with the National and County Governments development agenda.

- Encourage participation of the private sector, civil society, and vulnerable groups within society, including women, older members of society, and persons with disabilities, children, youth, and members of minority or marginalized communities.
- Provide a framework for mainstreaming climate change into sector functions at the county level.
- To tap into performance climate finance model for locally led climate actions.
- Support Kenya to achieve its mitigation Nationally Determined Contribution (NDC) targets of abating its GHG emissions by 30% by 2030 relative to the Business as Usual (BAU) scenario of 143 MtCO2eq.

To achieve climate change actions that simultaneously advance economic and sustainable development objectives of the County, CCCAP 2021-2026 is guided by the principles that also guide the implementation of the NCCAP which include:

- **Responsiveness** – responds to actual adaptation and mitigation needs in Machakos County by taking measures to reduce the adverse effects of climate change and prevent or minimize the causes of climate change.
- **Equity and social inclusion** – address the needs of vulnerable groups within the county including women, older members of society, persons with disabilities, children, youth, and members of minority or marginalized communities through an inclusive approach to climate change action.
- **Consultation and cooperation** – implement actions through consultation and cooperation between the National Government and County Governments, as well as consultation and cooperation with civil society and the private sector.

1.1.5 Methodology/Process of Developing the MCCCAP

The development of CCCAP 2023- 2027 has been a collaborative undertaking coordinated by the CECM Water, Environment, and Climate Change, Machakos County Government, the technical working group and other key stakeholders who formed part of the technical working. The team - led and trained by the National Drought management authority- became key Trainer of Trainees (TOT) who spear-headed the Participatory Climate Risk Assessment process at ward level.

The first step in the process began with the forming of a multi-sectoral technical working group (TWG). The multi-sectoral technical working group was identified and formed with representation from the following key stakeholder areas;

- County Department of Climate Change
- County Department of Water

- County Department of health
- County Department of Environment
- County Department of Agriculture
- County Department of Transport and infrastructure
- County Department of Devolution
- Water Resources Authority
- National Drought Management Authority (NDMA)
- Kenya Forestry Services
- Civil Society - Machakos

The National Drought Management Authority offered technical support in the training of TOTs for the Participatory Climate Risk Assessment (PCRA) process. This training was conducted in Mombasa between 16th and 22nd April, 2023. The trained TOTs graduated into County PCRA facilitators and were commissioned to conduct ward level PCRA process and stakeholder engagements in all wards by H.E Hon. Francis Mwangangi – the Deputy Governor of Machakos County and the chairperson County Climate Change Steering Committee (CCCSC).

The Participatory Climate Risk Assessment targeted stakeholders who had been identified through a consultative stakeholder identification and mapping forum conducted by the Technical working group in line with FLLoCA guidelines. The mapped target group for stakeholder engagement at all levels are as per the breakdown presented in table 3.

Table 1: PCRA Stakeholder Mapping

S/No	Department/Agency	Category of stakeholder	Comments
1.	Department of Education	Education sponsors/religious groups	
2.		Representative from Kenya Private School Association	Nominated by umbrella organization
3.		Ward Education Coordinators	Government official from education
4.	Department of Gender and Social Welfare	DEK (Deaf Empowerment Community); GEM (Africa Media Initiative);	Nominated through Red Cross Society of Kenya
5.		Social Welfare Officer	Nominated by the department of gender and social welfare
6.	Department of Environment	A representative from either Kenya Association of Manufacturers (KAM), Sand	Environment to rationalize (NEMA to be co-

		Harvesting Association or Kenya Forestry Services (KFS)	opted in the technical working group)
7.	Department of Devolution	Ward Coordinators	County opinion leaders
8.		Sub-County Coordinators	County opinion leaders
9.		Ward Administrator	Secretary to the ward planning committee
10.	Department of Water	A representative from Water Resource Users Associations	Nominated by WRA
11.		Either one of Ward Water Officer, Sub – County Water Officer/Engineer or representative of the nearest WSP	Nominated by the Department of Water
12.	Stakeholders from Transport and Infrastructure	A representative from MAMAO (Machakos Matatu Owners Association)	Nominated by the umbrella body
13.		A representative from Boda Boda Riders Association	Nominated by the umbrella body
14.		Representation from sub-county engineer's office	
15.	Stakeholders from Department of Agriculture	Either of Ward Agricultural officer or Sub-County Agricultural officer	Nominated by the Department of Agriculture
16.	A representative from Public Health	Community Health Volunteer (CHV)	Identified through the Department of Public Health
17.	Civil Society	A male nominee from Civil Society	Nominated by the umbrella body
18.		A female nominee from Civil Society	
19.	Kenya Meteorology Department	Rain gauge readers and those trained in reading	Identified through KMD
20.	The other stakeholders come from the ward climate change planning committee.		

Mobilization of the stakeholders for the PCRA process was done through the county department of devolution in consultation with area leaders and the county coordinators. They ensured that the trainees met the threshold of at least 50% representation for women and marginalized groups.

The approach adopted for the county PCRA process included a four day seminar with stakeholders per ward with ten (10 no) of TOT teams concurrently managing training and data collection programmes in 10 wards per week. The ward based PCRA process kicked off on the 2nd May, 2023 in Yatta and Masinga Sub-Counties and ended on Saturday 20th May in Machakos and Mavoko Sub Counties. The PCRA process culminated in the development of PCRA reports in every ward which have proposed climate change interventions/actions per ward and the same are annexed into this report.

Secondary data sources were also reviewed and used to complement the findings from primary data collection. These sources included relevant International, National, laws, and County laws and regulations including:

- The Climate Change Act (2016)
- The Constitution of Kenya (2010)
- National Climate Change Action Plan (NCCAP) 2018-2022
- Kenya Vision 2030 (2008) and its Medium-Term Plans
- National Climate Change Response Strategy (2010)
- National Adaptation Plan (2015-2030)
- Kenya's Nationally Determined Contribution (NDC) (2016)
- Kenya Climate-Smart Agriculture Strategy (2017-2026)
- Climate Risk Management Framework (2017)
- National Climate Change Framework Policy (2018)
- National Climate Finance Policy (2018)
- The Environment Management and Coordination Act 1999 (Amendment - 2015)
- The BETA approach

The County legal and regulatory frameworks reviewed include:

- Machakos County Climate Change Bill of 2020
- Machakos County Climate Change Finance Draft Regulations (2019)
- The Machakos County Sand Harvesting Act of 2014
- The Machakos Agricultural Development Fund Act of 2014
- The Machakos Water and Sanitation Board
- Machakos County E-Waste Management Act of 2015
- Machakos County Management of Quarrying Act of 2016
- Machakos Sand Harvesting Act of 2014
- Machakos County Water Policy of 2018
- Machakos County Annual Development Plan 2020-2021
- Machakos County Public Participation Act of 2014

Other important literature sources were the County Integrated Development Plans (CIDP 2018-2022 and draft CIDP 2023 - 2027), County Fiscal Strategy Paper 2023,

information collected from County departments, and other relevant reviewed data originally collected for other research purposes.

The department appointed a technical committee for compiling the Climate Change Action Plan 2023 – 2027. This technical committee walked alongside the PCRA trainers, receiving the PCRA reports to develop the draft Climate Change Action Plan 2023 – 2027.

The draft Climate Change Action Plan 2023 – 2027 was validated in a multi stakeholder forum held on 25th May, 2023 in Nairobi and presented to the cabinet for approval on 29th May, 2023.

1.2 Underlying Climate Resilience Context

The County Climate Change Action Plan (CCCAP 2023- 2027) presents comprehensive actions that Machakos County Government will undertake to address climate change, during the period 2021-2026. Kenya continues to experience unprecedented increased extreme climate events due to climate change (NCCAP 2018-2022). These climate events have led to the loss of lives, diminished livelihoods, reduced crop and livestock production, loss of biodiversity, and damaged infrastructure, among other adverse impacts. The interaction between increase in temperature and precipitation because of climate change is likely to result in the loss of arable land due to decreased soil moisture, increased aridity, increased salinity, and ground water depletion (Omoyo, et.al,2015).

Machakos County is not categorized as an Arid and Semi-arid area (ASAL) and though its highly susceptible to climate change-related hazards such as drought and floods, which have caused considerable reduction in crop yields. The effect of these devastating extreme weather events has put the lives and livelihoods of many people within the county at risk; and has affected the economy and environment. Climate change is therefore a significant threat to the current and future development of Machakos and Kenya at large, and this may hamper the attainment of Kenya's development agenda. Additionally, Climate Change will affect the attainment of the Machakos CIDP due to continued negative effects on the economy due to events such as increased periods of drought, erratic rainfall, and an increase in temperatures leading to low agricultural productivity.

Machakos County has made significant progress in addressing the threats posed by climate change. Key among these milestones is the development of the Machakos County Climate Change Act (2021) and the Machakos County Climate Change Fund Regulations (2021). The regulations obligate the setting aside of at least 3% of the annual development budget of the county to climate change action which is meant to; (a) give effect to priorities set by communities following a

community-driven participatory planning process; (b) strengthen the role of communities, community structures, and indigenous knowledge systems in the planning of climate change response interventions; and (c) invest in public goods and structures to strengthen adaptation to climate change.

Development of the MCCCAP 2023-2027 is guided by the Climate Change Act, 2016 provides for the development of National Climate Change Action Plans (NCCAPs) to prescribe measures and mechanisms to mainstream adaptation and mitigation actions into sector functions of the National and County Governments. Section 19 of the Climate Change Act, 2016 provides that County Governments shall integrate and mainstream climate change actions, interventions, and duties set out in the Act and the NCCAP into various sectors. Further, the County Governments are required to mainstream the implementation of the NCCAP while developing, updating, and approving the County Integrated Development Plans (CIDPs) and the County Sectorial Plans, while considering both national and county priorities.

In compliance with this requirement, Machakos County Government through the CECM Water, Environment, and Natural resources is developing this CCCAP to guide climate change-related affairs in the County. The County has also established a climate change unit to integrate NCCAP 2018-2022 into strategies and implementation plans, and to report to the Council on an annual basis on performance and implementation.

This CCCAP 2023-2027 guides the climate actions of the Machakos County Government to enable the County transition to low carbon climate-resilient development which emphasizes on:

- **Sustainable Development** – Achieving sustainable development is at the forefront of all climate actions; climate change and development are intricately linked.
- **Adaptation** – Reducing vulnerability to avoid or cushion the impacts of climate change, and to enable people to respond to climate risks by moving toward a climate resilient society.
- **Mitigation** – Taking actions, where possible, to encourage greenhouse gas emissions that are lower than business-as-usual practice; and to reduce the human causes of emissions by moving toward a resource-efficient economy.

1.2.1 Impacts of Climate Change

Machakos County is vulnerable to the impacts of climate change with highest incidence of poverty is found among female headed households as women and

men experience greater competition over resources, and lower access to basic infrastructure such as potable water, electricity, and clean cooking facilities. The County economy is highly dependent on climate-sensitive activities. Emerging cross- county conflicts on water and grazing land with Kitui and Kajiado counties may be exacerbated by climate change due to competition for the already scarce resources.

Drought spells have become more prolonged in the recent past. This has resulted in frequent crop failures over the years, aggravating the already dire need for food aid. In 2011, 1,876 families received relief food in Yatta Sub County due to drought whereas, in 2015, more than 50,000 people faced hunger also due to drought (Machakos, 2016). Due to the adverse effects on the agriculture sector, people have opted for some deleterious coping strategies such as sand harvesting, which lessen their resilience capacity. The frequency and magnitude of these extreme weather events are likely to increase, necessitating measures that can sustainably cushion the farmers and pastoralists from the climate disasters.

Flash flood events in Machakos County have led to the loss of human lives. These are very common in Tala, Matungulu West, and Athi-river wards. The devastating floods in early 2018 claimed over 183 lives and displaced more than 225,000 people in the country and Machakos County was adversely affected (MoALF, 2017). The incidences of floods lead to disease outbreaks in Machakos with cholera and other water-borne diseases affecting the population in Mwala, Mavoko and Machakos sub counties. These also lead to an upsurge of mosquito-borne diseases such as malaria.

Overall, in Machakos, at least 840,000 residents are food insecure while an estimated 500,000 people do not have access to water. Hundreds of children in the county suffer from malnutrition, and school performance has dropped significantly.

1.2.1.1 Social/Economic impacts

Climate is a major driver of socio-economic activities in Machakos County. The sectors which depend on weather and climate information include; agriculture, water, construction, energy, trade and manufacturing, energy, health, and forestry. Citizens of Machakos County are often directly dependent on natural resources to sustain their livelihood with mixed farming as the principal livelihood employing 73% of the population and contributing 70% of household incomes (Machakos County, 2015).

The county's key economic activities include: subsistence agriculture, livestock keeping, trade and industrialization, mining/quarrying, housing, and urban development. According to the CIDP 2018-2022, the absence of a county spatial planning framework has led to the proliferation of informal settlements, congestion, environmental degradation, unplanned urban centres, pressure on agricultural

land, and land-use conflicts. These challenges coupled with extreme weather events due to climate change such as floods and droughts have caused a negative impact on the economic performance of the County.

The costs that are incurred to respond to the climate change effects are high. The four wards of Athi River, Muthwani, Tala and Mlolongo/Syokimau that are prone to flooding, the economic impacts of floods are moderately severe as they wipe out resources worth millions of shillings as witnessed in 2018/2019. Roads and infrastructure were damaged, seasonal crops destroyed and livestock drowned.

In Machakos County, droughts have had the greatest economic impact due to the suppressed production of crops and adverse effects on livestock production. Drought also leads to depressed hydroelectricity generation, which consequently increases demand for electricity generation from thermal sources that are more costly and produce GHG emissions. The impacts of drought are felt at the household level and are particularly devastating for smallscale farmers and women who depend on rainfall for livelihoods.

Water: The quantity, quality and accessibility of water are strongly influenced by weather and climate. Drought was the most rampant hazard identified by the PCRA in Machakos County. This implies that the county is more at risk from water scarcity rather than an excess of water.

Agriculture: Subsistence agriculture is the backbone for the county accounting for about 70% of income for households (Machakos County, 2015). This is despite the environmental and climatic challenges facing the county especially due to extreme weather events such as floods and drought. Approximately 60% of total land area in Machakos is arable. The main cash crops are coffee, mangoes, citrus, French beans, pineapples, flowers, sorghum and vegetables. The food crops grown include maize, beans, pigeon peas, green grams, cowpeas and cassava which are cultivated in small scale. Women were identified as the most involved in subsistence agricultural farming and providing water for domestic use.

Fruit farming is a key source of livelihood for the county with 5593 Ha under Mango with a production of 67,320 metric tonnes per year. This sector suffers challenges of post-harvest losses and price depreciation. The PCRA proposed value addition and produce aggregation centres.
When agriculture is affected by climate change, it is therefore women, children and PWD who suffer the most.

Livestock farming: The County has 13 Ranches 3 of these are located in Machakos Sub- County while ten (10) are in Mavoko Sub- County. The livestock in these ranches include cattle, sheep and goats. The PCRA process identified that access and control of livestock rests entirely with the men while women provide the labour for livestock keeping. The vulnerable groups (Women, children and PLWDs) are not

able to access livestock resources as an adaptation tool for addressing their climate vulnerability.

Trade: The County plays host to the open-air market concept with major market days where farm produce is traded. Commodities sold in these markets include fruits, vegetables, maize and beans. Women form the majority of those involved in small service industry with such ventures as salons, hotels and road side kiosks. Vulnerable groups within the county also derive their livelihoods from unskilled employment.

Mining and Industry: The PCRA identified major natural resources/mineral deposits within the County as limestone, granite and sand. The county hosts major cement and steel factories within Mavoko Sub- County. Sand harvesting was identified as a major source of livelihood in the five wards of Masinga and Ndalani ward in Yatta Sub County and Kalama Ssub County. The activity is rampant along the river beds and is undertaken by the youth including male children (14 – 35 years of age). In addition, there are stone mining quarries mainly within Mavoko, Matungulu, and Yatta sub counties.

Energy: Energy systems drive economic and social development. Firewood and charcoal are the most common sources of energy accounting for 81% of total energy used in Kalama sub county; 82.4% in Kangundo; 83% in Kathiani; 83.2% in masinga;73.1% in Yatta at 83.3% in Mwala and in Matungulu 62%. The county average use of wood fuel sources of energy reached 53.4% with Machakos Town at 42% and Athi River at a low of 6.7% (KNBS, 2019). Approximately 27% of households use paraffin lanterns for lighting despite the high cost of kerosene (CIDP 2023-2028). The choice of energy sources affects the rate of green transition for Machakos County where women and children provide labour for looking for firewood and cooking which is hindrance to efforts to increase vegetation cover and other tree growing initiatives.

Health: Temperature and rainfall conditions influence the spread of communicable diseases. This PCRA report illustrates that pollution of the Athi River was a key risk for all the wards along the length of the river and that stakeholders identified the health risks associated with use of the water from the Athi river on their health, that of their livestock and crops.

Other livelihood activities within the county include minimal apiculture and tourism.

1.2.1.2 Environmental Impacts

The PCRA process identified drought is the most predominant disaster affecting the county. The second was described as environmental degradation and challenges which comprise of inadequate solid waste management systems, insufficient sewerage networks, raw waste water discharge to rivers, air pollution, underground water sources contamination, unregulated sand harvesting, ecosystem degradation, flooding, and deforestation. These challenges arise due to conflicting

demands for resources; increasing population, change in land-use patterns and climatic conditions, high industrialization and urbanization and emissions of greenhouse gases.

Deforestation leads to desertification and this is one of the major threats facing Machakos County. Machakos County is the largest exporter of sand to the other counties. Rampant sand harvesting in the county has resulted in drying up of some of the rivers, leading to a reduction in a substantial amount of water in the County. The majority of the population relies on firewood and charcoal as the main source of fuel which is a major cause of desertification. Additionally, farming on slopes has resulted in the destruction of forests and water catchment areas, leading to desertification (Boitt, M.K and Odima, P.A, 2017).

1.2.1.3 Water Resources

The county has two permanent rivers –Tana and Athi traversing through that provide water for hydroelectric, industrial, domestic and irrigation. Other sources of water include streams, shallow wells, boreholes, small earth dams, springs and domestic water harvesting interventions such as tanks and farm ponds. According to the Machakos County Integrated Development Plan (CIDP) 2023 -2027 the percentage of households with access to clean safe water reached 45%. To increase this ration to 60% within the life span of the current planning cycle the county government plans to construct weirs so as to leverage the available sources of water including 453 seasonal rivers and streams.

Athi River is a main water source that would aid the county residents in coping with climate induced water scarcity, however among the stakeholders from Athi River, Kyeleni, Kithimani, Mbiuni, Wamunyu, Katangi and Kibauni wards pollution of the Athi river was identified as their main climate induced risk.

Drought induced water scarcity in Machakos can be classified into three: scarcity of water for domestic use, livestock and for agricultural use. During the PCRA stakeholders in Yatta, Masinga, parts of Mwala and Kalama sub counties identified the drought induced risks of crop failure and lack of water for domestic and livestock use. In Kangundo and Matungulu Sub Counties crop failure was the main drought induced risk.

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. Food shortage, increased food prices, and lack of water are just some of the consequences of extreme weather events such as drought and flooding.

1.2.2 County Climate Hazard

The Climate in Kenya has changed significantly over the past few decades. According to the Fifth Assessment Report of the Intergovernmental Panel on

Climate Change (IPCC), the surface temperatures across Africa have increased by 0.5-2°C over the past 100 years, and from 1950 onward climate change has changed the magnitude and frequency of extreme weather events. The frequency of cold days and nights has decreased; while hot days and nights, and heat waves have increased. The rainfall patterns have shifted with the long rainy season becoming shorter and drier, and the short rainy season has become longer and wetter. The overall annual rainfall remains low. The frequency of rainfall events causing floods in the country has increased.

Machakos County climate has equally been affected especially since it is an ASAL area. An assessment of past climate data in the county reveals a significant change in the weather conditions over the last few decades which is a confirmation that climate is indeed varying. Machakos County receives bimodal rainfall with short rains in October and December while the long rains from March to May. The rainfall range is between 500mm and 1250mm, which is unevenly distributed and highly unreliable due to influence by altitude. The high-altitude areas such as Mua, Iveti, and Kangundo receive an average rainfall of 1000mm while the lowland areas receive about 500mm. Temperatures vary between 18°C and 29°C throughout the year (Gichangi et al., 2015). Literature findings reveal that between 1980 to 2005, there was a steady increase in temperature in both the first and second seasons. Rainfall levels have declined where in the first season, the average rainfall is about 25 mm.

During the stakeholder consultations conducted, most of the county residents reported remarkable changes in the county climate. According to the stakeholder, droughts are now more frequent and prolonged, and the rains have reduced and have become more erratic and unpredictable compared to the situation in the 1980s. It was observed that, the long rains that used to start in March and end in June, now start in late April. The short rains which used to start in October now start in November and end in December. Analysis of long-term temperature data from Katumani weather station indicates a high year-to-year variation in annual mean maximum and minimum temperatures in the county (Gichangi et.al 2015). The period from 2000–2011 was the warmest period with 2010 being the single hottest year in Machakos County. There has been a general increase in maximum temperature by 1°C and 0.3 °C for minimum temperature. Low rainfall and high temperature form the highest sources of vulnerability leading to major climate risks.

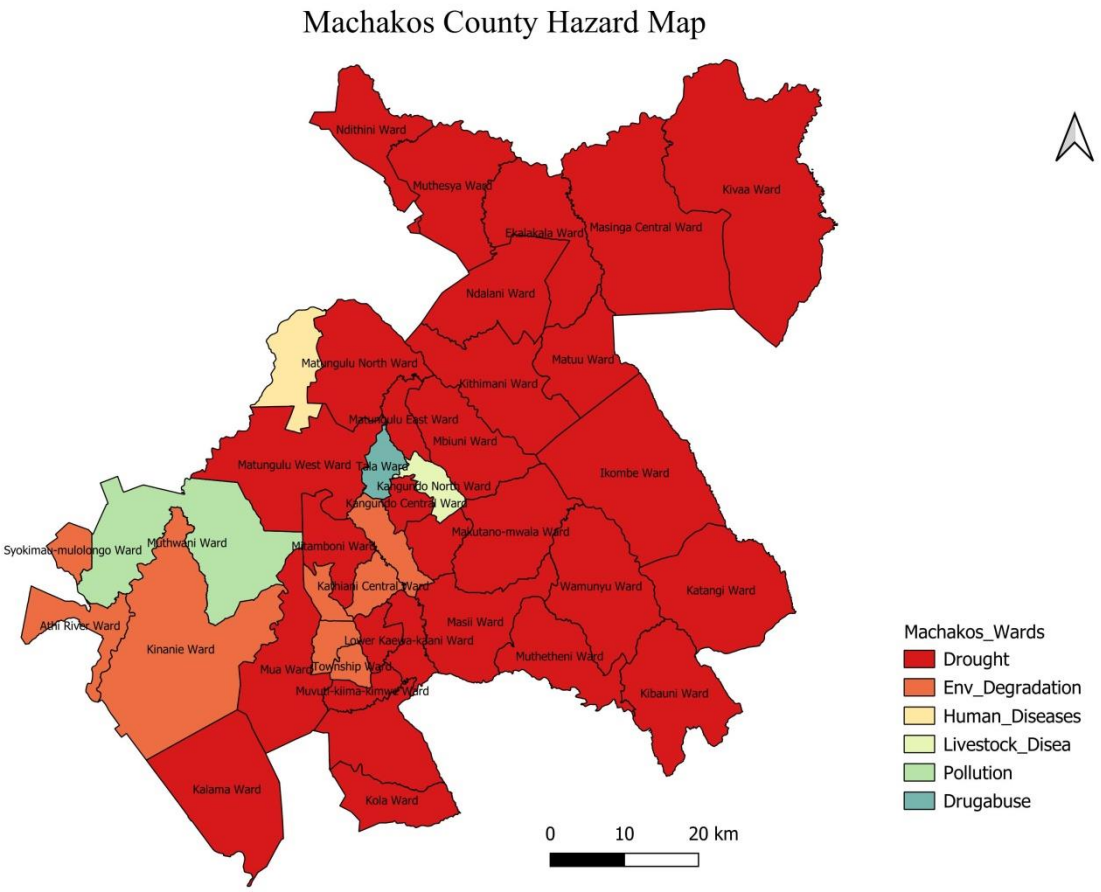

Figure 2 County Climate Hazards Map

1.2.3 Differentiated exposure of the Various VMGs to Climate Hazards

Drought is the prolonged dry spell/ period caused by delayed onset of rainfall, low unreliable rainfall and deforestation. Lack of rainfall results into hunger (food insecurity), thirst, high temperature, body weakness, animal emaciation and low milk production in livestock. The warning signs of drought in the county include: immigration of birds, shedding of leaves in some trees or failure to grow /stunted growth of some plants and non-flowering of others.

The forewarning period is normally 3 months and the speed of onset is usually slow ranging between 4-5months. The frequency of drought in Machakos is annually in the months of January-February and June-September.

Among elements at risk of drought hazard are human elements among these women, children under five years of age, the youth, the aged and persons with disability. Other elements are productive assets of livestock and farms/farmlands as well as critical infrastructure in such facilities schools, health centres, roads, market centres, water and sewer infrastructure etc.

Environmental degradation is the destruction of the surrounding due to either natural or human related causes which include overgrazing, overstocking, deforestation, poor farming methods, bricks making, rainfall failure, murram

extraction and poor soil conservation measures. The forces associated with environmental degradation include hunger, death of livestock, desertification, and poor infrastructure. The warning signs are gully formation, decreased vegetation cover, high temperatures, livestock diseases and increased wind storms. The forewarning for environmental degradation hazard is two months and the speed of onset is medium speed and occurrence is continuous.
The causes of this hazard include over grazing, overstocking, poor farming practices, bricks making rainfall failure, murram extraction, poor soil conservation measures.

During the PCRA process 55% of wards reported pests and diseases as climate hazards and the same were presented as crop pests and diseases (22 wards), livestock diseases (18 wards) and human diseases (15 wards) respectively.

1.2.3.1 Women

The PCRA exercise found women to have a high level of vulnerability to identified hazards. The reason for their vulnerability emanates from the key roles of women in the county that include fetching wood fuel, collecting water, tending to livestock, tilling the land and caregiving roles. The PCRA used various tools among them access and control, the gender daily calendar and wealth ranking exercise which potrayed women were more vulnerable due to existing gender inequalities, unequal power relations and structures, discriminatory laws and customs, and unequal access and control of resources.

Drought further compromises the hygiene situation for girls and women in that the little water available is used for drinking and cooking which also implicates women's time management of household chores. Some women due to stress induced by climate hazards are lured into risky behaviors among these drug and substance abuse and prostitution especially in the urban centres of Mulolongo/Syokimau, Matuu and Masii Wards further comfounding the fight against HIV/AIDS within the county.

1.2.3.2 Children Under 5 Years

Children were identified to have a high level of vulnerability to hazards due to their location and dependence on their care givers for their survival and health needs. Children suffer malnutrition, low immunity and poor health during climate events among these drought and floods.

1.2.3.3 Youth

Youth in the county were found to have a moderate to high level of vulnerability to drought, livelihoods disruption and environmental degradation hazards. Climate insecure youth within Masinga, Yatta and Matungulu sub counties tend to drop out of school, are more exposed to child labour, early marriage and teenage pregnancies. Tala and Kalama wards identified drug and substance abuse as

serious risks affecting the youth. The main reason for which youths are affected is that they are providers for other groups of people. Youth also own assets and businesses as such when their livelihoods are disrupted, they are directly affected.

1.2.3.4 The Elderly

The elderly (60+ years) are mainly located within the home setting/community and are dependent on youthful family members. The level of vulnerability for this group was found to be high. The aged lose their independence as they age leaving them vulnerable to loss of assets, lack of social security, and stress due to abandonment, poor health and death.

1.2.3.5 Persons Living with Disability

The population of persons with disability reached 33,000 persons accounting for 2.32% of the total population of Machakos County (KNBS, 2019). PWD have a high level of vulnerability to climate induced stress due to their dependent nature, are neglected, and are susceptible to suffer poor physical and mental health as alluded in the PCRA reports for Lower Kaewa, Mavoko and Machakos Sub Counties. PWDs also suffer stigma, malnutrition and difficulties in movement due to inaccessibility and poor infrastructure.

Further women, children, the elderly and persons living with disabilities are more exposed to the climate risks hence compromising on their coping capacities. The vulnerable groups do not have equal access to and control over most resources at the household level such as land due to patriarchal society that bars women and children from owning family assets. This PCRA report recognizes the role of these groups in the development of climate adaptation/resilience actions crucial for the attainment of county climate goals.

1.2.3.6 Productive Assets

Livestock and farms were productive assets found to experience a very high level of vulnerability during the PCRA exercise. In Masinga and Yatta Sub Counties all wards identified livestock diseases as hazards affecting their livelihoods due to poor animal husbandry. Farm lands are affected by soil degradation and invasion of livestock for pasture.

1.2.3.7 Critical facilities

Climate events affect critical infrastructure in different ways; schools have medium level of vulnerability as these may be left unused by learners during drought. Health care centres have a high level of vulnerability as these get congested due to spread of human diseases. Road networks have low level of vulnerability and may be washed away by floods in Tala, Athiriver, Muthwani and Kinanie/Mathatani Wards.

The differentiated impacts of climate change for different VMGs are as listed in table 54

Table 2 Differentiated Impacts of Climate Risks

Hazard	**Vulnerable/ Marginalized Group**	**Climate Risk**
Drought	Women	- Greater water resource scarcity for household chores Decreased capability to develop alternate water sources due to - compromised hygiene situation - Heavier disease burden, and limited access to quality health care due to their care giving roles - Increased exposure due to use of (fossil fuel)firewood/ charcoal for cooking & Lighting - Loss of livelihoods – womens small businesses (MSMEs) are unable to break even or stay afloat) -Increased cost of food items leading to food insecurity -family disintegration due to GBV
	Children under 5 years	-Increased incidences of water borne diseases - Malnutrition -Accidents when thirsty children drink harmful liquids
	Youth (Female)	-Existing gender inequalities -unequal power relations and structures -discriminatory laws and customs, -unequal access to and control of resources. -Teenage pregnancies -School drop out -Child labour Drug and substance abuse and other social vices
	Youth (Male)	-School drop out -Child labour

		-petty crime -drug and substance abuse and other social vices
	The Aged (60+)	-Neglect -Hunger -Degenerative /old age diseases -Psychological trauma due to loss of independence
	PWD	Stigma . They lack balanced diet Tend to have limited access to health care Low income Low immunity
Environmental Degradation	Women	Women look for firewood and therefore face greater resource scarcity, - Increased exposure to ill health due to use of (fossil fuel)firewood/ charcoal for cooking & Lighting - Food insecurity -
	Children under 5 years	Malnutrition Increased incidences of water borne diseases
	Youth (Female)	-School drop out -Child labour Drug and substance abuse and other social vices
	Youth (Male)	School drop out -Child labour -petty crime -drug and substance abuse and other social vices
	The Aged (60+)	-Neglect - Hunger -Degenerative /old age diseases -Psychological trauma due to loss of independence
	PWD	Stigma . They lack balanced diet Tend to have limited access to health care Reduced income Reduced immunity
Pests and Diseases	Women	- Loss of livelihoods – womens small businesses (MSMEs) are unable to break even or stay afloat) -Increased cost of food items leading to food insecurity -family disintegration due to GBV

	Children under 5 years	Malnutrition
	Youth (Female)	Prostitution Teenage pregnancies
	Youth (Male)	Loss of livelihood Petty crime
	The Aged (60+)	Degenerative /old age diseases Hunger Malnutrition
	PWD	They lack balanced diet Low income Low immunity

Other climate vulnerable livelihoods include *Households that depend on rain fed agriculture for livelihoods and Micro, Small and Medium Enterprises (MSMEs)*:

This CCCAP therefore makes major strides in recognizing the role of women in environmental conservation which is crucial towards attaining environmental sustainability.

1.2.4 Climate Exposure and Vulnerability

Low rainfall and high temperature form the highest sources of vulnerability leading to major climate risks for Machakos County. The PCRA process found drought, environmental degradation and pests and diseases to be the most prevalent hazards for Machakos County. The effect of these hazards include: water scarcity and poor water quality, food insecurity, flash floods, soil erosion, reduced soil fertility, increased incidences of pests and diseases and environmental degradation and loss of bio diversity.

Table 3 Climate Exposure and Vulnerability

Sector	**Hazard/ Climate Risk**	**Vulnerable Group(s)**	**Sources of Vulnerability**
Water	Drought/ inadequate water availability	Women, Children, PLWDs, the Youth and the elderly	-Rising temperatures -Uncertain changes in rainfall patterns - Water pollution -Potential for human wildlife conflict -Declines in school attendance, and rising dropout rates.

			-Disruption of access to work to education centres -Increased levels of unemployment among youths -Drug and substance abuse -Damage to water infrastructure eg breaching of earth dams and damage to pipelines
Environment and Natural Resources	Environmental degradation, including loss of forest cover, quarrying and sand harvesting	Women, Children, PLWDs , the Youth and the elderly	-Greater risk of extreme climate events (droughts, floods, and landslides) -Rising temperatures -Uncertain changes in rainfall patterns -Loss of biodiversity -Decline in forest productivity due to low rainfall and high temperatures -Increases in invasive species, and a resurgence of new pests and diseases - Increase in air pollution -Increased exposure to forest fire, pathogens, and invasive species -Reduced environmental resources and benefits -reduced forestry associated economic activities eg bee keeping
Health	-Heavy disease burden, and limited access to quality health care, particularly in rural climate vulnerable	Men, Women, PLWD, children and the elderly	-Rising temperatures -Increased pests and diseases -Flooding - pollution

	communities - Inadequate access to nutritious food		
Agriculture	-Crop Pests and Diseases - Livestock diseases -Poor farming practices	Women, PLWD, children and the elderly Women, Children, PLWDs, the Youth and the elderly	-Rising temperatures -Uncertain changes in rainfall patterns -Water scarcity -Poor land-use planning -Loss of soil fertility - High reliance on rain-fed agriculture -Insecure land tenure and -land fragmentation
Roads	Poor road network	Women, Children, PLWDs and the elderly	-Damage to infrastructure, including roads and bridges due to floods. -Interruptions to the road, networks, because of flooding and heavy rainfall events -Disruption of access to work, markets, education, and healthcare facilities, due to damaged infrastructure and transport services -Increase in risks from the collapse of buildings, declining health of buildings, and loss of value, due to more frequent and heavier rain events, and encroachment of water catchment areas

Manufacturing	Pollution	Men, Women, Youth, PLWD, Children and the elderly	-unresponsive policies and legislation - Greater resource scarcity, such as water and raw materials. -Greater risk of plant, product, and infrastructure damage -supply chain disruptions due to extreme climate events -Higher operation costs for companies
Tourism	-Drought -Ecosystem degradation through encroachment of wildlife corridors and parks	Men, Women, Youth, PLWD, Children and the elderly	-Tourist facilities are affected by reduced availability of water, -potential for loss of biodiversity and species extinction

1.3 Over view of Climate Change Actions in the County

1.3.1. Mainstreaming NCCAP in County Actions

Machakos County Government has made some progress by undertaking actions aimed at reducing climate change-related vulnerabilities and build the County's adaptive capacity as identified in the NCCAP. Key among these actions include the integration of climate change in the Machakos County Integrated Development Plan (CIDP) 2023-2027 .

The development of this MCCCAP (2023 – 2027) is a further indicator of the county's commitment to contribute towards the development of the NCCAP (2023 – 2027) by operationalizing the proposed climate actions. The county is also committed to working with other counties in the SEKEB region to give consolidated input towards the development of the NCCAP (2023 -2027).

1.3.2 Climate Change in CIDP

The SDGS are supported in the Machakos County Integrated Development Plan (CIDP) 2023 - 2027 as summarised in Table 4.

Table 4 County Progress in Supporting the NCCAP 2018- 2022

No.	CIDP Sector	Key Programmes/Projects/Policies Prioritized in the CIDP
1.	Agriculture and Food security	• Increasing land under cultivation through the free tractor project • Free seeds project • Extension services • Free chicks' program • Livestock feed and nutrition information system • Value addition of farm produce
2.	Water and Irrigation	• Water harvesting • Management of water sources
3.	Infrastructure Energy and ICT	• Climate proofing of more roads • Embracing alternative energy solutions (wind & solar energy)
4.	Health	• Promotion of preventive and promotive health services • Retrofitting initiatives for more responsive curative health care services
5.	Public Administration	• Leadership, Supervisory, and Coordination • Public Finance Management • Monitoring, Learning and Evaluation
6.	Education and social welfare	• School feeding programme for ECDE centres to improve access to education and nutrition • Improved access to technical and vocational training for climate vulnerable youth (out of school) • Sports and talent development • Economic empowerment of women and youth
7.	Lands	• Development of spatial development plans • Preparation and adoption of county physical planning policies and legislation • Solid waste management
8.	Commercial, Tourism and Labour Affairs	• Livelihood promotion for all women and men, including young people and persons with disabilities, Investor facilitation, and aftercare services. • Creating market linkages for both national and international Markets

In addition, the County Government has also developed the Machakos County Climate Change Finance draft regulation (2019). The regulations obligate the setting aside of at least 3% of the annual development budget of the County to climate change action. In compliance with the recommendations of NCCAP 2018-2022, the County has also established a County Climate Change Unit to integrate climate change actions into strategies and implementation plans of the County.

Though the County does not have an Early Warning System (EWS) the county encourages adoption of EWS from the Kenya Meteorological Department (KMD) who in collaboration with the Participatory Scenario Planning (PSP) group that comprises the Agricultural Sector Development Support Programme (ASDSP), the Ministry of Agriculture, Livestock and Fisheries, the Ministry of Water and Irrigation, Kenya Agriculture and Livestock Research Organization (KALRO), and the Kenya Forestry Service (KFS). The EWS system entails forecasting weather and disseminating the information to farmers to inform their planting calendars through monthly bulletins which are broadcasted in English, Kiswahili, and the local Kamba language (Machakos County, 2015).

1.3.3 Other Key Climate Strategies in the County

The County Government has also invested in climate strategies as depicted by the use of solar powered borehole pumps for all county water infrastructure. The county has support capacity building on rainwater harvesting and provision of subsidized water harvesting and storage structures (tanks) to public institutions and Support installation/construction of raised storage tanks for water distribution supports installation/construction of raised storage tanks for water distribution.

The county department of agriculture also support of farm level rainwater harvesting, storage and alternative productive use (e.g. micro irrigation, aqua culture etc.) through subsidizing excavation of farm ponds and provision of dam liners to climate vulnerable families. The department has an array of extension services to farmers, pastoralists, and fishermen in partnership with other institutions such as the Ministry of Agriculture, Livestock and Fisheries, and research organizations such as KALRO. Machakos County takes pride in hosting key agricultural, academic, and research institutions and demo farms that are instrumental in supporting the county to undertake and actualise climate change adaptation and resilience strategies (See annex 2).

The Machakos County Government has also established and implemented several programs aimed at enhancing agricultural productivity in the county through initiatives such as the provision of free seeds and fruit seedlings, subsidized fertilizers, and provision of tractors.

The key programs that are currently running include:

- The Kenya Cereal Enhancement Programme Climate-Resilient Agricultural Livelihoods Window (KCEP-CRAL): the goal of the program is to contribute to the reduction of rural poverty and food insecurity of smallholder farmers in the ASALs by developing their economic potential while improving their natural resources management capacity and resilience to climate change in an increasingly fragile ecosystem.
- Kenya Climate-Smart Agriculture Project: This is a Government of Kenya project jointly supported by the World Bank and being implemented over five years (20172022) under the framework of the Agriculture Sector Development Strategy (ASDS) (2010-2020) and National Climate Change Response Strategy (NCCRS, 2010). The objective of the program is to increase agricultural productivity and enhance coping and resilience mechanisms to climate change risks in the targeted smallholder farming and pastoral communities in Kenya.
- The Small-Scale Irrigation and Value Addition Project (SIVAP) which seeks to increases incomes, food security, and nutrition along the agricultural value chain by raising agricultural productivity and improving agricultural market access for poor and marginalized communities.

CHAPTER TWO
POLICY ENVIRONMENT

2..1.1 National Policy Context

This CCCAP is informed by several National Government policies and frameworks among these the following:

i. *Kenya Vision 2030 (2008) and its medium plans* (2013-2017) - the country's development blueprint that recognizes climate change as a risk that could slow the country's development. Key climate change actions were identified in the Second Medium Term Plan (MTP) (2013-2017). MTP 2018-2022 recognizes climate change as a cross-cutting thematic area and mainstream climate change actions in sector plans.

ii. Kenya's *National Climate Change Response Strategy* (2010) was the first national policy document on climate change. It aimed to advance the integration of climate change adaptation and mitigation into all government planning, budgeting, and development objectives.

iii. *Nationally Determined Contributions (NDC, 2016)* Kenya's NDC under the Paris
Agreement of the UNFCCC includes mitigation and adaptation contributions. Regarding adaptation, "Kenya will ensure enhanced resilience to climate change towards the attainment of Vision 2030 by mainstreaming climate change into the Medium-Term Plans (MTPs) and implementing adaptation actions." The mitigation contribution "seeks to abate its GHG emissions by 30% by 2030 relative to the Business as Usual (BAU) scenario of 143 $MtCO_2eq$." Achievement of the NDC is subject to international support in the form of finance, investment, technology development, and transfer and capacity development. Kenya is currently preparing its second NDC update.

iv. Kenya's *National Adaptation Plan 2015-2030* was submitted to the UNFCCC in 2017. The NAP provides a climate hazard and vulnerability assessment and sets out priority adaptation actions in the 21 planning sectors in MTP II.

v. The *Kenya Climate Smart Agriculture Strategy (2017-2026)*. The broad objective of the Kenya Climate-Smart Agriculture Strategy (KCSAS) is to adapt to climate change, build the resilience of agricultural systems while minimizing emissions for enhanced food and nutritional security, and improved livelihoods.

vi. The *Climate Risk Management Framework for Kenya* integrates disaster risk reduction, climate change adaptation, and sustainable development so that they are pursued as mutually supportive rather than stand-alone goals so that an integrated climate risk management approach becomes a central part of policy and planning and national and county levels.

Vii The *National Climate Change Framework Policy* (2018) aims to ensure the integration of the climate change considerations into planning, budgeting, implementation, and decision-making at the national and county levels and across all sectors.

2.1.2 National Legal and Policy Framework

Constitution of Kenya (2010)-Kenya has a robust framework of policies, plans, and institutions that have been established to address climate change. The blueprint for the institutional and legal framework for climate change action is the Constitution of Kenya (2010). Article 10 of the constitution sets out national values and principles of governance, such as sustainable development, devolution of government, and public participation, which are mandatory when making or implementing any law or public policy decisions, including those relating to climate change. Article 42 provides for the right to a clean and healthy environment for every Kenyan, including the right to have the environment protected for the benefit of present and future generations through legislation and other measures.

The Climate Change Act (2016) is the national legislation that provides for an enhanced response to climate change and provides mechanisms and measures to achieve low carbon climate-resilient development. The Act adopts a mainstreaming approach that includes integration of climate change considerations into all sectors and in County Integrated Development Plans. The Act establishes the National Climate Change Council, chaired by His Excellency the President. The Council is responsible for overall coordination and advisory functions. The Act also establishes the Climate Change Fund as a financing mechanism for priority climate change actions and interventions The Act forms the legal basis for mainstreaming climate change considerations and actions into county sector functions and provides the legal foundation for CCCAPs. The CCCAP 2021-2026 has been developed to ensure compliance with provisions in the Climate Change Act, 2016 that require the County Governments to integrate and mainstream climate change actions into the various sectors.

The National Climate Change Action Plan (NCCAP) 2018-2022 aims to further Kenya's development goals by providing mechanisms and measures to achieve low carbon climate resilient development in a manner that prioritizes adaptation. The plan builds on the first Action Plan (2013-2017) which provided a framework for Kenya to deliver on its Nationally Determined Contribution (NDC) under the Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC). NCCAP 2018-2022 guides the climate actions of the National and County Governments, the private sector, civil society, and other actors as Kenya transitions to a low carbon climate-resilient development pathway.

2.2 County Enabling Legal and Policy Framework

The Climate Change Act, 2016 requires County Governments to mainstream climate change actions, interventions, and duties into various sectors, and into their County Integrated Development Plans (CIDPs) and County Sectoral Plans. The CCCAP has been formulated in compliance with the provisions of the Climate Change Act, 2016. Machakos County Government has made significant strides towards achieving enabling legal and policy framework. The formulation of policies and regulations aimed at mainstreaming climate change in various sectors are discussed in Table 6.

Table 5: Machakos County Legal Framework

County Framework	Description
Machakos County Integrated Development Plan 2023- 2027	The Machakos County Integrated Development Plan 2023- 2027 has been developed taking into account the provisions and aspirations of other national and international development plans. The CIDP 2023-2027 has mainstreamed climate change in their CIDPs across all sectors. Climate change was recognized as one of the challenges liming the achievement of the 2018 - 2022 CIDP targets, and adaptation actions are recognized as a priority to address climate change impacts in the current CIDP.
The Machakos County Climate Change Act of 2021	This is an ACT of the County Assembly of Machakos to put in place the framework and mechanisms for mobilization and facilitation of the County government, communities, and other stakeholders to respond effectively to climate change through appropriate adaptation and mitigation measures and actions and for connected purposes. The Act put in place mechanisms for the enhancement of climate resilience through development, management implementation regulation and monitoring of adaptation and mitigation measures and actions.

	The Act establishes the County Climate Change Steering Committee responsible for the co-ordination and oversight of climate change response the County.
Machakos County Climate Change Finance Regulations (2019)	The draft regulations establish the Machakos County Climate Change Fund. The regulations obligate the setting aside of at least 5% of the annual development budget of the county for climate change action.
The Machakos County Sand Harvesting Act of 2014	The Act seeks to ensure sustainable exploitation and equitable sharing of the accruing benefits from sand harvesting. Administration and enforcement of the Act is by the Machakos County Sand Harvesting and Management Committee, which comprises the chief officers for finance and natural resources and representatives from special interest groups, among others.
The Machakos Agricultural Development Fund Act of 2014	This Act mainstreams climate change actions in agricultural development. The Act seeks to increase agricultural productivity through the provision of credits to undertake value addition, water harvesting, provision of farm inputs, facilitation of market research, and dissemination of market information.
The Machakos County E-Waste Management Act of 2015	The Act establishes the institutional framework necessary for ensuring efficient management of E-Waste within the County. The Act recognizes that each person is entitled to a clean and healthy environment that is free from e-waste.
Machakos County Management of Quarrying Act of 2016	The Act provides a legislative framework for the regulation of quarrying activities in the County. Key among the provisions of the Act is the designation of quarrying exploitation areas, protection of the environment from harmful effects of quarrying activities and rehabilitation of quarrying sites. This is critical in preventing environmental degradation and escalation of climate change effects.
Machakos County Annual Development Plan 2023-2024	The county annual development plan for this period mainstreams climate change across all the priority sectors identified in the plan with specific adaptation and mitigation measures identified and budgeted for. Also, the plan also observes that Climate change impacts like persistent drought has exerted negative

	effects on the economy as it affected agricultural productivity.
The Machakos County Government Water Policy, 2018	The goal of the water policy is to guide the efficient supply and utilization of water as a commodity and natural resource for sustainable development in the County.
Machakos County Public Participation Act of 2014	The act establishes the modalities and platform for public participation in the governance of the County. It provides that County Executive Committees shall ensure that there are measures in place to ensure that minorities and marginalized groups participate decision making in all matters that affect them.
Machakos County Climate Change Amendment Act, 2022	Creates the county climate change organs and bridges the gap in the county government and national government climate change policy (management of the climate change function) by the county government
Machakos County Climate Change (Fund Administration) Regulations	Operationalize the Climate Change Act, 2016 and the County Climate Change Act, 2021 through prioritized climate actions as per the MCCCAP 2023 -2027 and in consultation with the WCCCPC.

CHAPTER THREE

PRIORITY CLIMATE CHANGE ACTIONS

3.1 Identification of the County Priority Climate Change Actions

This County Climate Change Action Plan (MCCCAP 2023-2027) has been developed by the community in Machakos through structured workshops during the PCRA process to respond to the impacts of climate change on the livelihoods of the people, the environment and the Machakos economy. It identifies strategic areas where climate action over the next four (4) years is linked to the bottom-up transformational agenda, the Governor's Manifesto, and Kenya Vision 2030. These MCCCAP strategies resonate well with the Machakos Governor's manifesto with the clarion call "*chakula mezani, pesa mfukoni*" translating into

food security and the social and economic empowerment of Machakos and aims to achieve the following:

i. Improved access to water
ii. Improved access to health services
iii. Climate proofing of roads and public infrastructure
iv. Access to adequate nutritious food
v. Increased/ improved livestock production
vi. Increased income from farming and other livelihoods
vii. Ecosystem restoration and green energy transition
viii. Improved accessibility to critical facilities including market centres and health facilities
ix. Working with collaborators in improving access to alternative livelihoods for women, children, PLWDs and climate-vulnerable youth including school drop-outs, unemployed youth, teenage mothers and youth engaged in drug and substance abuse.

These climate actions have been integrated into the eight (8) sectors covered in the Machakos County CIDP 2023-2027.

The MCCCAP 2023-2027 sets priority on adaptation actions due to the devastating impacts of droughts and environmental degradation that have had negative effects of climate change on vulnerable groups, including women, older members of society, persons living with disabilities, children and youth in Machakos County. The climate actions to be undertaken are also aimed at reducing GHG emissions and increasing tree cover to ensure that the county's adaptive capacity to climate change is enhanced.

3.2 Priority Climate Change Actions

The MCCCAP 2023 - 2027 presents the programs and strategies for adaptation and mitigation for the period covering 1st July 2023 to 30th June 2027. The Action Plan seeks to:

- Enable all sectors within the Machakos County Government to undertake actions that promote the achievement of climate change adaptation/ resilience and objectives.
- Support the Machakos County Government achieve its transformative development agenda of social economic empowerment through such initiatives as the *wikwatyo fund* and climate proofed infrastructure that contribute towards the realization of the country's Bottom Up Transformational Agenda and Sustainable Development Goals (SDGs).
- Enhance the adaptive capacity and resilience of communities especially the climate vulnerable groups among these women, children, youth, the elderly and minority groups within Machakos County.

- Undertake actions, where possible, in a way that ensures the County's GHG emissions are kept at a minimum limit to support Kenya achieve its mitigation NDC under the Paris Agreement.
- Enable actions to be undertaken in an integrated manner that addresses the priorities set out in the plan.

The priority climate change actions are summarised in Table 7.

Table 6 : Priority Climate Change Actions for Machakos County

No	Priority Actions	Objectives
1	**Water Sector**	Enhance the resilience of the water sector by promoting sustainable management of water resources to meet the demand for all uses.
2	**Food and nutrition**	Increase food and nutrition security by enhancing the productivity and resilience of the agricultural sector.
3	**Health, Sanitation and Human Settlements**	Mainstream climate change adaptation into the health sector; develop effective sanitation mechanisms and enhance the resilience of human settlements
4	**Environment and Ecosystems Management**	Increase forest/tree cover of Machakos County from 3.5% to 10% of total land area; rehabilitate degraded lands; increase the resilience of wildlife and promote tourism development.
5	**Disaster Risk (Floods and Drought) Management**	Reduce risks to communities by climate - proofing infrastructure and minimise the negative effects resulting from climate-related disasters such as droughts and floods.

6	**Energy and Transport sectors**	Promote the adoption of renewable energy, promote energy efficiency to reduce energy demand; and encourage a shift to clean cooking that reduces the demand for wood. Develop and manage effective, efficient, sustainable, and secure transport systems and infrastructure that can withstand the devastating impacts of climate change (Climate proofing)
7	**Manufacturing**	Promote energy and resource efficiency in the manufacturing sector.

The successful implementation of the actions in the MCCCAP will be based on the support of the Machakos County Government, who is the main implementing actor for all the climate actions set out in the Action Plan. The County Government is required to implement the identified actions in the most feasible and sustainable manner to cater to the needs of its population. The Climate Change Act, 2016 requires that County Governments mainstream climate change actions and interventions in the CIDPs, taking into account national and country priorities. Machakos County Government developed its first CIDP covering the period 2013-2017, the second period 2018-2022, and the current one in place for the period 2023-2027. The three (3) the CIDPs acknowledge the impacts of climate change and identify the need to undertake meaningful actions to address these impacts. The main climate change impacts identified in the CIDP are an increase in temperatures resulting in prolonged dry periods and drought, unpredictable weather patterns, scanty rainfall, and increased pests and diseases. These climate change effects have been attached to the negative implications on economic activities, resulting in reduced agricultural and livestock production, water scarcity, increased spread of diseases, and increased conflicts (human/human and human/wildlife).

The impacts of climate change and responses to it were discussed by the stakeholders during consultations. Focus Group Discussions were held with representatives from the respective County Executive Committees including the Environment and Agriculture Committees. Public consultation forums were also held in the eight sub-counties including Machakos Town, Mavoko, Masinga, Yatta, Kangundo, Kathiani, Matungulu and Mwala. The ward consultations were held at the ward level where the participants came up with ward action plans which have informed the climate change actions in this CCCAP.

The priority climate change actions identified during the consultations include tree planting, addressing deforestation and forest degradation to achieve 10% tree cover, transition to clean cooking solutions (including use of improved stoves, ethanol, and biogas), and promotion of renewable energy, including wind and solar.

3.2.1 Water

Climate Change Priority 1: Water Sector

Issue/problem: Inadequate Water Availability
Climate Change has resulted in a decline in access to ample water and the quality of water continues to deteriorate. The Blue economy is also going to be affected by the impacts of climate change due to scanty rainfall and high temperatures.

3.2.1.1 The Challenge of Water Scarcity in Machakos County

Machakos County is endowed with different water sources that include rivers (major ones being Athi and Tana rivers), springs, and underground aquifers. The County has two perennial rivers which include Athi River, which traverses the County, and Tana River which forms the County boundary with Embu and Tharaka Nithi counties. Other rivers in the county include Thwake, Mitheu, and Iiyini rivers. The major dams in the County include Maruba dam which is the main source of domestic water in Machakos town and Masinga dam which is largely used for hydroelectric power generation. The main water catchment areas in the County are Iveti hills, Muumandu, Kalimanzalu and Kiima Kimwe (CIDP, 2018). Other surface sources of water include earth dams, water pans, and springs, while underground water sources include boreholes and wells (CIDP, 2023). The main water uses in the County are domestic, livestock, agricultural (irrigation), industrial and commercial purposes.

However, the water sources are diminishing and are vulnerable to pollution and degradation from agricultural chemicals, urban and industrial wastes especially Athi River, which is threatened by pollution from Nairobi city and adjacent towns leading to water scarcity. Rivers in the county are experiencing declining water flows due to persistent droughts, over-abstraction for irrigation, and destruction of catchment areas. The rivers especially Athi, Mitheu, and Iiyini are highly polluted by industrial and human activities.

The groundwater levels are being over-exploited for use in agricultural irrigation, domestic, industrial, and use for hydroelectric power generation presenting future challenges in meeting water needs. Water scarcity is further compounded by the

non-uniform spatial-temporal distribution of rainfall which often falls below 400mm, lack of rainwater harvesting, deforestation, and destruction of water towers due to encroachment, low water storage capacity, poor management of the existing water resources, and increasing water demand. Consequently, rivers are drying up, dams and water pans are silting, and water quality is deteriorating. Uncontrolled water uses and sand harvesting; low compliance and enforcement of water policies; and conflicting water and land policies are other factors affecting the water sector.

The population of Machakos County is 1,421,932 as per the 2019 population census and out of these, approximately 350,000 people are within the water service area, representing about 27.8 percent of the population. The average potable water access in the County is between 40 percent and 51 percent which is divided between the rural and urban users. At present, the County enjoys 18 hours per day of water supply within the serviced areas (Machakos Water Policy, 2014). The high population especially in urban areas means a high-water demand in a water-scarce environment leading to acute water shortages. In rural areas, women are mostly affected by the challenges imposed by water scarcity which implicates on household's wellbeing and maintaining small-scale agribusinesses. Women and girls are forced to walk long distances to obtain water which limits the opportunities of women to access other productive and income-generating activities, while girls' school attendance is disrupted.

The water demand within the county exceeds the capacity of its renewable freshwater sources. Further, the County's water resources are under pressure due to increasing incidences of soil erosion and siltation, land degradation and destruction of water catchments areas, non-compliance to water quality regulations, inefficient water use strategies, invasive alien species, uncontrolled sand harvesting, and over-abstraction of water resources. Additionally, there is no existing framework between counties to ensure sustainable utilization and management of shared water resources like Tana, Athi, and Thwake River which are often polluted outside the jurisdiction of Machakos County. This water stress adversely affects food production and disrupts economic development (CIDP, 2023).

Machakos County has a high potential for growing its Blue Economy. This is built on promoting lucrative economic activities around water sources. Some of these activities include fisheries activities which are carried out in Masinga & Kamburu dams and Athi, Tana & Thika Rivers; water sports like kayaking and boat riding; and tourist attraction due to the beautiful scenic view of these areas. Extreme weather events such as droughts and flooding negatively impact the performance of Machakos Blue economy due to negative impacts on fisher communities and damage to tourist attraction sites and essential infrastructure, among others.

3.2.1 Enhancing Access to Quality Water For All

CCCAP 2023-2027 strives to promote to increase in the annual per capita water availability for Machakos County to the recommended 1,000 m^3. The high population growth rate and expansion of economic activities will continue to exert increasing pressure on water resources in Kenya and urgent measures are required to boost supply and rationalize demand.

Water supply and distribution in the County is managed by water companies which include: Machakos Water & Sewerage Company (MACHWASCO) whose main source of water is Maruba dam and various boreholes; Mavoko Water & Sewerage Company (MAVWASCO), Yatta Water Company (YAWASCO), Kangundo- Matungulu Water & Sanitation Company (KAMAWASCO), Mwala Water & Sanitation Company (MWAWASCO), Kathiani Water & Sanitation Company Ltd (KAWASCO) and other community water supply schemes. The Water Service Providers (WSPs) are under the County Government as provided in the Water Act 2016. The WSPs are often with challenges of operation and maintenance due to high cost, inadequate infrastructure, and poor management. The water providers are also under pressure to provide quantity and quality which is declining due to environmental degradation and climate change impacts.

Borehole drilling is a major initiative by the County government to provide water for its citizens. The current number of boreholes that have been drilled within Machakos County is 548. However, the rate of borehole failure in the County is also high with some boreholes failing to produce water or the water not being viable after drilling. This can be attributed to climate change impacts such as prolonged periods of drought, over-abstraction of groundwater resources, and geology of the area.

The priority action proposes comprehensive actions to enhance the resilience of the water sector by ensuring adequate access to water, promote protection and conservation of water sources, and advocate for efficient use of water for agriculture, manufacturing, domestic use, wildlife, and other conflicting uses. This can be achieved through:

- Construction of dams, earth dams, water pans and weirs.
- Drilling of more boreholes and upgrading existing ones.
- Increased distribution and connection to households to save on time, distance, and risks of contamination from direct water abstraction.
- Construction of water troughs (drinking points) to minimize point pollution by livestock drinking directly.
- Rehabilitation and conservation of riverine ecosystems (planting of bamboo along the riverbanks for water detoxification),

- Desilting of dams
- Rehabilitation and fencing/ protection of water structures
- Enforcement of existing laws to ensure compliance
- Monitoring of water quality both upstream and downstream

The actions also aim at promoting the Blue Economy of Machakos County by assisting fisher communities to cope with the changing climate. The priority actions will be implemented in line with the Machakos Water Policy of 2014 and the CIDP 2023-2027 whose aim is to promote efficient supply and utilization of water as a commodity and natural resource for sustainable development in the County.

Table 7: Enhancing Resilience of the Water Sector

	Strategic Objective 1: Enhance the resilience of the water sector by promoting sustainable management of water resources to meet the demand for all uses		
Action	**Ward**	**Expected Results by 30th June 2027**	**Adaptation/ Mitigation**
Increase annual per capita water availability through the development of water infrastructure.	Kangundo East, Masii (Parts) Kangundo East, Masii, Mbiuni, Muthetheni, Mwala/ Makutano Wamunyu, Kibauni, Ikombe, Katangi, Matuu, Ndalani, Kithimani, Kivaa, Ekalakala, Masinga central, Muthesya, Ndithini Muthwani and Kinanie Kalama, Kola, Muvuti/Kiima kimwe, Lower Kaewa, Mitaboni, Kangundo East, Matungulu West, Matungulu East, Matungulu North, Kyeleni,	• Integrated catchment rehabilitation and ecosystem management including construction of 174 earth dams, 548 weirs and rehabilitation of 407 earth dams and water pans across the county • Mapping out of groundwater sources such as aquifers to determine the quantity and quality of groundwater resources. • Solarisation of 209 boreholes across	*Adaptation* Addresses climate risk of high temperatures and changing rainfall patterns.

		the county. • Implement rehabilitation and conservation initiatives for the Tana and Athi water catchment areas.	
Rainwater harvesting and water storage infrastructure and improve flood control	Kangundo East, Masii, Mbiuni, Muthetheni, Mwala/ Makutano Wamunyu, Kibauni, Ikombe, Katangi, , Ndalani, Kithimani, , central, Athi River, Mlolongo/Syokimau, Kinanie, Mbiuni, Mwala, Muthwani Kangundo East, Masii (Parts) Kangundo East, Masii, Mbiuni, Muthetheni, Mwala/ Makutano Wamunyu, Kibauni, Ikombe, Katangi, Matuu, Ndalani, Kithimani, Kivaa, Ekalakala, Masinga central, Muthesya, Ndithini Muthwani and Kinanie Kalama, Kola, Muvuti/Kiima kimwe, Lower Kaewa, Mitaboni, Kangundo East, Matungulu West, Matungulu East, Matungulu North, Kyeleni,	• Support capacity building on rainwater harvesting and provision of subsidized water harvesting and storage structures (tanks) to increase the percentage of households harvesting rainwater to 100% • Support women and youth groups nature based enterprises eg tree nurseries • Incorporation of rainwater harvesting systems in settlements/ development plans. • Enforce the Machakos Sand harvesting act of 2014 to control sand harvesting and support	Addresses climate risk due to high temperatures and changing rainfall patterns. Rainfall patterns causing water shortages

		community initiatives that control sand harvesting in local streams • Development of flood early warning systems in areas susceptible to floods.	
Promote water efficiency and reduce water pollution	Wamunyu, Kibauni, Ikombe, Katangi, , Ndalani, Kithimani, , central, Athi River, Mlolongo/Syokimau, Kinanie, Mbiuni, Mwala, Muthwani, Matungulu North,Kyeleni	• Reduce water wastage and non-revenue water through innovation in water metering and tracking leakages identification and reporting • Establish a public awareness program for water efficiency and conservation. • Develop and enforce regulations to control water pollution especially in major rivers such as Athi and Thika which are prone to pollution	Addresses climate risk of water shortages

Improve access to good quality water	Wamunyu, Kibauni, Ikombe, Katangi, , Ndalani, Kithimani, , central, Athi River, Mlolongo/Syokimau , Kinanie, Mbiuni, Mwala, Muthwani, Matungulu North,Kyeleni	• Ensuring equitable access to safe affordable drinking water for all by increasing the number of households accessing clean water to 230,000 households. • Improve water supply to reduce the average distance to the water sources to 0.15km by pipeline extending pipelines in the 40 wards. • Liaise with the Water Service Trust Fund to support the vulnerable community groups within the County to develop small community water schemes. • Implement water conservation measures around in the manufacturing sector	*Adaptation* Increases resilience

Enabling actions (policies and regulations)	Machakos County	• Implementation of water resource management action plan to control encroachment on water catchment and riparian areas. • Develop a Machakos County Blue Economy Master Plan to provide guidelines for the long-term holistic development of the Blue Economy in Machakos County • Develop a water harvesting policy for institutions and households. • Formulate a County policy for the control of water pollution.	Enabling environment for implementation of climate action programs

Relevant Institutions: Machakos County Government; County Departments of Water, Irrigation, Environment, and Climate Change; Agriculture, Food Security and Co-operative Development; Lands, Energy, Housing and Urban Development; Finance and Economic Planning;
Education, Skills Training and Social Welfare; National treasury; Ministry of water and sanitation; Water Resources Management Authority (WRMA); Water Services Regulatory Board
(WASREB); NEMA; Machakos Water & Sewerage Companies; Water Resource User Associations (WRUA); and Private sector investors. All County sectors to identify actions to realize the strategic objective.

Climate Change Priority 2: Increase Food and Nutrition Security

Issue/Problem: Inadequate access to nutritious food. Climate change is one of the environmental drivers interacting with the food system and hence affects not only food production, but also food processing, distribution, and consumption. An increase in the severity and frequency of drought – a climate change-related disaster has posed threats to food security and negatively impacted farmers in Machakos County.

Machakos County agricultural systems are of two types: Irrigation Agricultural and rain-fed Agricultural systems. 60% of the County's land area is arable hence suitable for agriculture. However, only about 67% of the total arable area (372.020 Ha) has been utilized, out of which food crops occupy approximately 161,695ha, and cash crops occupy only 86,638ha (Machakos County, 2015). The average farm sizes for small- and large-scale production in the county are 0.756 and 10 ha respectively (CIDP, 2023).

Some of the major food crops grown in the county include beans, maize, peas, Dolichos, arrow roots, sweet potatoes, cassava, Irish potatoes, and millet. The main cash crops are coffee, mangoes, citrus, French beans, pineapples, flowers, sorghum, and vegetables. Vegetables and fruits farming are highly dependent on irrigation, key among them being pawpaw, bananas, mangoes, avocadoes, apples, passion fruits, tomatoes, cabbage, guavas, onions, French beans, carrots, okra, and kales (Machakos District Planning Unit, 2006). The land size occupied by these crops is summarised in Table 8.

Subsistence agriculture is also practiced with maize and drought-resistant crops such as millet and sorghum being grown in the semi-arid areas. These crops especially legumes are largely affected by floods as they cannot withstand a lot of water. Limited yields due to drought lead to hunger and accelerate the community's susceptibility to disasters. There is also high uncertainty regarding the impact on the production of specific crops but there exists a high likely reduction in yields of maize and beans. Research has revealed that maize crop is very sensitive to water deficit during its critical period (flowering to beginning of grain filling), making it prone to climate variability (Omoyo, et.al, 2015). The yields of pigeon pea are also expected to decline by over 60% by 2050 (Kwena, 2015). It is also important to note that Kenya is the fourth largest producer of pigeon pea in the world after India, Myanmar, and Malawi (Kwena, 2015). Most of the pigeon pea is produced by smallholder farmers in Eastern Kenya who consume it and export the surplus to India and the Middle East.

There is therefore a need to invest in developing water-logging-tolerant pigeon pea varieties given the projected decline in pigeon pea yields. There is also a glaring danger of increased risk of crops attack from invasive alien species. This is likely to affect the achievement of food security within the County and therefore, proactive measures are needed to address these challenges.

Table 8: Acreage under Main food and Cash crops in Machakos County

Types of crops	**Hectares**
Maize	62, 000
Beans	38,000
Cowpeas	32,000
Pigeon peas	18,000
Green grams	12,000
Mangoes	6,000
Coffee	5,000
Citrus(Oranges, lemon, and tangerine)	2,000

(Source: CIDP, 2023)

Declining soil fertility due to soil degradation caused by excessive use of synthetic fertilizers; unsustainable farming practices such as conventional tillage; low precipitation and prolonged droughts due to climate change have affected agricultural productivity. Increased sand harvesting activities within the county has also increased risks of soil erosion which is a threat to agriculture.

Livestock keeping in Machakos County comprises of different types of livestock such as chickens (local chicken), cattle (both beef and dairy), goats, and sheep (Gichangi et al., 2015). Most of the livestock population is found in 13 cattle ranches located in Machakos and Mavoko Sub-counties and which include Kasisi, B&T Malinda, Carol Malinda, Machakos ranch, Kyelu, Lukenya, Game ranch, Maanzoni, Kakenyi, Kapiti, Mwambi, New Astra and Lisa ranches (CIDP, 2023). Livestock production in the county is affected by declined water resources due to low rainfall and increasing temperatures. Frequent flooding due to intense rainfall has led to animal deaths, transmission of diseases and loss of livestock pasture. Drought suppresses the growth of fodder and livestock production and leads to drying up of water points which may lead to community conflicts over pasture and water resources. Farmers are also forced to overgraze in already straining pastureland and encroach to protected lands in search of pasture which causes environmental degradation. Pastoralists are impacted because extreme weather events lead to reduced pasture and forage availability, degradation of the environment, and an increase in poverty. Strong winds and dust storms erode topsoil, thus making grass and rangeland regeneration difficult even when it rains.

In Machakos County, the main fishing practices are aquaculture and freshwater fishing practiced in Masinga & Kamburu dams and Athi, Tana & Thika Rivers. Fish farming (aquaculture) was introduced in the County under the economic stimulus program in 2010. The main types of fish cultured are tilapia, catfish, and ornamental fish. The County has three (3) gazetted fish landing sites Masinga dam (Ekalakala, Mananja, and Tumutumu) and one (1) in Kamburu dam (Kisumu Ndogo). The main species harvested from the dams and rivers are common carp, tilapia and catfish while for aquaculture, the main species cultured are tilapia, catfish, and ornamental fish. The annual average fish production from aquaculture currently stands at 30,704 kilograms (CIDP, 2023).

The productivity of capture fisheries is declining due to overfishing especially in major rivers such as Athi and Tana and in major dams such as Masinga and Kamburu dams. Overfishing reduces fish abundance, spawning potential and lower fish population. Changing precipitation, temperature, and climatic patterns due to climate change affect the quantity, quality and seasonality of water resources, leading to inevitable changes in aquatic ecosystems (FAO, 2022). This affects species productivity and fish growth which affects fish distribution leading to low yields. Drought will affect the fisheries sector in the county by drying up and

reducing natural sources of fish feed while increasing temperatures will accelerate water loss affecting natural water cycles for freshwater systems.

The County also has a high potential for beekeeping with Mavoko and Machakos Sub-counties having the highest honey and wax yields.

3.2.2 Promoting sustainable solutions for climate smart agriculture and food security

Machakos County residents engage in various agricultural practices have negative impact on the environment. These include excessive and wrong use of fertilizers and pesticides which have contributed to increased alkalinity and acidity of soil reducing the overall soil fertility, and eutrophication of nearby water bodies. Poor farming methods such as farming on elevated and sloppy grounds have resulted in the loss of fertile topsoil due to soil erosion. The use of heavy farming machinery leads to soil compaction which reduces water infiltration and slows the germination rate which affects crop productivity. This coupled with poor land management practices leads to depletion of essential soil macro and micronutrients.

The County hosts several agro-based industries such as Kenya Meat Commission, Agrosafe, Delmonte and Kenchick among others. Although these industries contribute to the county's economy, they also pose several environmental threats such as soil, water and air pollution from industrial effluents which affect vegetation, human and aquatic life, and lower quality of drinking water.

Low and erratic rainfall and harsh weather and climate conditions due to climate change have affected the County's agricultural sector. Farmers suffer from perennial water shortage due to frequent and prolonged droughts. Water scarcity is further compounded by the fact that most rivers within the County are seasonal and the predominantly sandy soils allow percolation of water with very low retention. The situation is further aggravated by sand harvesting on riverbeds which usually increase during droughts, lowering the water table. Other major effects of drought within the County include high food prices, reduced crop yield, reduced animal productivity, sale of livestock at low prices, increase in field and storage pests, lack of casual employment and death of livestock.

CCCAP 2023-2027 provides a range of actions to transform the agricultural sector, with the main focus being on adaptation actions. The priority actions in the agriculture sector will also contribute positively towards reduced GHG emissions through practices such as agroforestry, sustainable land management, and improved efficiency in livestock management.

Main action on food security will be the implementation of the FAO Strategic Framework 2022-2031 which is captured in the Machakos CIDP 2023-2027 and aims at increasing agricultural productivity and enhance resilience to climate change and reduce greenhouse gas emissions. The County's Small-Scale Irrigation and Value Addition Project (SIVAP) also aims at increasing agricultural productivity through increasing land acreage under micro and drip irrigation schemes, and the number of micro dams and water pans, and also enhance water storage, gabions construction and development of water catchment area. In the Financial Year 2022/2023 and over the Medium-Term Expenditure Framework (MTEF) period, the County has planned to invest in key areas in the agriculture sector. This is to improve agriculture production of the main crops through promotion of drought-tolerant crops and quarter acre farm project; improved livestock, fish and poultry farming; train farmers on appropriate farming technologies; animal disease control and management through regular compulsory mass vaccination; promote crop and pasture irrigation, promote co-operatives in various sectors and establish co-ordination structure for public and private vets (CFSP, 2022).

The Medium-Term Plan III (MTP) has many flagship projects outlined for implementation under the three pillars through which Machakos County will benefit from several projects that will support agriculture and food security including:

- Agricultural Insurance Programme with support from the World Bank Group, the Financial Sector Deepening, and the National Treasury.
- Thwake Multipurpose Water Development program (being funded under the PPP initiative.

The County can also put specific emphasis on:

- Promoting irrigated maize and *in situ* water conservation measures to boost food production.
- Develop programs to provide affordable credit to farmers to enable them to invest in irrigation of maize and sorghum.
- Partner with the Kenya Agricultural Research Institute for the development of pigeon peas varieties that are adapted to increasingly wet conditions.

Table 9: Enhancing the productivity and resilience of the agricultural sector

Strategic Objective 2:		**Increase food and nutrition security by enhancing the productivity and resilience of the agricultural sector**	
Action	**Wards**	**Results by 30th June 2027**	**Adaptation / Mitigation**
Improve crop productivity through the implementation of micro irrigation	Kangundo East, Masii, Mbiuni, Muthetheni, Mwala/ Makutano Wamunyu, Kibauni, Ikombe, Katangi, , Ndalani, Kithimani, , central, Athi River, Mlolongo/Syokimau, Kinanie, Mbiuni, Mwala, Muthwani ,Matuu, Ndalani, Kithimani, Kivaa, Ekalakala, Masinga central, Muthesya, Ndithini Muthwani and Kinanie Kalama, Kola, Muvuti/Kiima	• Promote farmers access to appropriate agricultural inputs such as subsidized fertilizer and certified seeds increased from 26,000 to 150,000 farmers. • Construct 15,000 water pans for domestic irrigation farming activities to boost production of maize and sorghum yields by up to 100%. • Establish at least 3 modern grain storage facilities in the County to reduce pre- and post-harvest losses to 5%. • Develop Early Warning and Strategic Pests and Diseases Control system to reduce incidences and prevalence of pests and diseases to 5%.	Addresses climate risk due to high temperature and changes in precipitation which negatively impact rain-fed crop production.

		• Provide training services to 10,000 small scale farmers on areas that can boost productivity such as post-harvest handling and management, mechanized agriculture, drip irrigation and organic farming. • Support more food production through provision of 200 greenhouses to farmer/women/youth groups. Establishment 2 seed banks to conserve and promote use of indigenous seed varieties especially drought resistant and those identified in priority value chains commodities (VCC) such as millet, maize, sorghum, mangoes and pigeon peas.	

Promote sustainable land management practices	Kangundo East, Masii (Parts) Kangundo East, Masii, Mbiuni, Muthetheni, Mwala/ Makutano Wamunyu, Kibauni, Ikombe, Katangi, Matuu, Ndalani, Kithimani, Kivaa, Ekalakala, Masinga central, Muthesya, Ndithini Muthwani and Kinanie Kalama, Kola, Muvuti/Kiima kimwe, Lower Kaewa, Mitaboni, Kangundo East, Matungulu West, Matungulu East, Matungulu North, Kyeleni,	• Increasing the number of households harvesting water for agricultural use to 75%. • Improved extension services by training 1,000 farmers; conducting 100 on-farm trials and establishing 80 demonstration sites across the county	*Adaptation* Addresses climate risk due to land degradation *Mitigation*

Strategic Objective 2:		**Increase food and nutrition security by enhancing the productivity and resilience of the agricultural sector**	
Action	Upper Kaewa, Kathiani Central, Mua , Machakos	**Results by 30th June 2027**	**Adaptation / Mitigation**
	Machakos Central, Upper Kaewa, Kathiani, M Central, Kangundo Central, Kangundo East, Kangundo West, Kangundo North, Tala, Matungulu East, Mutituni, Mumbuni North	• Promote conservation agriculture and *in situ* water conservation/ management technologies such as bench terracing, tied ridging, retention ditches, *zai* pits and cut off ditches to improve farmers' skills on soil and water conservation by training 15,000 farmers and 20 women/ youth groups. • Establish a credit system to offer affordable credit to farmers and established women groups to enable them to set-up small-scale irrigation systems such as drip irrigation. ₀ Reclaim and rehabilitate at least 30% of degraded land in the County to increase percentage of arable land. • Promote adoption of organic manures by farmers to 50% to increase crop production and enable shift from the high-cost synthetic fertilizers.	

Improve productivity, management, and conservation of livestock.	Wamunyu, Kibauni, Ikombe, Katangi, Matuu, Ndalani, Kithimani, Kivaa, Ekalakala, Masinga central, Muthesya, Ndithini Muthwani and Kinanie	Productivity of livestock farmers improved through: • Increase number of indigenous livestock species under conservation by 30%. • Increase Acres of cultivated pasture/fodder from 420 acres to 2,500 acres. • Increase number of farmer groups trained on use of appropriate livestock feed and nutrition information system/year from 800 to 3,000 farmers.	*Adaptation* Addresses climate risk: land degradation

Strategic Objective 2:		**Increase food and nutrition security by enhancing the productivity and resilience of the agricultural sector**	
Action		**Results by 30th June 2027**	**Adaptation / Mitigation**
	Kangundo East, Masii (Parts) Kangundo East, Masii, Mbiuni, Muthetheni, Mwala/ Makutano Wamunyu, Kibauni, Ikombe, Katangi, Matuu, Ndalani, Kithimani, Kivaa, Ekalakala, Masinga central, Muthesya, Ndithini Muthwani and Kinanie	• Tonnage of pasture and fodder seeds distributed to pastoralists increased to 30 tonnes. • Develop 10 feed storage facilities and supporting 20 feed and fodder seed/ seedlings multiplication institutions such as farmer groups and Agriculture Training	*Adaptation* *Addresses climate risk:* *land degradation*

	Kalama, Kola, Muvuti/Kiima kimwe, Lower Kaewa, Mitaboni, Kangundo East, Matungulu West, Matungulu East, Matungulu North, Kyeleni,	Centres (ATC) • Improve animal disease control and surveillance by 40% to minimize livestock deaths. • Promote effective and efficient delivery of extension services to livestock farmers through hiring and capacity building of 30 extension officers	
Livelihood's diversification to enhance climate change	•	• Promote and support growing of traditional crops, which are more drought tolerant and adaptable to the drought such as cassava, millet, pigeon peas and sorghum by 50% of the farmers. • Increase the number of households engaged in diversified agro-enterprises and value addition of agricultural produce by 30%. • Increase support to nature-based enterprise such as beekeeping by installing 150,000	*Adaptation* Diversification of livelihoods to increase resilience to climate change impacts

		Langstroth hives. • Develop climate information systems and ensure dissemination of the information to 75% of crop and livestock farmers	
Enabling Action – technology and knowledge management	Machakos county	• Number of households implementing Climate Information Service plans	Enabling
	Relevant Institutions: Machakos County Government; County Departments of Water, Irrigation, Environment, and Climate Change ; Agriculture, Food Security and Co-operative Development; Finance and Economic Planning; Public Service, Quality Management and ICT; Education, Skills Training and Social Welfare; County Administration and Decentralized Units; Lands, Energy, Housing and Urban Development; County climate change unit; WRA; KALRO; KALRO; Ministry of Agriculture (MoA); Kenya Forest Service (KFS); Kenya Meteorological Department, Agriculture Training Centres; NGOs and CBOs; Private sector investors.		

Climate Change Priority 3: Health, Sanitation and Human Settlements

Issue/problem: Climate Change impacts have hampered the successful control of malaria, waterborne and respiratory diseases, infant mortality and malnutrition in Machakos County. Lack of adequate solid waste and effluent management further cascades the negative climate change-related health impacts and contributes towards GHG emissions.

Climate change as the greatest threat to human health

Human health has always been affected by climate and weather. However, climate change and climate variability cause extreme changes in weather, which result in significant threats on human health. The Third Assessment Report of the IPCC concluded that: "Overall, climate change is projected to increase threats to human health, particularly in lower-income populations" (IPCC, 2001). According to WHO, Climate change can cause direct impacts on human health due to impacts of thermal stress, death/ injury in floods and storms; and indirectly through changes in the ranges of disease vectors such as mosquitoes, water-borne pathogens, and implications on water and air quality, and food availability and quality.

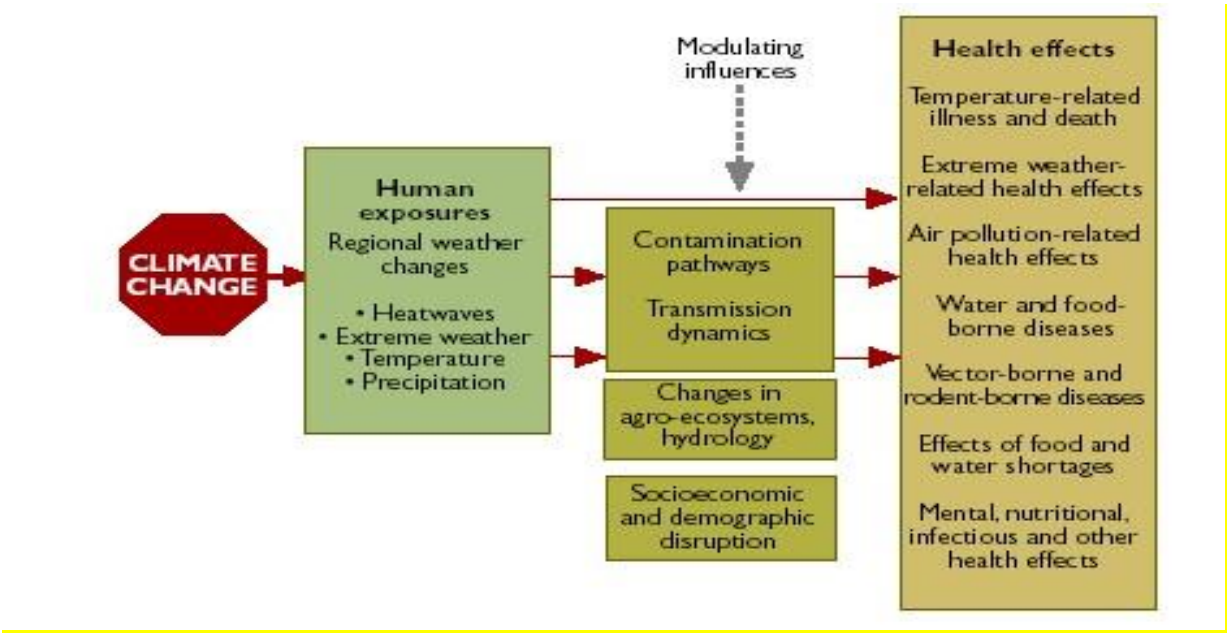

Figure 3: Impacts of Climate Change on Human Health

(Source: WHO, 2020 https://www.who.int/globalchange/summary/en/index2.html)

Machakos County faces an increasing risk of malaria and other vector-borne diseases due to changing climate conditions. There is also an upward trend in the level of waterborne and airborne diseases due to water pollution of rivers such as Athi and chemicals and gases emitted from industrials areas such as Mavoko Sub-county. Lack of adequate and quality food due to climate change effects affects a great number of people in the county which has led to poor health especially among the vulnerable populations. Some of the climate change-related health consequences arising include an increase in acute respiratory infections and malaria; emergence and re-emergence of Rift Valley fever; *leishmaniasis* and malnutrition. Flooding events increases the risks of water-borne diseases, such as cholera, dysentery, and typhoid, which impacts more on the most vulnerable people in society.

Climate change threats to human health are further cascaded due to impacts on human settlements. Settlements in Machakos County are classified into two broad categories, urban and rural settlements. Machakos is largely a rural society with most of its people living in dispersed rural settlements. According to the 2019 population census, Machakos County had a rural population of 1,007,854 while the urban population was 407,335. The urban settlements are mainly concentrated along main roads and highways passing through the urban and market centres forming linear patterns. Land in Machakos County urban areas has no well-defined zones for specific land uses. All existing physical development plans apart from Machakos New Town Local Physical Development Plan is out-dated and not implemented. The population living in informal settlements is estimated at 60,000 and 100,000 individuals who live as squatters within Machakos County urban centres. Most of these informal settlements are found in Mavoko Sub-county.

Flooding events lead to disruptions to water supply and sanitation systems and health-care infrastructure which have a huge implication on human settlements.
Drought compromises water quality and increases the operating costs of water systems while reducing their reliability. Water stress has increased because of changes in precipitation and the consequent decline in water supply and quality and increased demand for water. Increased water scarcity means less water is also available for hygiene.

There is a need to build the resilience of the built environment in human settlements to avoid the devastating impacts of climate change. Such measures may include developing effecting flood control strategies, ensuring effective waste management, and invest in urban infrastructure such as sewerage and storm water drainage systems. This is very critical for Machakos County due to increasing population demand as a result of its location in the Nairobi Metropolitan Region.

The County acts as the 'bedroom' for Nairobi County, with most of the people working in Nairobi but residing in Machakos. Consequently, the demand for human settlement and requisite support infrastructural services such as sewerage and sanitation remain high.

Action plans on sustainable waste management are necessary for building climate resilience. Machakos County generates significant volumes of solid waste with the main sources being households, marketplaces, urban centres, institutions, and industrial zones. Garbage disposal is done by the County Government, private firms, and individual households. Individual waste disposal is predominant and accounts for about 48.4% of total waste disposal methods (CIDP, 2015). Increasing population coupled with acceleration industrialization and urbanization rate have contributed to increased waste generation from industrial, commercial, medical, and domestic waste with an estimated daily tonnage of 204 tonnes which is above the County ecological footprint (KNBS, 2019). The main challenges associated with the waste sector in the County include:

- The waste generators do not minimize waste by reducing, reusing, refusing, or returning waste.
- Lack of waste segregation at source.
- Lack of provision of colour coded bags or bins by waste companies to promote waste segregation.
- Most waste transport vehicles are unroadworthy, hindering effective waste management.
- Limited ability by waste service providers to access some urban settlement areas due to poor road infrastructure and congestion.
- Lack of public sensitization on sustainable waste management leading to a lack of recycling and waste segregation, littering, and illegal dumping of waste in undesignated areas.
- Lack of technical capacity and poor financing of County Government
- Weak enforcement of waste policies and laws leading to inefficient management of solid waste.

Lack of sound solid waste management such as dumping in undesignated areas affects the effectiveness of water runoff systems and flood control mechanisms, increasing the vulnerability of urban areas to floods, pollution of water sources, and blockage of sewer lines. Open burning of wastes in dumpsites is a common practice and this leads to the release of GHG emissions into the atmosphere, which consequently contributes to climate change effects.

Machakos County has formulated and enacted the Machakos County E-waste Act of 2015, which seeks to establish the institutional framework for the management of e-waste in the county. This will go a long way in addressing

climate change impacts that arise due to poor disposal of e-waste such as releases of ozone-depleting substances. Although the waste sector accounts for only about 3% of total national GHG emissions, Kenya's main guiding approach to waste management is the "zero waste principle" which is stipulated in the National Solid Waste Management Strategy. The County should adopt the same approach to promote integrated waste management across all the sectors, with priorities given to the 3R principles of Reduction, Recycling, and Recovery.

In terms of sanitation, Machakos County two sewer lines located in Athi River and Machakos town. Approximately 50% of the population in Kariobangi and Mjini use pit latrines due to lack of sewer connection (CIDP, 2018). As of 2018, 250,000 households were reported to be using safely managed sanitation systems (CIDP, 2018). The County Government's goal is to make Machakos County an open defecation free County by 2027 and the County has undertaken measures to achieve this goal through construction and expansion of sewer lines across the County and construction of free public toilets in bus parks and market centres.

Table 10: Enhance the Resilience of Human Settlements

Strategic Objective 3:	**Mainstream climate change adaptation into the health sector; develop effective sanitation mechanisms and**		
Action	**Wards**	**Expected Results by 30th June 2027**	**Adaptation/ Mitigation**
Develop a County Integrated Solid Waste Management system	Machakos Central Masii Athiriver Mlolongo/syokimau Matuu Tala Kangundo central Wamunyu Mwala Muthwani Kinainie	▪ Develop a County integrated solid waste management policy to guide sound management of waste in the county with priority on reduction, recycling, and recovery practices. ▪ Develop a waste management strategy for managing the increasing volume of emerging waste streams such as sanitary waste and	*Mitigation* GHG emission reductions

		baby diapers. ▪ Increase the acreage of land for regional sanitary landfill by 20%. ▪ Construction of a Regional Sanitary landfill in Machakos New City Site ▪ Enforcement of the Machakos E-Waste Management Act of 2015 to curb the rising volumes of e-waste in the county. ▪ Install dustbins in all major public places including bus parks, green parks, and streets	
Promote sustainable human settlements	Machakos Central Masii Athiriver Mlolongo/syokimau Matuu Tala Kangundo central Wamunyu Mwala Muthwani ▪ Kinainie	▪ Establish and upgrade 50% of sewerage and drainage systems across the county. ▪ Improve access to sanitation facilities in market centres through the construction of 80 modern toilets. ▪ Increase number of households using safely managed sanitation system by 60%.Resolve any conflicting land uses in the County Urban Spatial Plan for effective development and	*Adaptation* Increases resilience of urban settlements

		management of human settlements. ▪ Enhance partnerships and working relationship with the national government and neighbouring counties such as Makueni and Kajiado, to promote infrastructural development.	
Control flooding in human settlements	▪ Athi river, Tala, mlolongo /syokimau ▪ Matuu ,Masii	▪ Reduce incidences of flash flooding especially in urban settlements by 80% ▪ Develop proper drainage systems in all flood-prone urban areas.	*Adaptation* Addresses climate risk of flooding
		▪ Ensure proper urban planning and approval of plans aimed at promoting sound urban development and curtail developments in floodplains. ▪ Promote urban forestry to increase surface covered by trees in urban areas by 40% to moderate heat and increase infiltration of surface run-off.	

Enabling Action (technology and capacity building)	Machakos Central Masii Athiriver Mlolongo/syokimau Matuu Tala Kangundo central Wamunyu Mwala Muthwani ▪ Kinainie	▪ Develop a system for surveillance and monitoring of climate-related diseases such as respiratory illnesses. ▪ Promote transition to clean cooking to reduce the number of deaths due to indoor air pollution	Enabling
Enabling action (capacity building)	Machakos Central Masii Athiriver Mlolongo/syokimau Matuu Tala Kangundo central Wamunyu Mwala Muthwani • Kinainie	• Capacity building and awareness creation of community health workers and volunteers on climate-related health risks and disaster risk management aimed at protecting human health.	Enabling
Enabling Action (policy and regulation)	Machakos Central Masii Athiriver Mlolongo/syokimau Matuu Tala Kangundo central Wamunyu Mwala Muthwani ▪ Kinainie	▪ Develop a County Integrated solid waste management policy and plan that is consistent with the National Waste Management Strategy and other relevant policies. ▪ Develop a County framework for wastewater management. ▪ Enforce the Machakos E-Waste Management Act of 2015	Enabling

		▪ Establish proper building codes and standards to prevent developments on floodplains.	
	Relevant Institutions: Machakos County Government; County Departments of Health and Emergency Services; Agriculture, Food Security and Co-operative Development; Finance and Economic Planning; Water, Irrigation, Environment, and Natural Resources; Lands, Energy, Housing and Urban; Roads Transport and Public Works; Ministry of Health; Machakos Water and Sewerage Company; NEMA; Kenya National Bureau of Statistics (KNBS): Private Sector, Youth organizations, Women's Groups. All County sectors to identify actions to realize the strategic objective.		

Priority 4. Environmental Conservation and ecosystem protection

Issue/Problem: Unrestricted development such as quarrying activities, agricultural expansion, settlement, and infrastructure development, coupled with increased dependence on non-renewable biomass such as firewood for cooking leads to deforestation and forest degradation. This affects the prosperity of wildlife and contributes to increasing GHG emissions.

3.2.3 Recognizing the Intrinsic Value of Machakos Fragile Ecosystems

Machakos County has varied tourist attraction sites including dams (e.g. Masinga), plateaus (e.g. Yatta and Kapiti plains), hills (e.g. Iveti and Lukenya), park (Ol Donyo Sabuk), falls (Fourteen Falls), rivers (e.g. Athi), and areas of cultural heritage. The lower part of Mavoko Sub-county comprises of wildlife ranches and is also a wildlife corridor that serves animal migratory route to Nairobi National Park, Amboseli, and Ol Donyo Sabuk game reserves. Ol Donyo Sabuk National Park is a protected area

within which is under the management of Kenya Wildlife Service (KWS). Private owned ranches include Kapiti, Konza, Maanzoni, Stone Athi, which contain wildlife such as zebras, impala, buffaloes, hyena, and lions. Other tourist attraction facilities include McMillan Castle, Kyamwilu gravitational defying area, Komarock shrine, Masaku Footprint Rock in Kiima Kimwe, AIC Mumbuni (the first church in Machakos), wood carving in Wamunyu, Yathui traditional shrine, Masinga dam, Yatta Plateau, Katoloni Prayer mountain, Maanzoni Sanctuary, Machakos People's Park and Kenyatta Stadium (CIDP, 2023).

The County is also endowed with several ecosystems such as forests, hills, savannah grasslands, shrubs and herbs, woodlands, and freshwater ecosystems. The forests ecosystems in the county include Iveti, Muumandu, Uuni Hill, Kiteta Hill, Kalimanzalu Hill, Mango Hill, Kibauni Hill, Nguluni, Matetani-Muisuni, and Kithatani forests. These ecosystems are rich in biodiversity which includes mammals, birds, insects, fish, amphibians, and reptile species, and plants. The main wildlife species in the County include antelopes, zebras, wildebeests, elands, giraffes, Thompson's gazelles, grant gazelles, elephants, hippopotamus, buffaloes, waterbucks, lions, cheetahs, leopards, warthogs, ostriches, impalas, dik-diks, hyena, reedbucks and a variety of birds and fish species within the water sources (Tilapia, catfish, common carp) (CIDP, 2023). Dominant plant species include Acacia, Croton, Eucalyptus, Grevillea, desert date, among others. Fruit tree species include mangoes, oranges, lemon, papaya, loquats, water berries, custard apple, and guava. These are mostly found on farms, with a few naturally growing in the wild. More than 45 species of birds have been recorded mostly at Ol Donyo Sabuk National Park. Potential migration of wildlife to other areas and extinction of some species due to climate change has adverse impacts on ecologically sensitive tourist destinations.

Forests in Machakos County are State, County, and privately owned. In 2022, the proportion of land covered by forest in Machakos County is estimated at 3.4% which is equivalent to 2,516.19Ha (CIDP, 2023). This proportion is significantly low compared to Kenya's forest cover which is estimated at 7.4% of land area. The forests in Machakos comprise of natural forests, plantation forests, and open woodlands. The State forests in Machakos are namely Iveti forest 364.07Ha, Muumandu forest 139.22Ha, Uuni Hill 92.7Ha, and Kiteta Hill 11.0Ha. Machakos County forests include Kalimanzalu Hill forest 110.0Ha, Mango Hill forest 45.0Ha, Kibauni Hill forest 1619.4Ha, Nguluni forest 28.8 Ha, Matetani-Muisuni forest 42Ha and Kithatani forest 12Ha translating to a total forest area of 2,516.19Ha (CIDP, 2023). The wooded savannah grassland area covers lower hill slopes and comprises mostly of Combretum *spp* and Acacia *spp* bushlands.

Forests have multiple economic, environmental, social, and cultural values. The benefits achieved include the provision of forest goods such as fuel wood and timber, acting as water catchment areas, biodiversity conservation, and provision of food and fodder for livestock. The main forest products in the County are firewood, charcoal, poles, posts, and timber for building and construction. Other

tree uses include wood carvings in Wamunyu and apiculture for domestic and commercial purposes (CIDP, 2023). The ecological functions of forests include carbon storage, nutrient cycling, water, and air purification, and maintenance of wildlife habitat. Forests also support the subsistence livelihoods of many communities, such as forest resource users who depend on forest goods. The forests in Machakos support some of the threatened indigenous tree species such as *Prunus africana* (*Muumba ume* in Kamba) and East African blackwood (*Muvingo/ Mukelete* in Kamba).

Environmental degradation is a major concern in Machakos County. The major drivers include unsustainable and rampant sand harvesting and deforestation. The main factors leading to deforestation include unsustainable utilization of forest products such as timber harvesting and charcoal production; land clearance for agriculture and weak policies governing the management of the forest sector. This consequently results in releases of large amounts of greenhouse gases due to loss of vegetation cover, flooding, and expansive soil erosion. These impacts are exacerbated further by climate change.

The quarrying industry contributes significantly to the economy of Machakos County wherein the Financial year 2021/2022, the sector contributed KES 142million to the economy of the County. However, increasing quarrying activities are of particular concern in the County. In recent years, most parts of the County such as Mavoko Municipality have become the epicentre of the impacts of quarrying activities. This is done discriminatorily even in some forested areas. Until the year 2000, there was only one cement factory in the area. In the last ten (10) years, there has been an upsurge of other companies namely Simba Cement, Mombasa Cement, Savannah Cement, Bamburi Cement, Blue Triangle, The East Africa Portland, Rhino Cement, and Athi River Mining, which have opened quarries and developed plants in the area. The emission of dust from the industries has resulted in both land degradation and air pollution in the area. There are many other quarries in the county in which the extraction of rocks, stones, sand gravel, construction aggregate, and limestone has occurred. The extraction is mainly as raw material for industrial use, road construction, or housing. These quarries pose a great hazard to the environment, people, and economic development in general due to:

- Increased threat due to injuries and deaths to people from blasts done using explosives.
- The weakening of the soil structure causing mild land movements which may lead to structures developing cracks and collapse eventually.
- The quarry pits store surface runoff and since they are not maintained and restricted, they have become death traps to locals especially kids who go swimming. These waters are also mosquito breeding groups and bring diseases such as malaria to the locals.

- Air Pollution: due to massive dust and other emissions that cause respiratory complications, skin rashes, eye itching in humans, plant, and wild animals' deaths.
- Quarrying activities destroys the natural landscapes and loss of agricultural land, which is converted to mining, escalating the challenge of food security.
- Quarrying also lowers water tables which further implicated the water scarcity issue and alters the direction of water flow along the Athi River which is dangerous to the downstream ecosystem.

Climate change puts a strain on the forestry sector due to suppressed growth and development of tree species and other vegetation. This result in reduced biodiversity and limits the ability of forests to deliver crucial forest goods and services. This has direct negative implications on the wildlife and tourism sectors which are highly dependent on forest productivity. Tourist facilities are also affected by reduced availability of water and lack of access due to damaged roads and infrastructure due to floods and drought.

3..2.3.1 Enhancing sustainable management of forests

The multiple benefits achieved from a sustainable forest management system should not be overlooked when developing priority action plans. Forests provide ecological services that are essential in reducing the vulnerability of people and wildlife to the impacts of climate change. Women and forest resource users play a key role in managing forests and are crucial to integrating forest conservation activities in livelihood activities.

Forests act as "carbon sinks" by sequestering carbon dioxide from the atmosphere and storing it for long periods which is important in mitigating the harmful effects of GHG emissions. Forests also provide hydrological ecosystem services through regulation of storm waters, increase infiltration of water to replenish the water table, reduce surface run-off, and controlling soil erosion.

However, the achievement of these benefits in the county is threatened by illegal logging activities; overexploitation for firewood, poles, and timber; charcoal burning; overgrazing; forest encroachment to provide land for settlement, agriculture, and development projects. The forestry sector is also faced with the challenges of unsustainable utilization of forest resources; lack of capacity to value forest goods and services; lack of harmonized guidelines on the management of trans-boundary forests resources; and lack of proper forest zonation. Declining forest cover affects critical ecological functions such as carbon sequestration, soil erosion control, water catchment areas, and the conservation of wildlife habitats and genetic resources.

Other environmental challenges affecting the forestry sector include the use of out-dated inventories on forest resources; control and management of privately

owned forest resources; increasing incidences of droughts and dry spells; water scarcity; conflicting land uses; and low survival rates of planted tree seedlings. Priority actions in the CCCAP 2023-2027 aim at implementing actions that combat deforestation and promote afforestation and restoration of degraded lands, promote sustainable charcoal production systems and clean cooking solutions; promote conservation of wildlife resources; and development of tourism facilities. These will be achieved through:

- Mapping of forest resources within the county and updating the forest inventories.
- Reforestation of degraded areas
- Afforestation of bare areas
- Encouraging agroforestry
- Creation and adoption of incentives on the management of forest resources
- Implementation of forest regulation and enforcing compliance with the same.
- Develop and harmonize management strategies for trans-boundary forests resources.
- Monitoring of forest resources
- Implementation of Transition Implementation Plans (TIPs)
- Establishment of community-based and joint forest management,
- Management and sustainable utilization of forests,
- Valuation of ecosystem goods and services and value addition for forest products
- Conservation of wildlife areas
- Diversification of tourism products

These will consequently contribute towards an increase in the County's forest cover and sustainable ecosystem management, economic growth, poverty reduction, and food security, and will enhance the capacity of communities to adapt to climate change.

Table 11: Rehabilitation of Degraded Lands

Strategic Objective 4:	**Increase forest/tree cover of Machakos County to 10% of total land area; rehabilitate degraded lands;**		
Actions	**wards**	**Expected Results by 30th June 2027**	**Adaptation/ Mitigation**
Afforest and reforest degraded and deforested areas in the County.	Kathiani Mumbuni Mutituni Mua Matungulu East Kangundo North Kibauni Kola/Muumandu	Increase the proportion of land covered by forests from 3.4 % to 10% through: Increase number of trees planted & survived to 3Million. o Establish& operationalize 8 sub-county tree nurseries especially with women, youth, and PLWD groups, and registration of all existing tree nurseries. Formulate an effective forest management plan. Promote agroforestry especially with fruit trees to increase number of small-holder farmers practicing agroforestry by 50%. Increase the	*Adaptation* Increased forest cover to 10% *Mitigation* Reduced GHG emissions

		proportion of land covered by forest in Machakos new town from 1% to 22%. Formulate regulations that promote setting aside a percentage of land for tree planting by project developers.	
Reduce deforestation and forest degradation.	Kathiani Mumbuni Mutituni Mua Matungulu East Kangundo North Kibauni Kola/Muumandu	Reduce deforestation and degradation of forest areas through the following actions: • Promote access to alternative energy sources such as clean cooking by increasing the percentage of households with access to clean energy by 70%. • Organize forums for public sensitization on clean cooking and renewable energy opportunities. • Enhanced protection of natural forests and rangeland	*Adaptation* Increased forest cover to 10% *Mitigation* Reduced GHG emissions

		areas through the following interventions: • Promote community/participatory forest management and equitable sharing of accrued benefits with the community. • Restriction of quarrying activities in forested and rangeland areas • Increased value addition for forest products • Mapping out of county forests to control encroachment. • Promote sustainable timber production on privately-owned forests. • Establish Participatory forest management plans for the Community Forest Associations (CFAs)	

Restore degraded forests and grasslands.	Kathiani Mumbuni Mutituni Mua Matungulu East Kangundo North Kibauni Kola/Muumandu	• Restoration of degraded forests and rangeland areas, through initiatives such as: • Supporting the natural generation of degraded lands through conservation and sustainable forest management. • Forest restoration through reforestation approaches. • Maintain and enhance natural ecosystems within forest landscapes. • Actively engagement of stakeholders in the forest sector including vulnerable groups, in planning and decision-making regarding land use, restoration goals and strategies, benefit-sharing, and monitoring. • Promoting planting of	*Adaptation* Increased forest cover to 10% *Mitigation* Reduced GHG emissions

		indigenous tree varieties.	
Conserve wildlife land areas and habitats	• Kyeleni • Matungulu North • Masinga Central • Ekalakala • Kivaa	• Conserve wildlife habitats and land areas to support a broad range of wildlife and plants under changed climatic conditions. • Reduce human-wildlife conflict by 50% and organize sensitization forums on human-wildlife conflict. • Fencing and increased surveillance in the National Park and Forest areas to control encroachment. • Land-use regulation near the parks and along with the wildlife migratory routes • Promote best practices in wildlife management and environmental conservation in Kilimambogo	*Adaptation* Increases area for wildlife habitat Addresses climate risk such as increased human-wildlife conflicts

		National Park and other wildlife migratory routes. • Conservation of riparian reserves and promotion of compatible land use along the water bodies • Improved wildlife surveillance to control illegal poaching	
Promote tourism and diversification of tourism products	• Wamunyu • Mutituni • Kyeleni • Matungulu North • Masinga Central • Ekalakala • Kivaa	• Promote diversification of tourism in the county through initiatives such as; • Development of potential tourist attraction areas • Develop niche products such as ecotourism, cultural tourism, sports tourism, bird watching, and heritage and historic sites. • Develop tourism infrastructure to enhance access to tourism facilities. • Promote proper management of wildlife resources to attract more	*Adaptation* Alternative livelihood Addresses climate risk such as increased human/ wildlife conflicts

		tourists.	
Enabling action (technology)	• Machakos county	• MRV technologies such as remote sensing and global positioning systems, computer tagging and tracking systems	Enabling
Enabling action (policy and regulatory)	Kathiani Mumbuni Mutituni Mua Matungulu East Kangundo North Kibauni • Kola/Muumandu	• Implementation of forest Transitional Implementation Plans (TIPs) • Development of a County Forest Management Policy • Mapping of County forests • Land use planning and zoning to segregate and identify forest and wildlife areas for conservation	Enabling
Enabling action (capacity development	Kathiani Mumbuni Mutituni	• Build the capacity of relevant wards	Enabling

)	Mua Matungulu East Kangundo North Kibauni Kola/Muumandu	institutions to efficiently implement the devolved function of forest managemen t concerning community forests.	
	Relevant Institutions: Machakos County Government; County Climate Change Coordination unit; County Departments of Water, Irrigation, Environment, and Natural Resources; Lands, Energy, Housing and Urban Development; Finance and Economic Planning; County Administration and Decentralized Units; Agriculture, Food Security and Co-operative Development; Public Service, Quality Management and ICT; Tourism, Culture, Youth and Sports; Education, Skills Training and Social Welfare; Kenya Forest Service (KFS); Kenya Forestry Research Institute (KEFRI); NEMA; Kenya Wildlife Service (KWS); Kenya Wildlife Service Training Institute (KWSTI); Water Resources Management Authority (WRMA); Wildlife Conservations Society (WCS); Wildlife Conservations NGO's; Community Forest Associations; Youth and women groups. All County sectors to identify actions to realize the strategic objective.		

Climate Change Priority 5: Disaster (Drought and Flood) Risk Management

Issue/problem: Drought and floods in Machakos County causes devastating socioeconomic and environmental impacts that affect households and businesses with more impact on the vulnerable groups. The current county responses to the climate change effects are reactive rather than proactive, and their implementation is hampered due to inadequate early warning systems, lack of disaster management coordination, and limited support to build disaster preparedness.

3.2.5 Impacts of climate disasters on the economy of Machakos County and the livelihoods of communities.

The communities within Machakos County are often hit by the impacts of the disasters which are mostly climate or weather-related, affecting their livelihoods

through disruption of economic activities, food insecurity, damage to property and infrastructure, and increased prices of food, fuel, and other goods.

Increased periods of droughts in the county due to scanty or failed rains is a common occurrence like many other semi-arid areas in Kenya. This is due to climate change effects and this has made some households extremely vulnerable, hence reducing their ability to spring back to cope with these devastating weather conditions. Agriculture is equally affected by the impacts of climate change due to crop failure as a result of drought, degradation of productive agricultural land, diminishing pastureland and loss of livestock. This has consequently affected food security in the county, and this has implicated the more vulnerable groups in the community such as children, the elderly, persons living with disabilities and pregnant women due to increased malnutrition. To mitigate these effects, farmers have developed both indigenous and modern strategies such as the provision of relief food, outmigration, destocking-restocking, remittances and donation, market exchanges, and the provision of savings and credit facilities.

Machakos County climate is semi-arid, with two distinct rainy seasons, the long and the short rain seasons. The County has a bimodal rainfall pattern with the long rain season starting at the end of March and continuing up to May, while the short rain season starts at the end of October and lasts till December. The annual average rainfall ranges between 500mm to 1,300mm, and the mean annual temperature is 26°C, which ranges between 20.4°C in the upper highlands to 34°C in the midlands. Low temperatures are experienced in July and August while January, February and March are the hottest months. Rainfall patterns within the county have become irregular and unpredictable, and when it rains, the downpour is more intense. The recently witnessed long rains between March and May 2018 left rivers such as Athi River and Mto wa Mawe that cuts across Machakos County and fed by the Ngong hills flooded and wreaked havoc to people residing near riparian land. Flooding incidences are particularly common in Matungulu and Kangundo Sub-counties.

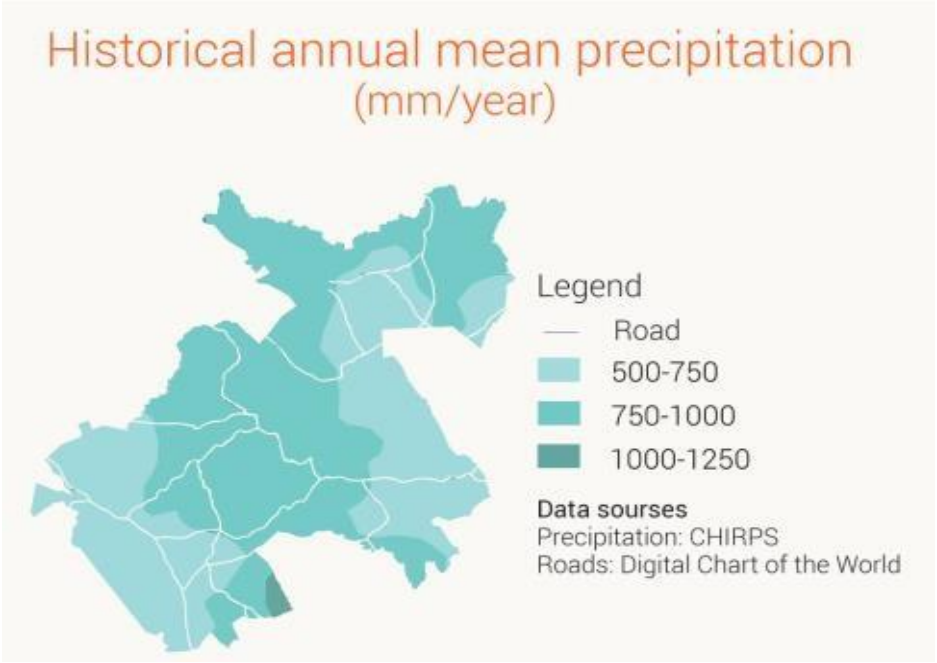

Figure 4 Historical Annual Mean precipitation of Machakos County

(Source: MoALF, 2017)

The unpredictable rainfall has further aggravated the already existing water scarcity challenge in Machakos. Most of the time women and girls are forced to walk for long in search of water to meet their domestic water demand. This has also affected pastoralist communities who solely depend on rainfall to nurture their grazing lands. Due to drought, pastureland is slowly diminishing, which is leading to increased livestock deaths due to lack of forage and water. Consequently, this has affected the livelihoods of these pastoralist communities, triggering an up rise in insecurity and conflicts within and across the County.

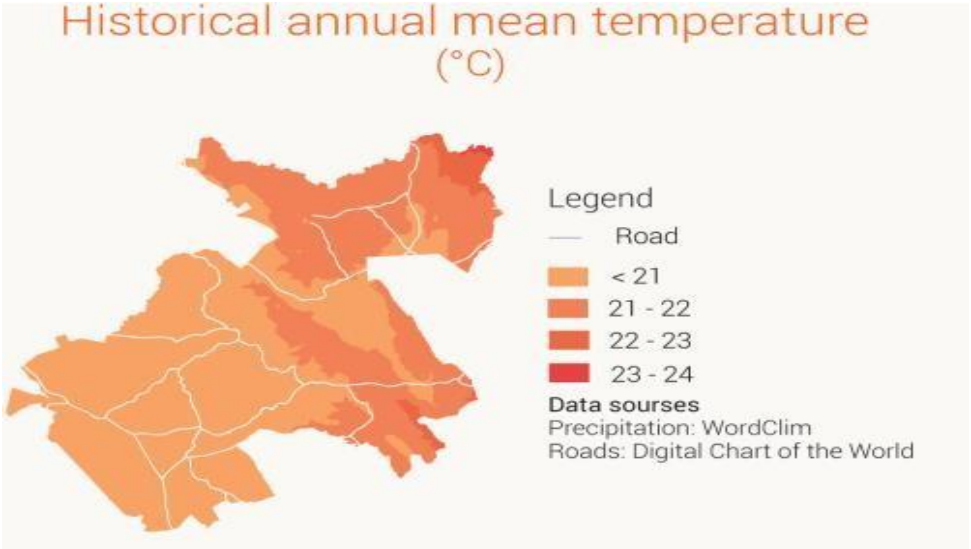

Figure 5 Historical Annual Mean Temperatures of Machakos County *(Source: MoALF, 2017)*

Some parts of the County such as Kinanie and Athi river are prone to flooding which causes widespread and more devastating impacts on communities. Floods have in recent years' submerged farms and villages and disrupted transportation networks in the County, consequently affecting food security and market distribution systems. These impacts range from loss of human life and livestock to widespread displacement of people, loss of crop yield, and damage to essential infrastructure.

Figure 6 Historical and expected heat stress and drought events in Machakos County (Source: MoALF, 2017)

3.2.5.1 A systemic approach for addressing climate-related disasters

The priority climate actions for tackling climate-related disasters require a systemic approach to establish a proactive approach to climate-related disasters. The actions aim at preventing or reducing the impacts of disasters, avoid emergencies and build the capacity of local people to reduce their vulnerability while strengthening their ability to cope with the impacts of climate change. These priority actions include flood and drought early warning systems at the County and community level, improved social protection programs for chronically food insecure community groups, establishment, and implementation of robust flood management plans. This entails run-off management, rainwater harvesting, and storage, developing proper drainage networks, reforestation, rehabilitation of riparian and quarry areas, construction of dams and water pans, and effective zoning to ensure land-use restrictions.

Other priority actions include the establishment and operationalization of the County Climate Change Fund to support locally identified priority adaptation actions and enhance community level capacity building to raise the community's awareness of climate disasters and their management. Men and women do not have the same adaptive and coping capacity to climate change. Women have a distinct vulnerability, increased exposure to risk and have less, coping capacity and ability to recover from climate change impacts. However, study shows that women are capable of adapting and generating ingenious mitigating activities against the effects of climate change especially when they engage in collective action through membership in women groups. Women groups are important when promoting uptake of new technologies and would therefore play a key role in implementation of interventions on food production and nutrition. In Machakos County, the merry-go-round women groups locally known as *"mwethya"* are widely recognised for their efforts in supporting and promoting adoption of soil and water conservation measures through labour sharing (Kamar 2001). Priority actions can be geared towards empowering these women groups to increase adaptive capacity to floods and droughts.

Promoting the use of cultural and traditional knowledge systems is also key in averting and managing climate-related disasters. Machakos County is largely inhabited by the Akamba tribe, which is rich in cultural and social practices that helps sustain the wellbeing of her people, animals, and plants and the ecosystems they live in. Some practices such as the use of traditional medicine, ecotourism, cultural beliefs, and practices exist as indigenous knowledge and have been applied for ages to save rivers, land, forest, and animals from overexploitation.

Most of these indigenous knowledge systems and cultural practices are not documented and are often disseminated through oral traditions. Proper collection, documentation, and dissemination of this information would go a long

way in supporting current and future generation to adapt to climate change impacts through key learning on:

- Crop rotation of cereals like millet, maize, and sorghum, and legumes such as cowpeas, green grams, and beans.
- Shifting cultivation to improve soil fertility.
- Establishment of holy places for worship under big indigenous trees which helped in their conservation since logging was discouraged. Trees with medicinal value and rare species that the community did not know their uses also were never to be cut.
- Taboos on kind of animals not to be eaten. The killing of some particular animal species was also believed to bring curses to households leading to their conservation.
- Knowledge of herbs and other resources for treating human and livestock diseases.
- Weather prediction and seasonal changes

Machakos County has made some milestones that are important for the realization of these priority actions. Key among these include:

- The drafting of Machakos County Climate Change Finance draft regulations of 2019 which provides for the setting up of the County Climate Change Fund.
- Budgetary allocation for disaster management in the CIDP 2018-2022, covering the development of Disaster Management bills and policies and enhanced disaster mitigation, preparedness, response, and recovery/rehabilitation.

The County has also promoted and supported drought coping mechanisms to safeguard the lives of the most vulnerable residents of the County. These efforts include promoting the planting of drought-resilient crops and crop diversification; provision of relief food; livestock destocking-restocking initiatives; and the provision of savings and credit facilities. The County has also put in place an Early Warning System for drought and supports the training of community and other relevant stakeholders on disaster response which has been done in collaboration with line ministries and relevant institutions and NGOs such as KMD and Kenya Red Cross Society respectively.

Table 12 Building Resilience to Disaster

Strategic Objective 5:	**Reduce risks to communities and infrastructure resulting from climate-related disasters such as droughts and floods.**		
Actions	**Wards**	**Expected Results by 30th June 2027**	**Adaptation/ Mitigation/ Enabling**
Increase number of households and entities benefiting from county climate change adaptive services	Machakos Central, Upper Kaewa, Kathiani Central, Kangundo Central, Kangundo East, Kangundo West, Kangundo North, Tala, Matungulu East, Mutituni, Mumbuni North Kalama, Kola, Muvuti/Kiima kimwe, Lower Kaewa, Mitaboni, Kangundo East, Matungulu West, Matungulu East, Matungulu North, Kyeleni Wamunyu, Kibauni, Ikombe, Katangi, Matuu, Ndalani, Kithimani, Kivaa, Ekalakala, Masinga central, Muthesya, Ndithini	The number of households able to cope with climate change more effectively due to support from the County Climate Change Fund increased by 50%. • Provide Climate Change Fund to address local adaptation priorities that are identified and monitored by ward planning committees. • Support 80 established women/youth groups across the county undertaking soil and water conservation to enhance their adaptive capacity.	*Adaptation*

	Upper Kaewa, Kathiani Central, Mua		
Improve the ability of people to cope with drought	Machakos Central, Upper Kaewa, Kathiani Central, Kangundo Central, Kangundo East, Kangundo West, Kangundo North, Tala, Matungulu East, Mutituni, Mumbuni North Kalama, Kola, Muvuti/Kiima kimwe, Lower Kaewa, Mitaboni, Kangundo East, Matungulu West, Matungulu East, Matungulu North, Kyeleni Wamunyu, Kibauni, Ikombe, Katangi, Matuu, Ndalani, Kithimani, Kivaa, Ekalakala, Masinga central, Muthesya, Ndithini • Upper Kaewa, Kathiani Central, Mua	• Improvement of early warning systems for drought and flood at the community level. • The number of recipients of climate information services that use the information in their risk management decisions increased to 75%. • Enhanced water harvesting and storage by increasing the construction of sand dams in homesteads to increase access to water for domestic use and crop production. • Promote the adoption and growing of drought tolerant crop varieties such as millet, sweet potatoes, sorghum and	*Adaptation* Addresses Climate risk due to high temperatures and low rainfall resulting in loss of crops and animals, and water scarcity

		cassava by small scale farmers.	
Improve the ability of people to cope with flood disasters and develop essential infrastructure	Wamunyu, Kibauni, Ikombe, Katangi, Matuu, Ndalani, Kithimani, Kivaa, Ekalakala, Masinga central, Muthesya, Ndithini	• Improved flood early warning systems, taking advantage of widespread access to mobile technology that provides an avenue for disseminating information. • Develop and implement integrated flood management plans, for example, water storage, drainage networks, reforestation and rehabilitation of riparian areas, construction of dams, land use restrictions.	*Adaptation* Addresses Climate risk arising due to heavy rainfall and flooding leading to damage and loss of infrastructure, property, and livelihoods

Enhance coordination and delivery of disaster risk management	Machakos Central, Upper Kaewa, Kathiani Central, Kangundo Central, Kangundo East, Kangundo West, Kangundo North, Tala, Matungulu East, Mutituni, Mumbuni North Kalama, Kola, Muvuti/Kiima kimwe, Lower Kaewa, Mitaboni, Kangundo East, Matungulu West, Matungulu East, Matungulu North, Kyeleni Wamunyu, Kibauni, Ikombe, Katangi, Matuu, Ndalani, Kithimani, Kivaa, Ekalakala, Masinga central, Muthesya, Ndithini Upper Kaewa, Kathiani Central, Mua	• Develop and implement a County disaster risk management policy. • Set up a County Disaster Risk Management Committee to coordinate disaster response at the County level. • Establish a County Disaster Risk Management Fund to provide funds for disaster preparedness, mitigation of disaster impacts, and disaster recovery measures	Enabling

Promote the use of cultural practice and traditional knowledge to increase resilience to climate change	Wamunyu, Kibauni, Ikombe, Katangi, Matuu, Ndalani, Kithimani, Kivaa, Ekalakala, Masinga central, Muthesya, Ndithini •	• Explore and promote cultural practices that promote environmental conservation. • Safeguard traditional knowledge, values, and practices that enhance the communities' resilience against natural disasters and climate change.	Adaptation Climate risk: extreme weather events, including droughts and floods
Enabling (policy and regulation)	• Machakos county	• County Disaster Risk Management Policy • County Disaster Risk Management Fund	Enabling

Table 13: Climate-Related Disasters

Strategic Objective 5:	**Reduce risks to communities and infrastructure resulting from climate-related disasters such as droughts and floods.**		
Wards	**Actions**	**Expected Results by 30th June 2027**	**Adaptation/ Mitigation/ Enabling**
Machakos county	**Enabling (technology)**	Expertise developed for flood and drought early warning and response	Enabling
Machakos county	**Enabling (capacity development)**	Capacity building for the County Disaster Risk Management Committee on disaster response	Enabling
	Relevant Institutions: Machakos County Government , County Climate Change Coordination unit; County Disaster Management Committee; County Depts. Of Education, Skills Training and Social Welfare; Agriculture, Food Security and Co-operative Development; Administration and Decentralized Units; Water, Irrigation, Environment, and Natural Resources; Tourism, Culture, Youth and Sports; Finance and Economic Planning; and Health and Emergency Services; Ministry of Devolution and ASAL Areas; National Drought Management Authority (NDMA); Water Resource Management Authority (WRMA); Kenya Meteorological Department; Climate Change Directorate; NGOs and CBOs; Water Sector trust fund (WSTF). All County sectors to identify actions to realize the strategic objective.		

Issue/Problem: The high rate of population increases and industrialization in Machakos County requires the transition to renewable energy to meet the rising energy demand. Households need to shift from the use of non-renewable biomass (firewood and charcoal) to more sustainable and clean fuels to achieve to reduce demand for biomass fuel; reduce deforestation, indoor air pollution-related illnesses, and deaths, and GHG emissions.

3.2.6 Energy and transport sectors contribution to Climate Change

Climate change impacts such as drought lower water levels in rivers and dams reducing the capacity for hydro-generated electricity. Increasing water scarcity due to prolonged droughts may raise operating costs for companies. Flooding events lead to the siltation of hydropower dams and lead to extensive damage to the road network.

Well-functioning transportation infrastructure increases the efficiency and reduces the costs of moving goods and people. Machakos town has a well-organized route network, although small but jointly organized with key stakeholders. In addition, the County has a general transport policy and one on non-motorized transport. The sector is impacted by climate change due to disruptions on design, construction, location, and operations of transport infrastructure. Higher temperatures due to climate change can cause pavements to soften and expand, creating rutting and potholes; and warping of rail tracks, requiring track repairs or speed restrictions to avoid derailments.

Addressing climate change in the transport sector means working towards reducing greenhouse gas emissions while encouraging the development of climate-proof infrastructure that accounts for flooding, extreme weather events, and other effects of climate change (KEPSA, 2014). Currently, the transport system operations are dependent on petroleum products and the profitability is closely tied to oil prices. Actions that promote improvements in fuel efficiency can lead to cost savings for businesses while reducing greenhouse gas emissions.

Nationally, the energy sector accounts for about 7.1% of total emissions, while transport emissions projected to rise to 17% of total national emissions in 2030 (NCCAP, 2018). Reducing GHG emissions in these sectors through improved fuel efficiency and shifting to more energy-efficient modes and technologies is essential in achieving sustainability of the sector.

Charcoal burning is a prevalent practice in Machakos County due to the high demand for charcoal. This targets mainly indigenous tree species such as *Acacia tortilis* and *Acacia abyssinica*. Charcoal burning leads to the release of emissions such as carbon dioxide (CO2), carbon monoxide (CO), and methane (CH4) which send tiny particulates into the air. Air pollution adversely affects human health and the environment. Particulates are associated with respiratory and eye diseases, like asthma, lung cancer, and conjunctivitis, especially in the young and elderly who are more vulnerable. Air pollution is also a major contributor to effects such as acid rain, which has been responsible for much damage to soil, fish resources, and vegetation. Additionally, it is a major contributor to deforestation in the County,

which already faces disproportionate effects of climate change being an ASAL area.

3.2.6.1 Identifying opportunities for improving the energy and transport sectors

The CCCAP 2023-2027 promotes actions aimed at promoting the transformation of the energy and transport systems in Machakos. The CIDP 2018-2022 recognizes the current challenges in the transport sector, key among them being inadequate transport infrastructure and frequent damages due to floods. The adverse consequence of transport activities in Machakos County on the environment is noise and carbon monoxide emissions which have direct harmful effects. The overall cumulative impacts on the ecosystem include climate change.

Masinga dam is one of the Seven Folks dams, located within the county that produces hydroelectric power for the national electricity grid. The main source of water for the dam is Tana river which is utilized for other uses such as small-scale irrigation and fisheries. Other dams located in the Machakos and Embu border include Kindaruma, Gitaru and Kamburu which produce total hydroelectric power estimated at 450 MW. Control of upstream water utilization is needed to support more power generation and protect the catchment areas. Other sources of energy supply in the county include solar, wind, biogas. Embracing alternative energy solutions such as wind & solar energy has a huge potential for countering climate change impacts in the energy sector. The Mombasa road-Namanga interchange has been installed with wind and solar hybrid streetlights and this can be replicated to other areas to achieve more effect. To date, the County has installed 753 solar integrated streetlights.

The County Government plans to pursue avenues which will generate affordable and reliable energy supply such as solar energy, wind energy, and biogas through public-private partnership as well as enhance rural electrification in conjunction with the National Government (CFSP, 2019). A research carried out on energy and demand assessment shows that Machakos County has huge solar energy potential with a yearly average solar irradiance of 2130 kWh/m2 and a peak hourly GHI of 1556 W/m2. Simulated PV energy production from these radiation levels gives a yearly average PV energy potential of over 1740 kWh at 1 kW peak installed capacity. With the huge solar PV potential, Machakos County can support a solar photovoltaic system for off-grid electrification.

Table 14: Transport Sector

Strategic Objective 6a: Develop and manage effective, efficient, sustainable, and secure transport systems and infrastructure that can withstand the devastating impacts of climate change.

Issue/Problem: The transport sector in Machakos County faces the challenges of increased traffic congestion, high fuel consumption, and inefficiency of transport operational systems which lead to high levels of GHG emissions. Transport infrastructure especially roads is also prone to damage from extreme weather events such as flooding.		
Action	**Expected Results by 30th June 2027**	**Adaptation / Mitigation**
Develop climate-proof transportation infrastructure	• Conduct a transport system audit to identify gaps and make actionable recommendations with an emphasis on water harvesting and floods mitigation. • Construct and create awareness on use of Non-Motorized Transport (NMT) facilities, including pedestrian and bicycle pathways within and to town centres. • Develop and disseminate climate information for use in infrastructure planning and formulation of transport resilience plans	*Adaptation* Reduces the vulnerability of transport infrastructure from climate risk due to extreme weather events
Enabling **(capacity development)**	• Build capacity for the Machakos County staff in the transport sector to develop transport plans • resilient to climate change impacts	Enabling
Enabling **(policy and regulation)**	• Develop an Integrated County Transport Policy that makes provision for the construction of NMT facilities in all major roads across the county. • Develop regulations for the development of climate-proof transport infrastructure	Enabling

Relevant Institutions: Machakos County Government; County Departments of Roads Transport and Public Works; Lands, Energy, Housing and Urban Development; Public Service, Quality Management and ICT; Public Service, Quality Management and ICT; Nairobi Metropolitan Area Transport Authority (NAMATA); National Transport and Safety Authority (NTSA); Kenya National Highways Authority (KeNHA); Kenya Rural Roads Authority (KeRRA); Kenya Urban Roads Authority (KURA); Motorists Association of Kenya (MAK); Kenya Railways Corporation (KRC); Private Sector, and Academic and Research Institutions. All County sectors to identify actions to realize the strategic objective.

3.2.6.2 Clean Cooking Interventions

Shifting to clean cooking is a priority action that seeks to reduce the high energy demand in the county. This is anticipated to reduce GHG emissions associated with the use of fossil fuels, improve health due to reduced indoor air pollution-related illnesses especially for women and children, and lead to cost-saving benefits due to reduced fuel consumption. Overall, this shift will also reduce deforestation and rate of environmental degradation,

Priority actions on clean cooking interventions should be integrated into community development initiatives and activities involving women and other vulnerable groups including PLWD groups, who are mostly affected. The County has put in place several strategies towards promoting sustainable energy through:

- Promotion of renewable energy through the development of demonstration sites; embracing alternative energy solutions through installation of wind-solar hybrid streetlights and capacity building in renewable energy through staff training.
- Promotion of efficient technologies for production, conversion, and utilization of biomass energy
- Promotion of alternative sources of cooking fuel rather than woodlot such as briquettes.

Strategic Objective 6b:	Promote adoption of renewable energy that is resilient to climate change, promote energy efficiency to reduce energy demand; and encourage a shift to clean cooking that reduces the demand for biomass.		
Actions	**Wards**	**Expected Results by 30th June 2027**	**Adaptation/ Mitigation**
Increase access to electricity and support the adoption of renewable energy for electricity generation.	Masinga, Yatta, Mwala, Kangundo, Matungulu, Kola, Kalama, Kathiani sub counties	▪ Increase the percentage of households with access to electricity to 100% ▪ Create awareness and promote the development of new renewable energy sources including biogas, hydro, Solar, and Wind. ▪ Increase the number of set renewable energy demonstration sites to 8.	*Mitigation* GHG emission reductions *Adaptation* Increases resilience of the energy sector from the impacts of drought
Promote energy efficiency and conservation in industries and households	▪ Masinga, Yatta, Mwala, Kangundo, Matungulu, Kola, Kalama, Kathiani sub counties	▪ Enhance partnerships with stakeholders in the electricity sector to improve the distribution of electricity and reduce losses in transmission by 60%. ▪ Develop and support energy efficiency and conservation projects promoting: - Efficient lighting in households and businesses - Energy efficiency in buildings such as solar water heating systems - Distribution of clean lighting devices such as Compact Fluorescent Lighting (CFL)	Mitigation *GHG emission reductions*

Table 15: Adoption of Renewable Energy

Strategic Objective 6b:	**Promote adoption of renewable energy that is resilient to climate change, promote energy efficiency to reduce energy demand; and encourage a shift to clean cooking that reduces the demand for biomass.**		
Actions	**Wards**	**Expected Results by 30th June 2027**	**Adaptation/ Mitigation**
Develop climate-proof energy infrastructure.	All wards in Masinga, Yatta, Mwala, Kangundo, Matungulu, Kola, Kathiani, Kalama sub counties	• Optimize hydroelectricity generation in Masinga dam through enhanced water management and conservation initiatives. • Implementation of water resource management action plans to control encroachment on water catchment areas. • Conserve and rehabilitate water catchment areas especially River Tana which feeds Masinga dam.	*Adaptation* Increases resilience of the energy sector from impacts of climate change such as floods

Promote the transition to clean cooking with alternative fuels, such as liquefied petroleum gas (LPG), ethanol, and other clean fuels in urban areas.	• All wards in Masinga, Yatta, Mwala, Kangundo, Matungulu, Kola, Kathiani, Kalama sub counties	• Reduce the percentage of households using solid biofuels for cooking to 45%. • Promote the use of biomass briquettes as alternatives to wood fuel by 10% of the County population. • Promote efficient conversion and cleaner utilization of biomass energy. • Promote the uptake of LPG, ethanol, and other cleaner fuels for cooking by 20% of households in the county by supporting a clean energy program that promotes: • Development of depots with LPG storage tanks and gas cylinders • Loan program through micro-finance institutions to assist with the up-front cost of cookers and cylinders.	*Mitigation* GHG emission reductions *Adaptation* Increase the proportion of people using clean cooking solutions to reduce the demand for biomass fuels.

Strategic Objective 6b:	**Promote adoption of renewable energy that is resilient to climate change, promote energy efficiency to reduce energy demand; and encourage a shift to clean cooking that reduces the demand for biomass.**		
Actions	**Wards**	**Expected Results by 30th June 2027**	**Adaptation/ Mitigation**
Encourage the uptake of clean improved biomass cookstoves and alternatives energy sources in rural areas	- All wards in Masinga, Yatta, Mwala, Kangundo, Matungulu, Kola, Kathiani, Kalama sub counties	- Support to local manufacture and servicing of clean cookers e.g. through tax-relief incentives for manufacturers; training and loans - Local clean fuel businesses stocking and delivering LPG and ethanol to consumers	

Encourage the uptake of clean improved biomass cookstoves and alternatives energy sources in rural areas	- All wards in Masinga, Yatta, Mwala, Kangundo, Matungulu, Kola, Kathiani, Kalama sub counties	▪ Increase number of households having access to clean cooking to 6000 which can be achieved through: ▪ Developing a County program that can offer loans through micro-finance institutions support the uptake of improved cook stoves. ▪ Support to the *Jua kali* sector within the County to manufacture quality and affordable clean cook stoves. ▪ Encourage and create a conducive environment for local businesses especially those owned by women, youths, and PLWD to engage in clean cook stoves businesses. ▪ Distribute 1,000 solar lanterns and 1,000 clean cooking stoves to support the work of women on an annual basis. ▪ Promote research, development, and adoption of biogas technology to generate renewable energy through the	*Mitigation* GHG emission reductions *Adaptation* Increase the proportion of people improve cook stoves to increase cooking efficiency.

Strategic Objective 6b	**: Promote adoption of renewable energy that is resilient to climate change, promote energy efficiency to reduce energy demand; and encourage a shift to clean cooking that reduces the demand for biomass.**		
Actions		**Expected Results by 30th June 2027**	**Adaptation/ Mitigation**
	All wards in Masinga, Yatta, Mwala, Kangundo, Matungulu, Kola, Kathiani, Kalama sub counties	construction of digesters for domestic use and biogas systems in slaughterhouses, schools, and public facilities.	
Enabling Actions (technology)	▪ All wards in Masinga, Yatta, Mwala, Kangundo, Matungulu, Kola, Kathiani, Kalama sub counties	▪ Promote climate change resilient technologies, such as the use of modern coolers and scrubbers in industries. ▪ Promote research and innovation of new and efficient energy technologies that will reduce GHG emissions.	Enabling
Enabling Actions (capacity development)	▪ All wards in Masinga, Yatta, Mwala, Kangundo, Matungulu, Kola, Kathiani, Kalama sub counties	▪ Training and awareness creation on climate change adaptation and mitigation mechanisms ▪ Training of *jua kali* artisans to produce improved cookstoves to enhance access. ▪ Introduce and support courses and training on renewable energy technologies in Technical and Vocational Education and Training (TVET)	Enabling

		colleges.	
Enabling Action (policy and regulations)	▪ All wards in Masinga, Yatta, Mwala, Kangundo, Matungulu, Kola, Kathiani, Kalama sub counties	▪ Develop a policy to support modern energy technologies. ▪ Develop County Energy Plan	Enabling
	Relevant Institutions: Machakos County Government; County Departme Lands, Energy, Housing and Urban Development; Finance and Economic Pla Water, Irrigation, Environment, and Natural Resources; REREC; EPRA; KETRACO; Power; PPP; KenGen; and KEPSA		

Climate Change Priority 7: Manufacturing and settlements

Issue/Problem: Climate change leads to scarcity of natural resources such as water and other inputs essential for production which affects performance of the sector. Unsustainable energy consumption practices in the manufacturing sector such as charcoal and cement production increases GHG emissions which lead to climate change.

3.2.7. Impact on Climate change in the manufacturing sector in Machakos County

Machakos is a highly industrialized county characterized by well-developed industrial activities such as meat processing, cement industries, quarrying, real estate, manufacturing, and flower farming. Most of the heavy industries are concentrated in Mavoko Sub-County. Some of the renowned industries within Machakos County include Portland cement, Bamburi cement, Mombasa cement, National and Athi river mining cement, and Savanna cement. The manufacturing industries includes; Saj Ceramics, and Devki Steel Millers. Mavoko Sub-county is also

home to the Kenya Meat Commission (KMC). The manufacturing sector is an important contributor to the economy of Machakos.

It is also the home of most of the cement factories that supply cement across the entire county, East African region, and COMESA. This harms the environment particularly the quality of water because of the emissions and discharges from these industries.

The number of industries is bound to increase drastically because of the New Machakos City which will be set up as well as the Investment Program that will be launched later in the year. Konza city which is within the County's environs is one of the flagships BPO projects, and some of the leading international firms like IBM, WIPRO, Microsoft, and Tata have shown interest of acquire space within the technology city. As part of vision 2030, the government has proposed the development of Konza ICT Technopolis in Machakos County. The city to be developed over 20 years on 5,000 acres of land is located about 47 Km from Athi River town. The proposed city will be a centre of ICT development, business process outsourcing, tourism, and advanced education. In line with the proposed city development and the wider strategies of Vision 2030, there are also plans by the Kenya National Highways Authority, to dual a section of the Nairobi - Mombasa highway. This is an international trunk road which passes through the County between Athi River and Malili towns. These proposed developments are large scale and will likely have greater implications on energy requirements, associated cumulative environmental impacts, and economic development in Machakos County. These factories and industries have a tendency of polluting water bodies within their vicinity. The manufacturing sector accounts for 7% of Kenya's GHG emissions. Adaptation strategies can increase resilience and help to protect the manufacturing sector and supply chains.

3.2.7.1 Shifting towards green manufacturing for improved climate-resilience, low carbon impact, and increased productivity

Green manufacturing has a greater opportunity for addressing the impacts of climate change on the sector. The priority actions recommended in Kenya's NCCAP 2018-2022 emphasizes on:

- Applying energy efficiency measures in all sectors to reduce power demand.
- Adopting energy efficiency measures in cement production.
- Developing and Implementing Improved Charcoal Production Systems (ICPS)
- Co-generation in agriculture

A shift toward green manufacturing will require technological innovation and supporting the micro, small and medium enterprises (MSME) especially those run by youths. Some of the relevant areas for innovations and MSME growth including

in urban and rooftop agriculture, briquettes making, and energy efficiency projects.

The charcoal value chain involves the collection or cutting of wood at the source (e.g. forests, woodlands, shrub lands, agroforestry systems and woodlots, and from wood processing operations), the carbonization of wood in kilns, the transportation, trade, and distribution of charcoal, and consumption by households or enterprises (FAO, 2022). Unsustainable charcoal production causes net GHG emissions and affects natural resources such as forests, water, biodiversity, and soils. A greener charcoal sector can reduce GHG emissions throughout its value chain and play an important role in Machakos low-carbon growth strategies. Developing a long-term policy vision is required to both improve the sustainability of the charcoal value chain and diversify clean-energy options to reduce pressure on forests caused by soaring charcoal demand.

The Bottom Up agenda seeks to support the National Industrial Policy of manufacturing growth of 15% annually. This cannot be achieved without support by counties hence the need to incorporate priority actions in the CCCAP 2023-2027. Climate change causes major setbacks in the manufacturing sector due to extreme weather events such as drought and floods, which need to be mitigated to promote the prosperity of the sector.

Table 16 : Promote Energy and Resource Efficiency in the Manufacturing Sector

Strategic Objective 7:	**Promote energy and resource efficiency in the manufacturing sector**		
Outcome	**wards**	**Sub-actions**	**Adaptation/ Mitigation**
Increase energy efficiency in industries.	Machakos Central, masii, mavoko, Athi River, Mua, Mlolongo syokimau	• Promote energy efficiency and energy conservation in industries through relevant initiatives. • Diversify energy production sources to reduce costs of production and enhance its reliability. • Conduct Energy audits in the manufacturing sites in	*Mitigation* GHG emission reductions

		the County	
Promote sustainable manufacturing and production processes	Machakos Central, masii, mavoko, Athi River, Mua, Mlolongo syokimau	• Optimization of manufacturing processes to reduce resource wastage. • Promote sustainable charcoal production processes through adoption and utilization of briquettes and use of efficient kiln technologies. • Formulate policies to regularize the charcoal sector to avoid illegal charcoal trade	*Mitigation* GHG emission reductions
Promote environmental sustainability	Machakos Central, masii, mavoko, Athi River, Mua, Mlolongo syokimau	• Promote tree planting activities by cement factories and other industries as part of Corporate Social responsibility (CSR) programs. • Promote the use of environmentally sound technologies and practices industries through the adoption of sustainable measures such as the recovery of waste, energy and transport efficiency, and sustainable utilization of	*Mitigation* Reduced GHG emissions

		resources. • Sensitization of cement industries and quarries to control dust. • Enforce the Machakos County • Management of Quarrying Act of 2016 to ensure the rehabilitation of quarries.	
Enabling (capacity development)	Machakos Central, masii, mavoko, Athi River, Mua, Mlolongo syokimau	▪ Awareness-raising and capacity building to promote resource efficiency within the private sector. ▪ GHG inventory for all the manufacturing industries in Machakos County	Enabling
	Relevant institutions and organizations: Machakos County Government; County Departments of Water, Irrigation, Environment and Climate Change; Lands, Energy, Housing and Urban Development; Agriculture, Kenya Association of Manufacturers (KAM); Kenya Industrial Research and Development Institute (KIRDI); Kenya Forest Service (KFS); Kenya Bureau of Standards (KEBS); National Environment Management Authority (NEMA); Machakos Water and Sewerage Company		

CHAPTER FOUR
4.0 DELIVERY MECHANISMS FOR THE CCCAP

4.1 Enabling Factors

To ensure successful delivery of the County Climate change Action plan, a mix of enabling actions is needed across all the priority actions identified in the previous chapter. The National Climate Change Action Plan (NCCAP) 2018-2022 recommends various enablers to equip county governments and other stakeholders with necessary knowledge, skills, finance, and technologies among other capacities. The key enablers for implementing the proposed adaptation and mitigation actions are:

1. Enabling policy environment and framework
2. Multi stakeholder participation processes
3. Capacity development and knowledge management
4. Resource mobilization and fundraising
5. Transparency, Measurement, Reporting and Verification Plus (MRV+)

The following briefly describes the priority enabling actions needed to deliver the proposed priority actions by June 2026.

4.1.1 Enabling Policy Environment and Regulation

Machakos County has made great strides when it comes to developing the needed policy framework to support climate change adaptation and mitigation**.** Notably, the county has in place the following documents to support the implementation of this CCCAP:

i) Machakos County Climate Change Act, 2021
ii) Machakos County Climate Change Finance Regulations (2019)
iii) County Climate Change Amendment Act, 2022

The Machakos County Climate Change Act, 2021 and Amendment, 2022 obligates the county to set aside of at least 3% of the annual development budget of the County to climate change actions which are informed by the local context and conform to the national public finance policies/regulations. However, a comprehensive policy framework is needed to ensure climate change issues are fully integrated into the local context and prioritized in the budgeting process. Table 9 provides a recommendation on the policy framework:

Table 17:Recommendations for the Policy Framework

Enabling Actions	Coordinating Institution& relevant partners	Expected results
Development of Climate Change Policy for the county integration and prioritization of climate change in budgeting process	-Machakos County Climate Change Department -Machakos County Assembly -CECM Water, Irrigation, Environment and Natural Resources	By June 2024
Align County legislations to the Climate Change Act, 2016	-Machakos County Climate Change Board -Machakos County Climate Change Department -Machakos County Assembly - CEC Water, Irrigation, Environment and Natural Resources -Climate Change Directorate	By June 2025, all county legislation aligned to the Climate Change Act of 2016
Develop a climate change grievance redress mechanism that is linked to the national system	Machakos County Climate Change Department -Machakos County Assembly - CEC Water, Irrigation, Environment and	December 2023

	Natural Resources -Climate Change Directorate	
Develop a County Energy Plan to operationalize the County Renewable Energy Policy	CEC Energy, Lands, Housing and Urban Development -Machakos County Climate Change unit	By December 2024
Develop a County Disaster Risk Management strategy/policy	-NDMA -Machakos County Climate Change Board -Machakos County Climate Change Unit -Machakos County Assembly	By June 2026
Develop a County Disaster Risk Management Fund	-CECM Finance -Machakos County Climate Change Unit -Machakos County Climate Change planning committee -Machakos County Assembly	By June 2022
Develop a County Environmental Conservation Policy	CECM Water, Environment and Climate Change -Machakos County Climate Change Unit Department of Environment -Machakos County Climate Change planning	December 2023

	committee -Machakos County Assembly	
Review of the Water Policy	CECM Water, Environment and Climate Change -Machakos County Climate Change Unit Department of Water -Machakos County Climate Change planning committee -Machakos County Assembly	December, 2023

4.1.2 Mainstreaming the MCCCAP in the CIDP

The County Government has taken the necessary steps to integrate climate change in county development planning with key climate resilience actions being prioritized in the CIDP (2023-2027) in the sectors depicted in table 11.

Table 18: Mainstreaming the MCCCAP in the CIDP

No.	CIDP Sector	Climate Resilience Actions
1.	Agriculture and Cooperative Development	• Increasing land under cultivation through the free tractor project • Subsidized seeds project • Measures towards increased/improved livestock production • Extension services • Free chicks' program • Livestock feed and nutrition information system • Value addition of farm produce • Aggregation of farm produce

2	Water and Irrigation	• Water harvesting • Ecosystem restoration • Management of water sources • Promotion of micro irrigation and hydroponics • Adoption of performance climate financing models
3	Infrastructure, Energy and ICT	• Climate proofing of more roads • Embracing alternative energy solutions (wind & solar energy) • Green energy transition • Adoption of technology in water supplies
4	Health	• Promotion of preventive and promotive health services • Retrofitting initiatives for more responsive curative health care services
5	Public Administration	• Leadership, Supervisory, and Coordination • Public Finance Management • Monitoring, Learning and Evaluation
6.	Education social welfare Livelihoods	• School feeding programme for ECDE centres to improve access to education and nutrition • Improved access to technical and vocational training for climate vulnerable youth (out of school) • Sports and talent development • Economic empowerment of women and youth • Measures towards increasing income from farm produce for improved livelihoods • Employment promotion for all women and men, including young people and persons with disabilities, Investor facilitation, and aftercare services. Creating market linkages for both national and international Markets
7	Lands	• Development of spatial development plans • Preparation and adoption of county physical planning policies and legislation • Solid waste management and reuse/recycling

4.1.3 Multi-stakeholder Participation Processes

This CCCAP follows the FFLoCA principles that include the following:

i. Devolving decision making to the lowest appropriate level;
ii. Addressing structural inequalities faced by women, youth, children, disabled and displaced people, indigenous peoples and marginalized ethnic groups;
iii. Investing in local capabilities to leave an institutional legacy;
iv. Building a robust understanding of climate risk and uncertainty Collaborative action and investment
v. Ensuring transparency and accountability
vi. Flexible programming and learning
vii. Providing patient and predictable funding that can be accessed more easily

These principles have been internalized to ensure inclusivity and meaningful participation of women, PLWD, youth and the elderly in climate risk assessment and planning processes that include Investing in local.

The PCRA process adopted towards the development of this CCCAP saw activel participation of one thousand two hundred and fifty one (1,251) members of diverse stake holder groups. Among them 537 (45.6%) women, 230 (18.4%) Youth and 69 (5%) PLWD.

4.1.4 Finance - County Climate Change Fund and Resource mobilization

Climate finance and resource mobilization is guided by the National Climate Change Finance Policy 2018. Specifically, the policy calls for the launch of climate change fund, development of climate finance and resource mobilization strategy, piloting of the issuance of Green Bonds, improving access modalities and efficiency of climate finance, and ensuring that climate finance is available for actions in key sectors which must all be cascaded to the county level. All counties are expected to establish County Climate Change Funds (CCCFs) and deploy not less than 3% of county development funds through the climate fund on climate adaptation/resilience initiatives. There is a need to enhance the institutional connection between national and sub-national government levels.

Machakos has operationalized the Machakos County Climate Change Finance Regulations
(2021) and has a functional climate change fund operated through a Special Purpose Account (SPA). The county has complied with the requirement to establish the climate change unit but gone a step further to set up a department with a chief officer and key staff among these a dedicated director, accountant, monitoring and evaluation officer among other desk officers.

The County hopes to reap from the benefits of performance climate finance and shall prioritize the development of the Machakos County Climate Change Finance Policy so as to reap the benefits of an holistic resource mobilization strategy for climate adaptation/resilience actions.

Table 19 Priority Enabling Actions: Climate Finance and Resource Mobilization

Enabling Actions	**Coordinating Institution& relevant partners**	**Expected results**
The county has an operational *Machakos County Climate Change Finance Draft Regulations (2019) and Established the County Climate Change Fund (CCCF)* including establishing the management and oversight of the Fund; annual budgeting and reporting; development of policies, guidelines, and procedures	-Machakos County Climate Change Board -Machakos County Climate Change Unit -Machakos County Climate Change Planning Committee - Machakos County Climate Change Fund Board -Fund administrator County treasury	-CCCF is operationalized, secretariat and management structures in place, as set out in the Climate Fund regulations by June 2023
Localize the National climate finance resource mobilization strategy that includes domestic allocations, international climate finance, access to carbon credits and markets, allocations from the private sector, and Public-Private Partnerships for climate friendly investments)	-Machakos County Climate Change Board -Machakos County Climate Change Unit -Machakos County Climate Change Planning Committee - Machakos County Climate Change Fund Board -Fund administrator The County Treasury	-The County climate finance mobilization strategy developed guided by the National Strategy

	-Private sector	
Promote investor confidence and participation in market based and results-based mechanisms.	- Machakos County Climate Change Unit -CCD -NEMA -KFS -The private sector	- By 30th June 2027 Unit established to promote investor participation in market based and result based mechanisms.
Enhance County's Capacity to engage in carbon assets and low carbon development	Machakos County Climate Change Unit -CCD -NEMA , KFS &- private sector	By 30th June 2027 Unit established to promote projects responsible for the generation of carbon credits.

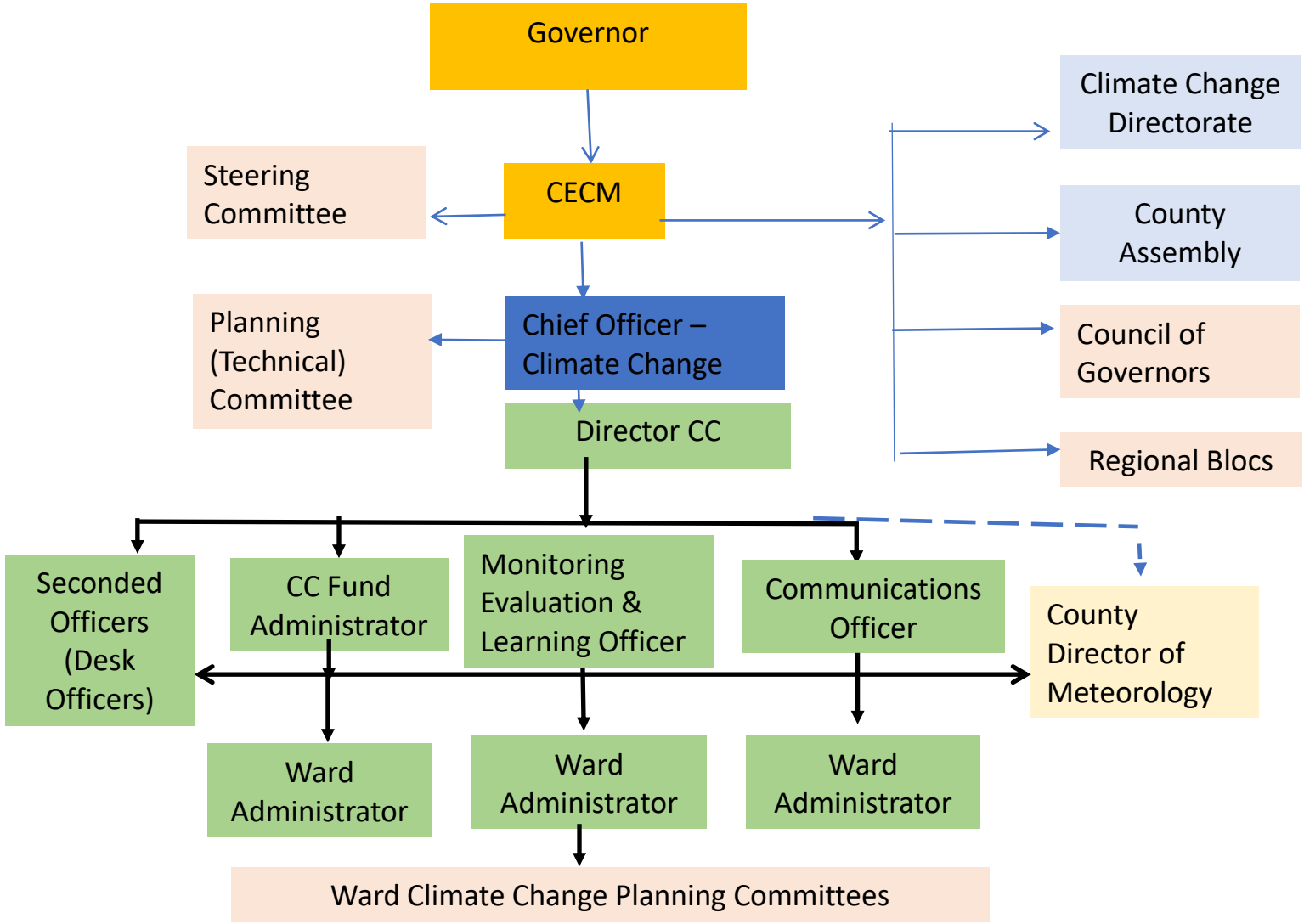

Figure 7 CCU Organogram

4.1.6 Governance – Climate Change Planning Committees

a) Climate Change Steering Committee (CCSC)

The Steering Committee is composed of the following:
The Deputy Governor, who shall be the Chairperson;
ii.) The County Executive Committee Member who shall be the Secretary;
iii.) The County Executive Committee Member responsible for the County Treasury;
iv.) The County Executive Committee Member responsible for matters relating to Agriculture, Livestock, and Fisheries;
v.) The County Executive Committee Member responsible for matters relating to Water;
vi.) A representative of a duly registered public benefit organisation working on matters relating to the environment in the County nominated by the umbrella organization representing the largest public benefit organization in the County;
vii.) A representative of the private sector operating in the County nominated by the largest umbrella body of the private sector in the County;
viii.) A representative of the youth from the County nominated by the National Youth Council in the County;
ix.) A representative of Persons with Disabilities duly registered with the National Council for Persons With Disabilities nominated by its Machakos Chapter.

b) County Climate Change Planning Committee (CCCPC)

The Planning Committee is composed of the following:
The Chief Officer who shall be the Chairperson;
ii.) The Director in charge of the Climate Change Directorate, who shall be the Secretary;
iii.) The Chief Officer responsible for the County Treasury;
iv.) The Chief Officer responsible for matters relating to Agriculture;
v.) The Chief Officer responsible for matters relating to Water;
vi.) A woman and a man representing duly registered public benefit organizations working on matters relating to the environment in the County nominated by the umbrella organization representing the largest public benefit organization in the County;
vii.) A representative of the private sector operating in the County nominated by the largest umbrella body of the private sector in the County;
viii.) A representative of Persons with Disabilities duly registered with the National Council for Persons with Disabilities nominated by its Machakos Chapter.

vii.) The Administrator of the Fund, who shall be an *ex-officio* member with no voting rights.

c) Ward Climate Change Planning Committee (WCCPC)

The Ward Planning Committee is composed of the following:
One person who has knowledge and demonstrated experience in public affairs, who ordinarily resides in the Ward and who shall be the Chairperson;
ii.) The County Government officer responsible for matters relating to climate change who shall be the Secretary and an *ex-officio* member with no voting rights;
iii.) A representative of the youth who ordinarily resides in the Ward;
iv.) A representative of persons with disabilities who ordinarily resides in the Ward;
v.) A representative of women who ordinarily resides in the Ward;
vi.) A representative of the business community who ordinarily resides in the Ward;
vii.) A representative of Community Based Organizations who ordinarily resides in the Ward.

4.1.7 Climate Information Services & Climate Data Access

The Paris Agreement under the UNFCCC sets out an enhanced transparency framework for climate change action and support. Kenya is expected to provide information on mitigation, adaptation, and the support received, including; *national GHG inventory to enable tracking of progress on implementing and achieving of the mitigation component of Kenya's NDC*; Information *related to climate change impacts, vulnerabilities, and adaptation*; and Information on financial, technology development and transfer, capacity building needs, and the support received from developed countries.

Table 20 Priority Enabling Actions CIS and Climate Data Access

Enabling Actions	Coordinating Institution & relevant partners	Expected results
-Cascade the National M&E component of the MRV+ system to report on County adaptation actions and benefits, including the identification and measurement of such adaptation indicators as	Machakos County Climate Change unit -Machakos County Climate Change Planning Committee -KNBS - County Ministries	By June 2024 Machakos County Climate registry for adaptation actions established, in line with the National registry. -The National adaptation M&E system

collected baseline data, gender disaggregated data, and gender indicator		localized in Machakos County and fully functional by June 2024
Customise the national system for tracking and reporting on land-based emissions; and; Develop a monitoring and reporting system for a transparent accounting of emissions and removals in the forestry and land	Machakos County Climate Change unit -Machakos County Climate Change Planning Committee- --KFS -SLEEK	Machakos County Reporting on land based emissions fully integrated into GHG inventory by June 2026.
Strengthen capacity for carbon management and verification	Machakos County Climate Change Directorate NEMA	By June 2027

4.1.8 Resilience Planning Tools

Machakos County shall adopt technology and innovation as a key resilience planning tool towards achievement of the objectives of this CCCAP. These are crucial in enabling the delivery of the proposed actions to investment in clean technologies for adaptation/resilience. These technologies allow users to adjust to negative effects of climate change or exploit positive ones. Climate-friendly technologies, no matter how advanced, clearly do not serve their purpose until they are deployed and used.

A meaningful solution requires the County to collectively embrace a broad array of clean technology solutions, many of which are already widely available on the market today. In the current CIDP, the County proposes to utilize the services of the two research institutions located in the County to undertake research and development in efforts to transfer technology and skills to farmers with the rationale of boosting production and quality in agriculture and livestock production. The CIDP also proposes to develop industrial and innovation parks. For this to be achieved, partnerships with technological institutions at the national level is key. Such institutions include: KIRDI, KFS, KEFRI, NDMA among others.

Additionally, technology and innovation to provide climate information are important for farmers to manage risk, for planning standards and regulations, and for assessing climate change risks in environmental assessments. Climate information is also a critical element of early warning systems to help communities, especially vulnerable groups, cope with such extreme climate events as droughts

and floods. The priority enabling actions for technology and innovation are summarised in Table 10.

To be able to deliver this CCCAP the county government of Machakos shall employ the resilience planning tools shown in table 10:

Table 21 Priority Enabling Actions: Resilience Planning Tools

Resilience Planning Tool		**Climate Resilience Strategies**
Policy and Governance:	The county government shall endeavour to develop and deploy effective policies, regulations, and governance structures are essential for fostering climate resilience.	The county has a draft Climate Change Finance Policy and has put in place mechanisms for climate action planning, land-use regulations, building codes, and zoning policies that consider climate change impacts and promote sustainable practices.
Ecosystem-based Approaches	Preserving and restoring natural ecosystems such as forests, wetlands which provides significant climate resilience benefits.	These ecosystems can absorb and store carbon dioxide, regulate water flows, protect against storm surges, and provide habitat for biodiversity.
Community Engagement and Social Networks	Shall strive to build strong social networks and engaging local communities in climate resilience efforts	The county shall adopt awareness raising, fostering community cohesion, and empowering individuals to participate in decision-making processes and implement adaptation measures in Climate resilience actions

Education and Capacity Building:	Involves educating and training individuals and communities about climate change impacts and adaptation strategies can enhance their ability to respond and build resilience.	The county shall provide information on sustainable practices, disaster preparedness, and promoting climate literacy by supporting the climate change directorate /community gain knowledge through exchange programmes/ bench marking and sponsored study tours
Financial Instruments	Access to funding mechanisms and financial instruments that support climate resilience initiatives. Develop the county's climate ability to attract finance and promote climate investment through financial and economic instruments and cooperative approaches/ market-based instruments in which benefits and risks are distributed equitably.	The county department of climate change shall develop proposals for such products as climate funds, grants, loans, insurance and other innovative financing mechanisms that incentivize climate adaptation and mitigation actions.
Infrastructure and Built Environment:	Shall develop the capacity of relevant department s to spearhead and enforce the designing of infrastructure and the built environment to withstand climate risks (climate proofing infrastructure.	This includes constructing buildings and infrastructure that are resilient to extreme weather events, improving drainage systems, and developing green infrastructure like permeable pavements and green roofs.

Early Warning Systems	Implementing robust early warning systems to help communities prepare for and respond to climate-related hazards such as drought, floods, locust invasions etc .	These systems provide timely information and alerts, enabling proactive actions to mitigate risks and minimize impacts.

Table 22 Enabling Actions

Enabling Actions	Coordinating Institution & relevant partners	Expected results
• Promote gender-responsive climate technologies and innovations within the community and in the private sector through the provision of financing, capacity building, and start-up/ scale-up of services.	-Machakos climate change unit - CEC Education, Skills Training and Social Welfare -Private sector	80 clients, half of who are women and youth, supported to commercialize their clean technology businesses.
• Provide Climate Information Services (CIS), including information to help farmers manage risk, inform early warning systems, and inform decision making for organizations, businesses, and households	-County Ministry of Water, Irrigation, Environment, and natural resources - CEC Education, Skills Training and Social Welfare -KMD -NDMA -Media	County Climate Information Service Plan developed by June 2025

• Establish a Sustainable Consumption and Production Networking facilities for Micro, Small, and Medium Enterprises (MSME), with an emphasis on women and youth.	-The private sector -The youth organizations -Women groups	Train MSMEs on how to reduce resource (energy and water) use by 10% by June 2024
• Encourage youth innovation through outreach programs with schools, universities, and organizations of the youth.	Academic institutions County Climate Change Unit -Machakos County Climate Change Board -County Climate	Clean technology businesses reach 500 customers by June 2025.
Identify policy and fiscal incentives to promote the uptake of climate-friendly technology (such as tax incentives, reduced energy tariffs, low-interest loans, and public-private partnerships.	Machakos County Assembly -CEC Energy, Lands, Housing and Urban Development	By June 2026

4.1.9 Measurement, Reporting and Verification

In response to this, Kenya is expected to develop a transparency framework based on the Measurement, Reporting, and Verification plus (MRV+) system defined in NCCAP 2013-2017 as "an integrated framework for measuring, monitoring, evaluating, verifying and reporting results of mitigation actions, adaptation actions and the synergies between them. The MRV+ system includes MRV of emissions and removals of GHGs by mitigation actions. Kenya reports to the UNFCCC through National Communications and Biennial Update Reports, which include GHG inventories in the agriculture; energy, which includes energy use in the transport sector; land use, land-use change, and forestry (LULUCF); industrial processes; and waste sectors.

Table 23: Measurement, Reporting and Verification

Enabling Actions	**Coordinating Institution& relevant partners**	**Expected results**

Develop a County Climate Vulnerability Assessment process to identify and prioritize adaptation actions.	-Machakos County Climate Change Unit	County vulnerability assessment completed and report compiled by May 2023. County Vulnerability assessment informs of CCCAP 2023-2027
Information Centre to improve access to information and reduce climate vulnerability. The Centre will be managed by engendered local management committees and will provide focused services for women, the youth, minority, and other marginalized groups	-Machakos County Climate Change Planning Committee -NEMA -NDMA -Relevant County ministries	established and equipped by June 2023
Develop a County gender and inter-generational responsive awareness plan and build capacity for effective gender integration in CCCAP 2021-2026		County Gender and Responsive Awareness Plan developed by June 2026
Develop and operationalize a public awareness and engagement strategy that highlights outreach to Members of the County Assembly, decision-makers, and media.		Public awareness and engagement strategy developed and implemented by June 2025
Engage vulnerable groups, including women, older members of society, children, youth, persons with disabilities, and members of minority and marginalized communities, in the development of the strategy		

Strengthen the capacity of County Government institutions to implement the Climate Change Act 2016, County Climate Change Action Plan, including: Training of staff of climate change units on reporting and climate finance; Training on the climate change –gender nexus		Climate change is mainstreamed in the County sector plans including the CIDP. By 30th June 2024 all County sectors provide annual reports with gender-disaggregated information

4.1.10 Capacity Development and Knowledge Management

Decisions and investments to address climate change actions in the County need to be based on reliable information and robust data. The UNFCCC defines climate change-related capacity development as 'enhancing the capacity and ability of countries to take effective climate change action'. The County must take a lead role working in collaboration with relevant stakeholders to generate, disseminate, and support the application of information and knowledge products and enact policies to address climate change impacts. Such measures include effective implementation of the County climate fiancé regulations, building the capacity of the county climate change committees, measuring County GHG emissions etc. Table 11 summarises the key actions needed to deliver the priority actions.

Table 24 :Priority Enabling Actions: Capacity Development and Knowledge Management

Enabling Actions	Wards	Coordinating Institution& relevant partners	Expected results
• Build the capacity of the • Machakos County Climate • Change Unit • Coordination of climate change programs across the • County • Mobilization and tracking of climate finance using gender disaggregated data, including CCCF allocations. • Monitoring and reporting on the impact of climate change programs.	Machakos County	-Machakos County Climate Change Board -Machakos County Climate Change Unit -Machakos County Climate Change Planning Committee -Machakos County Climate Change Fund Board -Fund administrator -Ward committees	Quarterly training held with the County climate Change Committee. Provision of annual reports on climate change with gender disaggregated information

• Build the capacity of stakeholders, including • Vulnerable groups, such as women, the youth, marginalized and minority communities, and persons with disabilities, to participate in, attract funding for, and report on climate change actions. • The private sector and civil society to implement and report on climate actions.	Machakos County	-Machakos County Climate Change Unit -Machakos County Climate Change Planning Committee -Private sector -Civil society and CBOs -Women, youth and PLWD groups	10 awareness creation sessions held by June 2026
• Use Knowledge Harvesting techniques to capture and share information, including on climate change-based traditional knowledge, especially from women and the elderly.	- Machakos County	- Machakos County Climate Change Coordination Unit -CEC Tourism, Culture, Sports and Youth - CEC Education, Skills Training and Social Welfare	Indigenous knowledge systems for knowledge harvesting developed by June 2026
• Establish County Community Education, Business, and incubation centre	Machakos County		Machakos County Community Centre

4.2 Delivery and Coordination Mechanism

4.2.1 Institutional Roles and Responsibilities

The existing institutional infrastructure at the national level provides Machakos County with the opportunity to put in place an effective institutional framework geared towards achieving the commitments set out in the CCCAP 2021-2026. For instance, the National Climate Change Council, chaired by His Excellency the President of the Republic of Kenya, is responsible for the overall coordination and advisory functions as guiding the implementation of NCCAPs, including this NCCAP 2018-2022. The Council ensures, among others, the mainstreaming of climate change functions by the National and County Governments and, approves and oversees the implementation of NCCAP. The following institutions will play critical roles in addressing adaptation and mitigation actions proposed in the Machakos CCCAP.

Institution	Roles
The County governor/Government	Appoints a designated CECM for Climate Change Establishes a Climate Change Unit/directorate
The CECM Department of Water, Irrigation, Environment &Climate Change	Coordinates climate change affairs, and reports on the implementation of climate change on an annual basis.
County Assembly of Machakos (Environment and Natural Resources Committee)	Promoting and facilitating for the development of relevant policies, regulations and other legislation towards attainment of the climate change mitigation and adaptation goals for the county
The County Climate Change Steering Committee	Ensure mainstreaming of climate change into County planning and development processes.
County Planning Committee	Co-ordinate the planning and implementation of projects and activities for climate change response in the County
Climate Change Unit/Directorate	Oversee the implementation of climate change actions stipulated in the CIDPs and the County Climate Change Action Plan. The Climate Change Unit will also serve as the Secretariat for the County Climate Change Planning Committee as provided under the County Climate Change Act, 2021.
Ward-Level Planning committees	Co-ordinate and mobilize communities and other stakeholders in the Ward to design and implement climate change response activities. Oversee the implementation of climate change response projects funded by the County Climate Change Fund and report thereon to the Planning Committee.
NEMA	Monitoring and enforcing compliance of climate change interventions and for integrating climate risk and vulnerability assessment into all forms of assessment.

NDMA	Coordinates actions on drought management and disaster risk reduction and will play a critical role in mainstreaming and reinforcing climate change disaster risk reduction into strategies and actions
National Treasury	Responsible for developing a strategy and making regulations that set out procedures finance, and monitoring its use
KMD	Custodian of climate data
Vulnerable groups	engaged through an inclusive approach to climate change action.
Academia	Provide evidence and science for knowledge-based decision making by the National and County Governments, the private sector, development partners, and civil society.
Media	To provide accurate, timely, and relevant information is a critical component of resilience and appropriate climate change action.

4.2. Implementation and Coordination Mechanisms

4.2.1 Directorate of Climate Change

Machakos County will support CCD in its coordination role by, nominating a CECM to be in charge of coordinating the implementation of climate change actions. Besides, the County will work closely with the Council of Governors and CCD to establish and strengthen the County Climate Change Units; ensuring that they ate fully functional to effectively implement the CCCAP 2023-2027. Further, the County will ensure that climate change actions are mainstreamed in the CIDP, implemented, and reporting over the 2023 -2027 period. Finally, the county is expected to generate best practices like developing appropriate County legislation on Climate Change and reporting annually to the County Assembly on the progress achieved in the implementation of climate change adaptation/ resilience actions.

4.2.2 The County Climate Change Steering Committee

The Board is established under the Machakos County Climate Change Bill of 2020 and is given the mandate to co-ordinate and oversee climate change response in the County. The Board shall be chaired by the Deputy Governor and the specific responsibilities assigned to the Board are to:

a) Ensure mainstreaming of climate change into county planning and development processes.
b) Co-ordinate formulation and monitor the implementation of the County Climate Change Action Plan, County Climate Finance Framework, and any other County climate change policies, plans and strategies.
c) Mobilize funds into and administer the County Climate Change Fund established under the Act.
d) Review, approve and monitor the implementation of Regulations for administration and management of the Fund.
e) Review and make recommendations the biennial report on implementation of the County Climate Change Action Plan and any other reports on climate change response interventions in the County.
f) Advise the County government on legislative, policy and other measures necessary for climate change response and attainment of low carbon climate resilient development.
g) Approve and oversee the implementation in the County of a comprehensive programme of climate change education awareness creation and capacity building.
h) Provide policy direction on research, training and dissemination of information relating to climate change to the public and other stakeholders the County.
i) Ensure positive linkages interactions and synergy between the County, neighbouring counties and the national government in climate change response programming and action.
j) Ensure a co-ordinated approach to climate change response, programming, and action within the County government between the County government and national government, and among the different stakeholders in the County.
k) Co-ordinate the formulation of a climate change reporting framework, and the preparation and dissemination of an annual report on climate change response activities in the County.
l) Perform such other functions as may be necessary for the achievement of the objectives of the Act.

4.2.3 The County Climate Change Planning Committee

The Committee is established under the Machakos County Climate Change Bill of 2020. The committee shall comprise of 14 members appointed by the Executive Committee Member. As provided in the Act, the main functions of the Planning Committee are to:

a) Co-ordinate the planning and implementation of projects and activities for climate change response in the County.
b) Co-ordinate the implementation of the County Climate Change Action Plan and the County Climate Finance Framework.
c) Establish guidelines to be used by Ward Planning Committees formulating climate response projects for funding by the County Climate Change Fund.
d) Support Ward Planning Committees in development and implementation of climate response projects.
e) Co-ordinate development and implementation of the County Climate Change Fund Regulations.
f) Advise the Board on strategies priority programmes, projects, and activities for climate change response in the County.
g) Formulate and implement strategic actions to foster climate change education awareness creation and capacity development in the County.
h) To co-ordinate research and knowledge management on climate change its impacts and strategies for responding thereto.
i) Prepare and disseminate an annual report on climate change response activities in the County.
j) Formulate and implement a County monitoring, evaluation, and reporting framework for climate change response.

4.2.4 Machakos County Climate Change Unit

The Unit supports coordination of climate change matters in the County. The Directorate will led by a CEC member responsible for climate change and will oversee the implementation of climate change actions stipulated in the CIDPs and the County Climate Change Action Plan.

The Climate Change Unit will also serve as the Secretariat for the County Climate Change Planning Committee as provided under the County Climate Change Act, 2021.

4.2.5 The CECM Department of Water, Irrigation, Environment &Natural Resources**-**

The CECM is responsible for integrating and mainstreaming climate change into CIDPs, is designated to coordinate climate change affairs, and reporting on the implementation of climate change on an annual basis. The County Government is also expected to establish Climate Change Units.

4.2.6 Machakos County Climate Change Fund Board- is responsible for providing oversight over the County Climate Change Fund and specifically; (a) Mobilize funds and resources for climate change response projects approved by the Planning Committee; (b) approve estimates of revenue and expenditure of the

Fund for each financial year; (c) approve the annual budget, work plan, procurement plans and cash plans for the Fund; (d) allocate funding for cross-ward and cross-county climate change response projects (e) approve the financial statements of the Fund prepared by the Fund Administrator before they are presented for audit; (f) approve the County Climate Finance Framework and the strategic plan of the Fund among other functions.

4.2.7 The National Environment Management Authority (NEMA) is responsible, on behalf of the Council, for monitoring and enforcing compliance of climate change interventions and for integrating climate risk and vulnerability assessment into all forms of assessment.

The County Climate Change Act also provides that the County representative of the National Environment Management Authority shall be a member of the County Climate Change Board and the County Climate Change Planning Committee.

4.2.8 Ward-Level Planning Committees

In accordance with the provisions of the County Climate Change Act, the ward level committees shall be responsible for the following functions:

a) Co-ordinate and mobilize communities and other stakeholders in the Ward to design and implement climate change response activities.
b) To facilitate research and knowledge management at the Ward level on climate change, its impacts, and strategies for responding thereto.
c) Facilitate public education, awareness creation, and capacity building at the Ward level on climate change, its impacts, and strategies for responding thereto.
d) Co-ordinate, facilitate and manage community consultations priority climate change response activities.
e) Participate in County planning and budgeting processes with a view to ensuring the mainstreaming of climate change and prioritization of climate change response in County development plans.
f) Facilitate public participation on climate change governance, implementation of agreed climate change response activities, and monitoring of those activities.
g) Co-ordinate and facilitate provision of technical support to communities in the Ward in developing proposals on climate change response projects for funding by the County Climate Change Fund.
h) Oversee the implementation of climate change response projects funded by the County Climate Change Fund and report thereon to the Planning Committee.

4.2.9 The National Drought Management Authority (NDMA) coordinates actions on drought management and disaster risk reduction in 23 ASAL counties. It will play a critical role in mainstreaming and reinforcing climate change disaster risk reduction into strategies and actions of public and private entities, including reporting annually to the Council on the status and progress of climate change actions in the County.

4.2.10 The National Treasury and Planning is responsible for developing a strategy and making regulations that set out procedures finance, and monitoring its use and, working with the Cabinet Secretary responsible for climate change affairs to develop incentives to promote climate change initiatives.

4.2.11 Vulnerable Groups Within Society,

These include women, older members of society, persons with disabilities, children, the youth, and members of minority or marginalized communities and shall be engaged through an inclusive approach to climate change action. Due to inequities and disparities, these groups are disproportionately affected by the impacts of climate change. Climate change actions will be delivered in a way that accounts for the unique needs of the following groups:

- **Women:** Gender equality is a critical component of Machakos CCCAP 20212026, and women will be engaged through planning, implementation, and monitoring of climate change interventions.
- **Youth:** Youths are agents of change and influence the broader community through their parents, relatives, and families. They will be engaged through climate change actions and in the development and implementation of the gender and intergenerational plan as described in the CCAP.
- **Persons living with disability** (PLWDs) will be engaged through planning, implementation, and monitoring of climate change interventions.

4.2.12 The Academia and research institutions

Researchers help to provide evidence and science for knowledge-based decision making by the National and County Governments, the private sector, development partners, and civil society. They research different aspects of climate change, including ways of improving the understanding of climate change attribution in Kenya, and developing appropriate technologies for reducing GHG emissions and adapting to climate change.

4.2.13 Media

Media provides vital information at times of emergency, from warning of imminent floods to explain how to deal with disease outbreaks. The media also helps to

disseminate information about climate change. Accurate, timely, and relevant information is a critical component of resilience and appropriate climate change action.

4.2.3 Monitoring and Evaluation of the Machakos CCCAP 2023-2027

Monitoring, evaluation, and reporting on implementation of the actions set out in the Action Plan will be the responsibility of the County Climate Change Coordination Unit. The designated CEC for Environment will send the Action Plan to the National Climate Change Directorate (CCD). The CCD will require monitoring reports once the Action Plan has been adopted. The process of monitoring and reporting on the implementation of the actions will be documented through the existing framework under the County M&E Framework and as guided by the County Integrated Monitoring and Evaluation System (CIMES).

This framework incorporates annual action plans, which outline the activities undertaken by different departments and agencies relating to specific development objectives. These annual action plans will be updated to align with the CCCAP (2023-2027), and the existing framework will be used to assess their performance. Processes to monitor their implementation will include:

- Quarterly review meetings. These meetings will be used to review activities listed in the annual action plan.
- Quarterly field visits, involving the monitoring of physical projects.
- The preparation of quarterly and annual progress reports.
- Biennial review of the CCCAP, to review implementation and report to the County Climate Change Steering Committee.

4.2.4 Learning and Evaluating Impact

The primary mechanism for evaluating the performance of the actions outlined in the CCCAP is the existing monitoring and reporting framework established by the Machakos CIDP. The regular review meetings and progress reports will ensure that prioritized actions can be tracked, and where necessary, adjusted to ensure they remain on course to achieve their aims. It will also be important to align this process with the preparation of Kenya's communication on Climate Change. It will be important to engage with all stakeholder groups identified in this plan to understand the effects of implemented actions on local communities and environments, Women's Representatives, Youth Representatives, etc.

4.3 Implementation matrix with timelines

PRIORITY OUTCOME	PROPOSED INTERVENTION/ACTION	KEY PERFORMANCE INDICATORS	RESPONSIBLE INSTITUTIONS	TARGETE GROUPS	SOURCE OF FUNDS		INDICATIVE BUDGET (KES MILLION)			
						Total	23/24	24/25	25/26	26/27
	Priority Action 1: Water Resources Objective: Enhance the resilience of the water sector by promoting sustainable management of water resources to meet the demand for all uses Indicators: • *Water storage per capita* • *Water accessibility* • *Per capita water availability* • *Water quality analysis* • *Coverage of protected water catchment areas*									
To have well managed ecosystem and	Rehabilitation of water catchments, ecosystem rehabilitation including the	*Adaptation* Number of water structures constructed	County Department of Water, Irrigation, Environment, and	Households, marginalized groups, and community water	County Budget FLLoCA	574	206	400	400	400

sustainably increase available water for domestic, agriculture and ecosystems	construction of 174 new earth dams, rehabilitation of 407 earth dams and water pans and construction of 548 weirs/sand dams	and catchments rehabilitated	Climate Change County Department of Finance and Economic Planning Water Sector Trust Fund Machakos Service Providers	groups	Other Development partners					
	Mapping out of groundwater sources such as aquifers to determine the quantity and quality of groundwater resources.	Assessment report produced	Water Resource User Associations (WRUA			30	-	20	10	-

Support water harvesting through rainwater harvesting and water storage infrastructure and improve flood control	Awareness creation on rainwater harvesting to increase the percentage of households harvesting rainwater to 85% Support the dissemination of hazard early warning systems e.g. floods, draughts crop pests and diseases	Percentage of households harvesting rainwater Number of early warning systems supported				12	3	3	3	3
	Rehabilitation of degraded rivers supplying water storage tanks to increase water storage per capita	Number of degraded rivers rehabilitated	County Government of Machakos County Department of Water, Irrigation,			12	3	3	3	3

	Supplying water storage tanks to increase water storage per capita	Number of water storage tanks distributed	Environment, and Climate Change County Department of Finance and Economic Planning Water Service Trust Fund Machakos Water & Sewerage Company Limited Water Resource User Associations (WRUA)			12	3	3	3	3
	Enforce the Machakos Sand harvesting act of 2014 to control sand harvesting and support community initiatives that controlled sand harvesting in local streams	Machakos Sand Harvesting Act enforced				4	1	1	1	1
Promote water efficiency and reduce water pollution	Reduce water wastage and non-revenue water through innovation in water metering and tracking leakages identification and	*Adaptation* Number of water metering systems installed				69	3	25	25	16

	reporting											
	Promote enforcement of regulations to control water pollution especially in major rivers such as Athi which is prone to pollution	Water Pollution control regulations						12	2	4	4	-
	Support vulnerable community groups within the County to develop small community water schemes	Number of community water schemes						46	6	8	12	20
Sub-total = 1,083								**227**	**467**	**461**	**446**	**227**

Priority 2: Food and Nutrition Security

Objective: Increase adaptation/resilience of households for food and nutrition security by enhancing the productivity and resilience of the agricultural sector

Indicators:

- GDP growth of the agricultural sector
- Livestock deaths from drought/number of livestock slaughtered attributable to drought
- Agricultural land under irrigation (acreage)

Reduce post-harvest losses through market linkages, and development of aggregation centers	Promote market linkages		County Department of Water, Irrigation, Environment, and Climate Change	Farmers cooperatives, organic/ecolo	County Budget	60	-	20	20	20

	Support irrigated agriculture through construction of farm based water structures (pans and ponds)	Number of water ponds constructed				25	5	5	5	5
	Develop Early Warning and Strategic Pests and Diseases Control system to reduce incidences and prevalence of pests and diseases to 5%	% reduction of pest and diseases				5	1	1	1	1
Promote sustainable land management	Increasing the number of households harvesting water for agricultural use and production	Number of households harvesting water	County Department of Water, Irrigation, Environment, and Natural Resources County Department of Agriculture, Food Security, and Co-operative			120	20	40	40	40
	Improved extension services by training 1,000 farmers; conducting 100									

	on-farm trials and establishing 400 demonstration sites across the County		Development County Department of Finance and Economic Planning County Department of Public Service, Quality Management and ICT County Department of Education, Skills Training and Social Welfare Department of County							
	Improve farmers' skills on soil and water conservation by training									

	15,000 farmers on soil and water conservation techniques such as terracing, Zai pits, retention ditches and cut-off drains.	Number of SLM practices supported	Administration and Decentralized Units KALRO Kenya Forest Service (KFS) NGOs Private sector investors FAO							
	Supporting reclamation and rehabilitation of degraded land									
	Promotion of conservation/ecological agriculture by training 15,000 farmers on conservation agriculture									
	Promote and increase agroforestry practices at the farm level									
	Promote the use of manure and compost, and integrated pest management practices (IPM) to increase crop production									

Sub-total =						**210**	**26**	**66**	**66**	**66**
PRIORITY ACTIONS	**EXPECTED OUTPUTS/OUTCOMES**	**KEY PERFORMANCE INDICATORS**	**RESPONSIBLE INSTITUTIONS**	**TARGETED GROUPS**	**SOURCE OF FUNDS**	**INDICATIVE BUDGET (KES MILLIONS)**				

Mainstream climate change adaptation into the health sector; develop effective sanitation mechanisms and enhance the resilience of human settlements Indicators: • Solid waste management systems • Increase the capacity of health facilities to handle dangers related to climate hazard • Sustainability of human settlements • Flooding in human settlements **Priority Area - Health**										
	Climate proof health care facilities and service regions	Number of healthcare facilities and service regions climate proofed	County Government of Machakos Development Partners NGOs	Households, Market associations, management companies, and Counties	C National Government Count Government of Machakos Other Stakeholders	100	0	30	30	40
	Establish and upgrade sewerage and drainage systems across the county	Number of sewerage and drainage systems developed								

	Improve access to sanitation facilities in market centres through the construction of 80 modern toilets	Number of public toilets constructed								
	Develop a waste management strategy for managing the increasing volume of emerging waste streams such as sanitary waste and baby diapers.	Waste Management Strategy developed								
	Resolve any conflicting land uses in the County Urban Spatial Plan for effective development	Land use planning adopted and enforced								

	and management of human settlements									
	Enhance partnerships and working relationship with the national	Partnerships established								

	government and neighbouring counties such as Makueni and Kajiado, to promote infrastructural development									
Promote the development a County Integrated Solid Waste Management System	Develop a County Integrated Solid Waste Management Policy to guide sound management of waste in the County	County Integrated Solid Waste Management Policy	County Department of Water, Irrigation, Environment, and Natural Resources County Department of Lands, Energy, Housing and Urban Development County Department of Health and Emergency Services National Environment Management		County Budget Development Partners	200	0	100	100	0
	Develop a waste management strategy for managing increasing volume of emerging waste streams such as sanitary waste	Waste Management Strategy								

	and baby diapers.		Authority (NEMA)							
	Construction of a Regional Sanitary landfill on Machakos New City Site	A regional sanitary landfill at Machakos new city established								
	Enforcement of the Machakos E-Waste Management Act of 2015 to curb the rising volumes of e-waste in the County	E-waste regulations developed and enacted								
	Mapping of Flash flooding zones within	*Adaptation* Flood Zones	County Department of Lands, Energy, Housing and	Residents of flood-prone						

Ensure proper urban planning and approval of plans aimed at promoting sound urban development	Coverage of established drainage systems									

	Develop proper stormwater drainage systems in all floodprone urban areas	Kilometres of stormwater drainage developed								
	the County	well mapped	Urban Development County Department of Health and Emergency Services County Department of Roads Transport and Public Works	areas and project developers						
	Reduce incidences of flash flooding especially in urban settlements by 80%	Number of incidences of flash flooding								

Sub-total =300					300					
EXPECTED OUTPUTS/OUTCOMES	**KEY PERFORMANCE INDICATORS**	**RESPONSIBLE INSTITUTIONS**	**TARGETED GROUPS**	**SOURCE OF FUNDS**	**INDICATIVE BUDGET (KES MILLIONS)**					
Priority Action 4: Forestry, Wildlife, and Tourism *Increase forest/tree cover of Machakos County to 10% of total land area; rehabilitate degraded lands; increase the resilience of wildlife and promote tourism development.* *Indicators* ▪ Forest cover as a % of total land area ▪ Forest cover in Machakos new city ▪ The proportion of households using alternative energy use										
• Increase proportion of land covered by forests from 3.4% to 10% through	The proportion of County land covered by forests. Assessment report on degraded areas produced Number of	County Climate Change Coordination unit County Department of Water, Irrigation, Environment, and Natural Resources County Department		County Budget Development Partners	145	15	30	30	70	

	trees planted and survived	of Lands, Energy, Housing and Urban Development County Department of							

	Mapping of degraded and deforested areas within the County	Number of tree nurseries established and registered	Finance and Economic Planning Department of County Administration and Decentralized Units Kenya Forest Service (KFS) Kenya Forestry Research Institute (KEFRI) Community Forest Associations Youth Organizations							
	Increased number of trees planted & survived to 3Million.	Number of trees planted								
	Establish sub-county tree nurseries especially with women, youth and PLWD groups and registration of all existing tree nurseries.	Number of tree nurseries established								

	Establish a tree monitoring system to increase the survival rate of trees planted	Tree monitoring system developed and implemented.								
	Increase the proportion of land covered by forest in Machakos new town from 1% to 22%.	The proportion of land covered by forest in Machakos.								
Promote tourism and diversification of tourism products	Promote diversification of tourism in the County	*Adaptation* Amount of money set aside for tourism activities.	County Department of Tourism, Culture, Youth and Sports County Department of Water, Irrigation, Environment and Natural Resources Kenya Wildlife Service (KWS) Kenya Wildlife Service							
	GIS mapping to develop potential tourist attraction facilities and	Number of potential tourism attraction areas								

	areas	developed	Training Institute (KWSTI) Wildlife Conservations NGO's							
	Develop niche products such as ecotourism, cultural tourism, sports tourism, bird watching, and heritage and historic sites	Tourism products profiled								

	Creating tourism market linkages for both national and international tourism markets	Number of Linkages and partnerships established								
	Develop sustainable tourism infrastructure to enhance access to tourism facilities	Amount of money allocated to the development of infrastructure leading to tourism facilities								
Sub-total = 3,000						**145**	15	30	30	**70**
PRIORITY ACTIONS	**EXPECTED OUTPUTS/OUTCOMES**	**KEY PERFORMANCE INDICATORS**	**RESPONSIBLE INSTITUTIONS**	**TARGETED GROUPS**	**SOURCE OF FUNDS**	**INDICATIVE BUDGET (KES MILLIONS)**				

Priority area 5: Disaster (Drought and Flood) Risk Management

Objective: Reduce risks to communities and infrastructure resulting from climate-related disasters such as droughts and floods.
Indicators:

- The number of sectors that adopt and implement sectorial disaster risk reduction strategies in line with the County strategies. □ Early warning systems.
- The number of households receiving food aid and cash transfers.

Increase number of households and entities benefiting from the County climate change adaptive services	The number of beneficiaries of social protection programs for chronically flood insecure populations increased from figures	Adaptation Number of beneficiaries of social protection mechanisms (food and cash transfers)	County Climate Change Coordination unit County Department of Water, Irrigation, Environment, and Natural Resources County and Sub-County Education, Skills Training and Social Welfare Committees County Department of	Small-holder farmers, Persons Living with Disabilities, Marginalised and vulnerable Community groups such as the elderly,	County Budget Development Partners	400	100	100	100	100

			Education, Skills Training and Social Welfare County Department of Agriculture, Food Security, and Co-operative Development County Administration and Decentralized Units committee County Department of Finance and Economic Planning County Department of Health and Emergency Services Ministry of Devolution and ASAL Areas. National Drought Management Authority (NDMA)	women and children, orphans						
	Establish County Climate Change Funds to address local adaptation priorities	Amount of funding allocated to climate change actions through the Machakos County Climate Change Fund regulations				200	50	50	50	50
Improve the ability of people to cope with drought	Improvement of early warning systems for drought at the community level	Number of developed drought early warning systems	County Climate Change Coordination unit County Department of Water, Irrigation,			450	50	200	100	100

			Environment, and Climate change County Department of Education, Skills Training and Social Welfare County Department of Agriculture, Food Security, and Co-operative Development County Department of Health and Emergency Services							
Improve the ability of people to cope with flood disasters and develop essential infrastructure	Improved flood early warning systems, taking advantage of widespread access to mobile technology that provides an avenue for disseminating information					100	200	200	200	200
	Develop Integrated Flood Management Plans for each sub-county					80	20	20	20	20

	with emphasis on water harvesting and storage, drainage networks, reforestation and rehabilitation of riparian areas, construction of dams, sand dams, and water pans, and controlled land-use restrictions		County Department of Public Service, Quality Management and ICT Department of County Administration and Decentralized Units National Drought Management Authority (NDMA) Water Resource Management Authority (WRMA) Kenya Meteorological Department Climate Change Directorate							
Enhance coordination and delivery of disaster risk management	Develop and implement a County disaster risk management policy and plan	County Disaster Risk Management Committee established				400	100	100	100	100
Establish a County Disaster Risk Management Fund	Set up a County Disaster Risk Management Committee to coordinate disaster response at the County level	Establish a County Disaster Risk Management Fund				500	50	150	150	150

Promote the use of cultural practice and traditional knowledge to increase resilience to climate change	Explore and document cultural practices that promote environmental conservation	Safeguard traditional knowledge, values, and practices that enhance the communities' resilience against natural disasters and climate change								
Sub-total =4000						**4000**	**800**	**800**	**800**	**800**

Promote the transition to clean cooking with alternative fuels, such as liquefied petroleum gas (LPG), ethanol, and other clean fuels in urban areas	Promote the use of biomass briquettes by households as alternatives to wood fuel	The proportion of households using briquettes	County Department of Lands, Energy, Housing and Urban Development County Department of Water, Irrigation, Environment and climate change County Climate Change Coordination unit Energy and Petroleum Regulatory Authority (EPRA) Clean Cooking Alliance of Kenya Kenya Private Sector Alliance (KEPSA)	Female headed households in urban areas, Microfinance institutions, women, youth and PLWD groups, LPG gas and stoves, manufacturer's and ethanol producers and distributors	County Budget Development Partners	800	200	200	250	150
	Promote the uptake of LPG, ethanol, and other cleaner fuels for cooking by supporting clean energy program	Number of households using LPG, ethanol, and other clean fuels								
	Support local businesses distributing LPG and ethanol to consumers Support to local manufacturers of clean cookers	Partnerships with micro-finance institutions								
	Support to the *Jua kali* sector within the County to manufacture	Number of cook stoves produced and sold by								

		the Juakali sector								

	quality and affordable clean cookstoves									
	Distribute 1000 solar lanterns and 1000 clean cooking stoves to support the work of women, youths, and PLWD	Number of solar lanterns distributed				25	5	15	10	5
	Promote research, development, and adoption of biogas technology to generate renewable energy through the construction of biodigesters and biogas systems for domestic use.	Research reports				80	1 5	25	25	15
Increase access and support to renewable energy and support the adoption of	Establishment of renewable energy demo site at sub-county level	Number of renewable energy demonstration sites				35	10	10	5	5

renewable		developed								
	Create awareness and promote Development and adoption of new renewable energy sources including biogas, hydro, Solar, and Wind	Number of renewable energy projects developed				12	4	4	4	0
Total						952	234	264	294	175

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