URBAN CLIMATE RISK PROFILE

FOR KERICHO MUNICIPALITY

A Comprehensive Assessment of Climate Hazard, Exposure, Vulnerability, and Institutional Resilience Pathways

Kericho Municipality within the Lake Victoria Basin.

Flash flooding during intense rainfall events.

Urban expansion within Kericho's high rainfall plateau.

Prepared for

Kericho Municipality

County Government of Kericho

March 2026

KEY MESSAGE: Kericho's climate risks are driven by intense rainfall, growing urban exposure, and infrastructure limitations. Strategic planning and resilient infrastructure can significantly reduce long-term vulnerability.

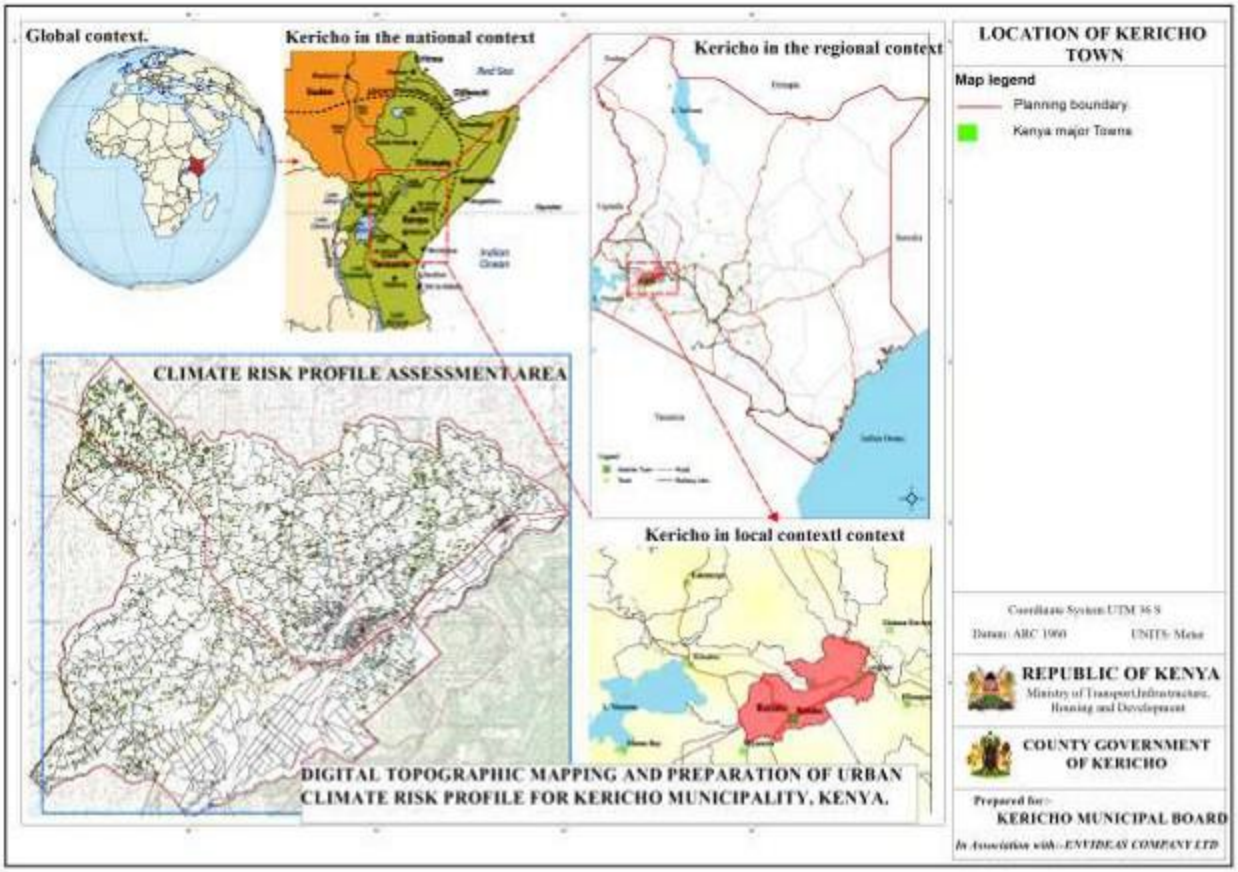

Figure 1: Digital Topographic Map- Location of Kericho Town

Foreword

Kericho Municipality continues to grow as an important urban and economic centre within Kericho County. The municipality plays a vital role in supporting regional development, providing services to residents, and sustaining the economic activities that contribute significantly to the broader prosperity of the region. However, like many urban areas around the world, Kericho faces increasing environmental pressures associated with climate variability and long-term climate change.

Urban areas are particularly vulnerable to climate-related hazards because of the concentration of people, infrastructure, and economic activities. In Kericho, heavy rainfall events, localized flooding, soil erosion, and increasing pressure on urban infrastructure present growing challenges for municipal planning and service delivery. These risks highlight the need for proactive planning approaches that strengthen resilience while supporting sustainable urban development.

This report on the Urban Climate Risk Profile of Kericho Municipality provides an important step toward understanding the nature and scale of these challenges. Through systematic analysis of climate trends, environmental conditions, and urban development patterns, the study identifies key vulnerabilities within the municipality and highlights practical strategies that can support climate-resilient development. The report also emphasizes the importance of integrating climate risk considerations into urban governance, infrastructure planning, and environmental management.

I therefore commend the efforts that have gone into the preparation of this report. It represents a significant contribution to the knowledge base needed to guide sustainable urban development in Kericho. I hope that the recommendations and insights contained within this document will support ongoing initiatives aimed at strengthening the municipality's resilience to climate-related hazards while promoting inclusive and environmentally responsible urban growth.

Philemon Kosgei

Municipal Manager

Preface

Urban centres today are facing increasingly complex challenges as a result of climate variability, rapid urbanization, and growing pressure on infrastructure and natural resources. These challenges require municipalities to adopt forward-looking planning approaches that ensure development remains sustainable, inclusive, and resilient. As a rapidly growing urban centre within Kericho County, Kericho Municipality must continually strengthen its ability to respond to environmental risks while supporting economic growth and improved quality of life for its residents.

This report on the Urban Climate Risk Profile of Kericho Municipality provides an important foundation for understanding the environmental risks that may affect the municipality both now and in the future. Through careful analysis of climate patterns, urban development trends, and environmental conditions, the study highlights the key climate hazards and risks that have the potential to affect infrastructure, livelihoods, and the overall functioning of the urban system.

As Chairman of the Municipal Board, I recognize the importance of ensuring that governance and planning processes are informed by reliable data and sound analysis. Effective urban management requires a clear understanding of the risks that cities face and the opportunities available to address them.

The Municipal Board plays a crucial role in guiding the strategic direction of the municipality and supporting initiatives that enhance sustainable development.

I commend the efforts of all those who contributed to the preparation of this report. Their work provides an important resource for municipal board members, planners, and policymakers seeking to strengthen Kericho's resilience to climate-related challenges. It is my hope that the knowledge and recommendations contained in this document will support ongoing initiatives aimed at building a more sustainable, resilient, and well-planned municipality.

CPA Peter Korir

Chairman, Municipal Board

Acknowledgements

The preparation of this Urban Climate Risk Profile for Kericho Municipality was made possible through the collaboration, guidance, and support of numerous individuals and institutions. The consulting team would like to express sincere appreciation to all those who contributed their time, expertise, and valuable insights during the development of this report.

First and foremost, we extend our gratitude to the leadership of Kericho Municipality in Kericho County for their commitment to strengthening climate resilience and promoting sustainable urban development. Special appreciation is extended to Mr. Philmon Kosgei, Municipal Manager, for his leadership and support throughout the preparation of this assessment. We also acknowledge Mr. Peter Korir, Chairman of the Municipal Board, and the entire Municipal Board Members for their strategic guidance and commitment to evidence-based planning.

This report was prepared by the consulting team from Envideas Company Ltd, whose multidisciplinary expertise made this work possible. The team was led by Brian Cheruiyot, Chief Executive Officer, who provided overall leadership and coordination of the study. The technical analysis and policy perspectives were further strengthened through the contribution of Dr. Onyari Nyabongoye, Climate and Urban Governance Expert, Dr. George Omondi Environmental Planning Specialist whose insights helped shape the analytical framework and governance considerations presented in this report. The study also benefited significantly from the professional expertise of Onesimus Musyoki, Registered Physical Planner, whose experience in urban planning and spatial analysis contributed to the assessment of land use patterns, urban growth, and planning implications for climate resilience.

Finally, we extend our appreciation to all institutions and individuals who supported the research process and contributed to the development of this report. It is our hope that the findings and recommendations presented herein will support ongoing efforts to strengthen climate resilience, enhance urban planning systems, and promote sustainable development within Kericho Municipality.

Envideas Company Ltd

Special Appreciation

The consulting team extends its sincere appreciation to the following county and municipal technical team for their valuable support, professional insights, and contributions during the preparation of this report. Their expertise greatly assisted in strengthening the technical quality and contextual relevance of the study for Kericho Municipality.

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Table of Contents

LIST OF FIGURES

LIST OF TABLES

Acronyms

CBD	Central Business District
CRA	Climate Risk Assessment
CRVA	Climate Risk and Vulnerability Assessment
DRR	Disaster Risk Reduction
FLLoCA	Financing Locally Led Climate Action
GIS	Geographic Information System
ICT	Information and Communication Technology
KEWASCO	Kericho Water and Sanitation Company
KMD	Kenya Meteorological Department
KPLC	Kenya Power and Lighting Company
KUSP	Kenya Urban Support Programme
NGO	Non-Governmental Organization
NMT	Non-Motorized Transport
PWD	Persons with Disabilities
RCRA	Resource Conservation and Recovery Act
SDGs	Sustainable Development Goals
SPEI	Standardized Precipitation Evapotranspiration Index
UCRP	Urban Climate Risk Profile
VMG	Vulnerable and Marginalized Group

Definition of Terms

TERMS	DEFINITION
Climate Intelligence	The collection, analysis, and use of climate-related data to inform governance, planning, and resilience decision-making.
Composite Risk	The combined measure of hazard, exposure, and vulnerability in a specific location, reflecting the overall likelihood and potential severity of climate impacts.
Exposure	The degree to which people, assets, or infrastructure are physically present in areas subject to climate hazards.
Hazard	A potentially damaging physical event or trend, such as extreme rainfall, flooding, or landslides.
Integrated Risk Assessment	A methodological approach combining hazard, exposure, and vulnerability to quantify overall climate risk.
Institutionalization	The process of embedding climate resilience practices into standard governance and administrative procedures.
KUVI (Kericho Urban Vulnerability Index)	A composite metric developed to quantify social, infrastructural, economic, and institutional vulnerability in Kericho Municipality.
Nonlinear Risk Amplification	The phenomenon where small increases in hazard intensity or exposure lead to disproportionately larger increases in overall risk
Resilience	The capacity of an urban system or community to absorb, adapt to, and recover from climate shocks while maintaining essential functions.
Resilience Trajectory	The projected evolution of a municipality's resilience over time under specific intervention strategies.
Risk	The potential for loss or harm, calculated as the interaction of hazard, exposure, and vulnerability.
Systemic Hotspot	Areas where high hazard intensity, dense exposure, and elevated vulnerability converge, generating concentrated risk.

Vulnerability	The susceptibility of a system, community, or asset to harm from climate hazards, influenced by socio-economic, infrastructural, and institutional factors.
Tier I, II, III Adaptation Measures	Phased categories of intervention: Tier I – risk avoidance through planning; Tier II – structural risk reduction; Tier III – risk management and institutional strengthening.
Green Infrastructure	Nature-based solutions such as trees, wetlands, permeable surfaces, and riparian buffers that reduce climate hazards while enhancing ecosystem services.

Abstract

This Urban Climate Risk Profile examines the climate-related risks facing Kericho Municipality and outlines a practical pathway toward building a more resilient and sustainable urban future. The study responds to increasing rainfall variability, localized flooding, infrastructure strain, and growing settlement exposure that together threaten long-term development stability.

Rather than treating climate challenges as isolated environmental events, this report approaches risk as the result of three interacting factors: the intensity of climate hazards, the location of people and infrastructure within hazard-prone areas, and the vulnerability of communities and institutions to absorb and recover from shocks. By bringing these elements together, the assessment provides a clear understanding of where risks are concentrated and why they occur.

The analysis identifies areas of heightened flood susceptibility, infrastructure weaknesses, and socio-economic vulnerability across the municipality. It then combines these findings into an integrated risk framework that supports evidence-based prioritization of interventions. This allows the municipality to direct resources strategically toward areas where risk is greatest and impact reduction will be most meaningful.

Beyond diagnosis, the report proposes a phased resilience strategy that includes drainage improvements, climate-sensitive urban planning, institutional reform, strengthened early warning systems, and long-term governance alignment. It emphasizes that resilience is not achieved through single projects but through sustained improvements in planning, infrastructure standards, fiscal management, and institutional coordination.

Ultimately, this Urban Climate Risk Profile positions Kericho Municipality to move from reactive crisis response toward proactive climate-informed development. It provides a structured foundation for long-term resilience, economic stability, and inclusive urban growth.

Table 1: Stakeholder Analysis and Engagement Framework for Climate Resilience in Kericho Municipality

Influence	Interest	Stakeholder	Role / Responsibility	Influence on Climate Resilience	Engagement Priority
High	Low	County Department Staff	Provide technical input and advisory support	Moderate – can influence technical guidance but limited project involvement	Medium – consult for technical reviews
High	High	Municipal Manager	Oversee municipal adaptation programs and approve interventions	Very High – key decision-maker for resource allocation	High – continuous engagement required
High	High	County Governor's Office	Policy approval, budget allocation, and inter-department coordination	Very High – strategic influence over adaptation funding and policy alignment	High – regular briefing and alignment meetings
High	High	Planning Department	Spatial planning, zoning, and hazard-informed approvals	High – critical for risk avoidance through land-use control	High – engage in policy design and monitoring

Low	Low	Community Groups	Represent local interests and provide feedback	Low – limited influence unless mobilized	Low – keep informed of plans
Low	High	Women, Youth, PWD VMGs Local NGOs	Advocate for vulnerable communities and implement local resilience initiatives	Medium – can amplify community voice and support adaptation projects	Medium – targeted engagement in project implementation
Low	High	Administrators	Local governance, coordination, and communication	Medium – key for local enforcement and awareness campaigns	High – maintain active consultation and monitoring
Low	High	Business Community Representatives	Liaison between residents and municipal authorities	Medium – provide ground-level risk insights	Medium – periodic engagement and reporting
Low	High	Informal Settlements	Urban Dwellers	Very High – require strategic policy alignment	

Executive Summary

Urban areas and the fastest-growing cities in Africa are experiencing devastating impact of climate change. The changing climate requires a human response to reduce urban vulnerability in Africa. The purpose of this scoping review was to map evidence of climate vulnerability, existing adaptation, and associated barriers to inform policies and future research in Kenya. Climate change is harming urban populations and communities, especially poor urban populations in informal settlements through food insecurity, water stress, destruction of livelihoods and key infrastructure, physical and mental health issues, poor sanitation, stigmatization, crime, disruption in school and healthcare delivery, migration and unemployment. Also, existing urban adaptation responses to climate risk are not at the level needed to build resilience to urban vulnerability. In addition, there is evidence of maladaptation which might worsen the climate burden on the poor urban population. In conclusion, climate change poses severe challenges for Kenya urban poor, heightening vulnerability through food insecurity, water stress, and infrastructure destruction. Current adaptation efforts are insufficient and may worsen adaptation efforts. Urgent actions are needed, including enhanced climate knowledge, early warning systems, robust policies, and targeted interventions addressing poverty and infrastructure deficits. Integrating climate research into urban planning is vital to build resilience and protect marginalized urban population.

Also;

Kericho Municipality is growing and developing within a changing climate environment. Increased rainfall intensity, localized flooding, and infrastructure pressure are no longer rare events. These patterns are becoming part of the municipality's development reality. If not managed strategically, they pose risks to infrastructure systems, economic stability, municipal finances, and vulnerable communities.

This Urban Climate Risk Profile was developed to provide Kericho with a clear, evidence-based understanding of these risks and a structured plan to address them. The report does not view climate change as an abstract global issue. Instead, it examines how rainfall patterns, settlement expansion, infrastructure design, and governance systems interact locally to shape risk.

The assessment is built around three key questions:

- Where the main climate is hazards occurring?

- Who and what are exposed to those hazards?
- How vulnerable are those exposed systems and communities?

By answering these questions, the report identifies specific wards and infrastructure networks where flood risk is most concentrated. It also highlights how settlement patterns, drainage limitations, and socio-economic inequality increase the impact of climate events.

One of the central findings of this report is that climate risk in Kericho is not random. It is shaped by planning decisions, infrastructure standards, land-use patterns, and institutional capacity. This means that risk can be reduced through deliberate policy choices and structured investment.

The report proposes a phased strategy for action. In the short term, priority should be given to drainage rehabilitation in high-risk areas, improved enforcement of zoning regulations, and strengthening of early warning systems. In the medium term, the municipality should integrate green infrastructure solutions, enhance climate screening in capital investments, and strengthen coordination across departments. In the long term, resilience must be fully embedded in municipal governance, budgeting, procurement, and investment in development planning processes.

The report also makes clear that climate resilience is not only about environmental protection. It is about economic stability. Flood impacts disrupts businesses, reduces revenue collection efficiency, increases repair costs, business operations and places strain on public infrastructure services. Reducing climate risk therefore protects municipal finances and strengthens investor confidence.

Importantly, the analysis shows that lower-income communities often face greater exposure and fewer resources to recover. Addressing these vulnerabilities is both a development priority and a matter of fairness. Targeted upgrading and infrastructure improvements in high-risk settlements are essential to building inclusive resilience.

This Urban Climate Risk Profile provides Kericho Municipality with a practical roadmap for the next twenty years. It establishes where risks are highest, what actions are most urgent, and how governance systems must evolve to ensure long-term stability.

Climate variability will continue. However, with structured planning, disciplined investment, and institutional commitment, Kericho can reduce its vulnerability, protect its development gains, and position itself as a climate-ready municipality.

The opportunity now is to move from assessment to implementation.

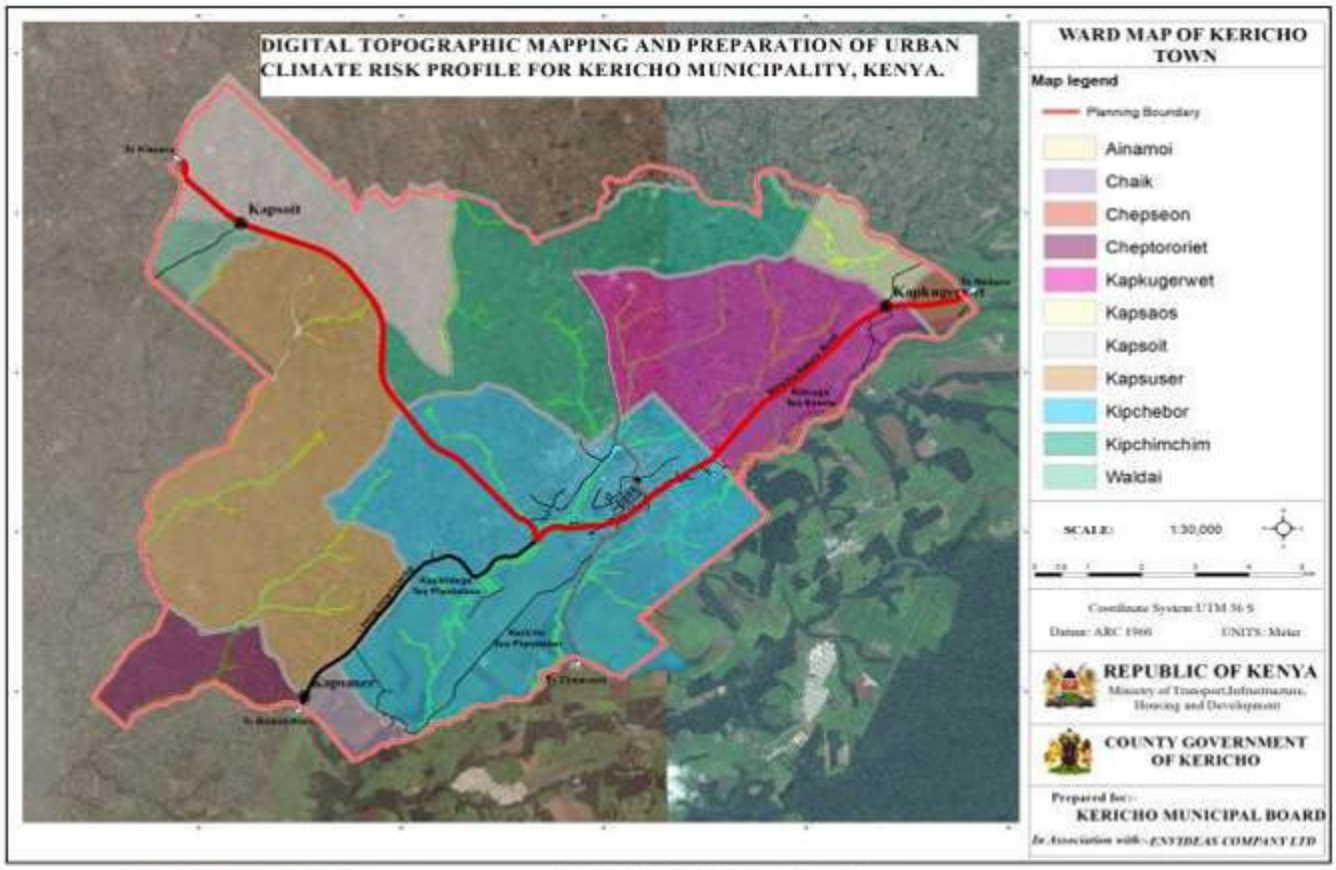

Figure 2:Ward Map Kericho Municipality

SECTION 1: GENERAL CONTEXT

CHAPTER ONE

1.0 Overview

Climate change is universally recognized as one of the most important development challenges facing humanity. There is growing evidence that climate change is directly impacting the social, economic, and human development. The fight against climate change has one of the most important global development priorities.

Table 2: Stakeholder Mapping (Expanded)

Influence	Interest	Stakeholders	Role	Notes
High	Low	County Department Staff	Policy implementation support	Limited direct engagement
High	High	Municipal Manager	Strategic oversight	Coordinates urban resilience projects
High	High	County Governor's Office	Policy direction, funding	Authorizes major development projects
High	High	Planning Department	Urban planning and technical guidance	Coordinates hazard mapping
Medium	Medium	Women, Youth ,PWDs and VMGs Local NGOs	Advocacy and community outreach	May assist with adaptation projects

Low	High	Administration	Community coordination	Mobilizes residents during hazard events
Low	High	Business Community Representatives	Awareness, reporting hazards	Voice for vulnerable populations

1.2 Objective(s) of the Urban Climate Risk Profile

This study aims to assess the nature and extent of current and future climate change risks by analyzing potential hazards and evaluating vulnerabilities that could pose threats to the population, property, livelihoods, and the environment within Kericho Municipality. This Climate Risk and Vulnerability Assessment provided critical information to support the municipality and county government in designing and adopting a targeted and ambitious climate change adaptation strategy. It also facilitated the mainstreaming of climate change considerations across all county departments and policies, including gender, youth, energy, finance, roads and transport, urban planning, water and wastewater management, education, and public health.

A key challenge in this process was changing mindsets. Raising awareness and sharing knowledge on climate change with all stakeholders, particularly the residents of Kericho Municipality, was essential. Showcasing best practices and practical adaptation measures encouraged communities to adopt behaviours and strategies that protected themselves, infrastructure, and economic activities, thereby strengthening the municipality's resilience to climate-related hazards

- To assess priority issues for climate change adaptation planning in order to enhance preparedness, reduce exposure, and minimize negative socio-economic and environmental impacts.
- To assess opportunities and challenges for strengthening adaptive capacity among communities, institutions, and key sectors, and for building resilient systems capable of withstanding current and future climate shocks and stresses.

1.3 Basic Information About Kericho Municipality

1.3.1 Urban Context

Kericho town is located in the south-western highlands of Kenya and serves as a major transit and service hub linking the greater Western Kenya region. Its strategic position along key transport corridors connecting Kisumu, Kisii, Bomet, Nakuru and Narok has significantly contributed to its rapid growth as a commercial and administrative centre.

Kericho Municipality occupies a strategic role as the economic anchor of the region and holds a comparative advantage as the headquarters of Kenya's tea industry. The presence of large multinational tea estates and processing factories has made the town a major employment destination, attracting workers from different parts of the country. As a result, Kericho has developed into a highly cosmopolitan urban centre with a diverse social and cultural composition.

As the county headquarters, Kericho town records the highest population among the major urban centers within the county. According to the 2019 Population and Housing Census, the municipality had a population of approximately 163,000 people. This population is projected to exceed 185,000 by 2025, driven by continued rural–urban migration, expansion of the tea sector, and growth in trade and service industries.

The current urban footprint of Kericho Municipality now includes the expanded town area covering the triangle formed by Kapkugerwet, Kapsoit and Kapsuser, reflecting ongoing spatial growth and increasing demand for housing, infrastructure and public services.

Table 3: Geographic and Environmental Context of Kericho Municipality with Climate Risk Implications

Feature	Description	Notes / Implications for Climate Risk
Municipality	Kericho Municipality	Primary urban center for Kericho County; high population density in central wards
County	Kericho County	County-level governance shapes policy and development planning
Geographic Coordinates	~0.368°S, 35.283°E	Positioned in highland region; influences rainfall and runoff patterns
Average Elevation	~2000 m above sea level	Steep slopes in peri-urban areas increase landslide susceptibility
Topography	Undulating hills and valleys	Slope gradients affect drainage flow and flood concentration zones
Average Annual Rainfall	1800–2200 mm	Rainfall variability drives surface runoff and seasonal flooding
Rainfall Pattern	Bimodal (long rains Mar–May; short rains Oct–Dec)	Planning for storm water management must account for peak rain periods
Average Temperature	18–24 °C	Moderate climate; temperature extremes are rare but affect evapotranspiration
Dominant Soil Types	Clay loam, volcanic soils	Soil permeability influences infiltration and surface runoff
Drainage / River Systems	Kericho River, small tributaries, natural drainage corridors	Areas along rivers and low-lying zones are highly exposed to flooding
Land Use	Urban residential, commercial, tea plantations, informal settlements	Exposure concentrated in drainage-adjacent informal settlements

Transportation / Connectivity	Road network links municipality to major county towns and tea factories	Flooding of roads can disrupt economic activity and supply chains
Proximity to Key Infrastructure	Hospitals, schools, municipal offices, markets	Critical infrastructure exposure contributes to systemic risk

1.3.2 Governance Structure

Devolution involves the transfer and distribution of powers, functions, and resources across different levels of government. Kericho Municipality is administratively divided into 11 wards, each governed by designated administrators responsible for the implementation of policies and management of public services within their respective jurisdictions. At the municipal level, governance is overseen by a Municipal Board established under the Urban Areas and Cities Act, comprising representatives from the county government, professional bodies, the private sector, special interest groups, and community representatives. The Municipal Board provides strategic direction, policy oversight, and coordination of development initiatives within the municipality.

The climate risk and vulnerability assessment adopted a multi-level scope, covering administrative units from the ward level down to the sub-location and village levels. Consequently, public participation was undertaken through structured stakeholder consultations and the administration of household questionnaires, ensuring inclusive engagement of communities at the grassroots level and capturing localized climate risks, vulnerabilities, and adaptation needs.

1.3.3 Kericho Municipality Physiographic Characteristics

Kericho Municipality experiences a cool and wet highland equatorial climate, largely influenced by its high altitude, which ranges between approximately 1,800 and 2,200 metres above sea level. The area is characterized by moderate temperatures and high rainfall throughout most of the year. Average daily temperatures range between 12°C and 24°C, with cooler conditions experienced during the months of June to August and slightly warmer temperatures occurring between January and March. The municipality rarely experiences extreme heat, making the climate generally favourable for agriculture and human settlement.

Rainfall is bimodal, with two main rainy seasons. The long rains occur between March and June, while the short rains are experienced between September and November. Annual rainfall averages between 1,200 mm and 2,000 mm, making Kericho one of the wettest regions in Kenya. Rainfall is often heavy and prolonged, sometimes accompanied by thunderstorms.

In recent years, however, the municipality has experienced increasing climate variability, including unpredictable rainfall patterns, prolonged dry spells, and episodes of intense rainfall. These changes have contributed to increased risks of flooding, soil erosion, waterlogging, and landslides in low-lying and steep areas, affecting agriculture, infrastructure, and public health.

1.3.4 Social Economic Context

Agriculture is the main source of livelihood in Kericho County, contributing to over 50% of household income and employing a vast majority of the county's population, primarily in tea, coffee, and maize production. However, the county faces a high poverty rate, with approximately 39.8% to 47.8% of the population living below the poverty line, often exacerbated by a high prevalence of food insecurity.

Kericho Municipality serves as the economic hub of Kericho County and the wider South Rift and Western Kenya region. The local economy is predominantly anchored on agriculture, with tea production forming the backbone of economic activity. The municipality hosts several large tea estates, processing factories, and regional offices of major tea companies, making it a key contributor to Kenya's export earnings and employment generation.

In addition to tea, the municipality supports other agricultural activities including dairy farming, maize and vegetable cultivation, and small-scale horticulture. These activities provide livelihoods for a significant proportion of households within peri-urban and surrounding rural areas. However, most agricultural production remains highly dependent on rainfall, making it vulnerable to climate variability and extreme weather events.

1.3.5 Governance Structure

Table 4: Governance Structure

Level	Institution	Mandate / Role	Key Responsibilities Relevant to Climate Resilience
County	Kericho County Government	Strategic policy direction and resource allocation	Formulates county-level climate policies, approves budgets for municipal adaptation projects, coordinates inter-municipal resilience initiatives
Municipal	Kericho Municipal Board	Urban management, development planning, and service delivery	Oversees zoning regulations, approves urban development plans, implements adaptation projects, monitors infrastructure performance
Ward	Administrators	Community engagement and localized coordination	Facilitates participatory planning, communicates risk alerts, mobilizes community-based adaptation initiatives, monitors informal settlements
Technical	Planning & Environment Departments	Technical analysis, planning, and implementation support	Conducts hazard mapping, environmental impact assessments, urban planning design, coordinates technical aspects of infrastructure and drainage projects
Disaster & Emergency	Municipal Disaster Management Unit	Preparedness and response coordination	Develops early warning systems, coordinates emergency response during floods or landslides,

			supports post-event recovery planning
Finance & Budget	Municipal Finance Department	Resource mobilization and fiscal management	Integrates climate budget tagging, allocates funds for resilience projects, ensures sustainable financing of adaptation measures

The service and trade sector also plays a major role in the municipal economy. Kericho town functions as a commercial centre serving surrounding counties, with vibrant wholesale and retail trade, financial services, hospitality, transport, education, and health services. The presence of county government offices, learning institutions, and private enterprises has further stimulated demand for housing, infrastructure, and urban services.

The informal sector constitutes a substantial share of economic activity, particularly in retail trade, transport (boda boda and matatu services), food vending, and small manufacturing. This sector provides employment for many low-income households but remains highly exposed to climate-related risks such as flooding, heat stress, and disruptions in market access.

Overall, while Kericho Municipality has a relatively strong economic base driven by agriculture and services, its economy remains climate-sensitive, with high dependence on natural resources, weather patterns, and infrastructure resilience. Strengthening economic diversification, value addition, and climate-resilient investments is therefore critical for sustainable and inclusive growth.

1.3.6 Preliminary Methodology- key stakeholders and inclusiveness

The preparation of the Climate Risk Profile for Kericho Municipality adopted a participatory and inclusive approach to ensure that the views, experiences, and priorities of all relevant stakeholders were effectively captured. Key stakeholders involved in the process included;

- County Government departments responsible for environment, climate change, water, agriculture, health, infrastructure, lands, and disaster management,
- Kericho Municipal Board, which provided strategic oversight and policy direction.
- National government agencies such as the National Environment Management Authority (NEMA) and the
- Kenya Meteorological Department (KMD) contributed technical expertise and data,

- Civil society organizations,
- Non-Governmental Organizations,
- Private sector actors including tea estates, traders, transport operators, and agro-processors provided sector-specific insights.
- Urban dwellers
- Informal Settlements

Inclusiveness was ensured through structured stakeholder consultations conducted at Municipality Ward levels, complemented by household surveys and focus group discussions. Special effort was made to engage vulnerable and marginalized groups, including women, youth, persons with disabilities, the elderly, informal settlement residents, and business communities. The use of local languages, gender-sensitive tools, and community-based engagement methods enabled broad participation and meaningful contribution. This inclusive process ensured that the Climate Risk Profile reflected local realities, captured differentiated vulnerabilities, and supported the development of equitable, practical, and community-driven climate adaptation strategies

1.3.7 General approach

The Climate Risk and Vulnerability Assessment (CRVA) for Kericho Municipality adopted a mixed-methods and participatory approach that combined both qualitative and quantitative techniques. The assessment was guided by national and international climate risk assessment frameworks and aligned with county and municipal development planning processes. It involved a systematic analysis of climate hazards, exposure, sensitivity, and adaptive capacity across key sectors, including water, agriculture, health, infrastructure, environment, and livelihoods.

The general approach comprised a desk review of relevant policy documents, climate data, and secondary literature, followed by primary data collection through stakeholder consultations, key informant interviews, focus group discussions, and household surveys conducted at ward, sub-location, and village levels. Spatial analysis and mapping were also applied to identify climate hotspots and vulnerable areas. The collected data were then analyzed to assess current and future climate risks, prioritize vulnerabilities, and identify adaptation options. Finally, the findings were validated through stakeholder feedback workshops to ensure accuracy, local relevance, and ownership of the results.

1.3.8 Ethical Considerations and Quality Control

The Climate Risk and Vulnerability Assessment for Kericho Municipality were conducted with strict adherence to ethical principles to ensure the protection, dignity, and rights of all participants. Participation in surveys, interviews, and focus group discussions was voluntary, and respondents were fully informed about the purpose of the assessment.

Field teams received training on standardized data collection procedures, and all collected data were cross-checked for completeness and consistency. Triangulation of information from different sources desk reviews, stakeholder consultations, surveys, and spatial analyses was applied to validate findings. Finally, stakeholder validation workshops were conducted to review and confirm the results, ensuring that the Climate Risk and Vulnerability Assessment reflected accurate, credible, and locally relevant information.

Table 5: Land use Patterns

Land Use Type	Estimated Share (%)	Description / Notes
Residential	45%	Includes formal housing estates, informal settlements, and mixed residential neighborhoods. Concentrations are higher in peri-urban zones.
Commercial	10%	Encompasses retail centers, markets, banks, office buildings, and small business clusters. Often concentrated in town center and along main transport corridors.
Industrial	5%	Small- and medium-scale industrial zones, including agro-processing facilities and light manufacturing units. Located primarily on municipal outskirts.
Green / Open Space	15%	Parks, recreational areas, riparian buffers, and natural reserves. Crucial for stormwater management and climate mitigation.
Agriculture / Peri-Urban	25%	Smallholder tea farms, horticulture plots, and mixed-use peri-urban farming areas that interface with expanding urban settlements.

1.4 Hazard Assessment: Overview

Kericho Municipality is exposed to a range of climate-related hazards that have the potential to affect its population, infrastructure, livelihoods, and ecosystems. The hazard screening below identifies and characterizes the key climate risks relevant to the municipality.

1.4.0 Hazard screening in Kericho municipality

This hazard screening highlights the need for targeted adaptation measures that address flooding, water stress, heat stress, and storms, while strengthening community resilience, urban infrastructure, and ecosystem management within Kericho Municipality.

1.4.1 Hazard Assessment

Table 6: Hazard Screening

Hazard	Likely Occurrence	Potential Impact	Priority Level	Classification as Key Hazard	Notes / Rationale
Heat Stress	Yes	Moderate	High	Yes	Increased daytime temperatures affect outdoor workers, health facilities, and energy demand. Localized but recurring.
Flooding	Yes	High	Very High	Yes	Recurrent pluvial flooding in low-lying wards, exacerbated by drainage inadequacy and impermeable surfaces.
Drought	Yes	High	High	Yes	Periodic rainfall deficits affecting water supply, agriculture, and economic activities,

					especially peri-urban tea farming.
Landslides	Yes	High	High	Yes	Slope instability in peri-urban settlements due to heavy rainfall and soil degradation. Potentially life-threatening.
Storms / Strong Winds	Yes	Low	Moderate	No	Occasional storms with localized roof damage or falling trees; low systemic impact relative to other hazards.

Table 7 : Table showing Impacts on each element

Hazard	Likely	Significant Impact	High Priority	Key Hazard
Heat Stress	Y	Y	Y	Y
Flooding	Y	Y	Y	Y
Drought	Y	Y	Y	Y
Landslides	Y	Y	Y	Y
Storms	Y	N	N	N

1.4.1.1Flooding

Flooding in Kericho Municipality is increasingly influenced by changes in precipitation patterns, including more intense and erratic rainfall during the long and short rainy seasons. The municipality experiences surface-level flooding in low-lying areas, flash floods in steep terrains, and urban flooding in densely built-up settlements where drainage systems are inadequate. Persistent rainfall and poor drainage contribute to waterlogging, particularly affecting roads such as Temple Road, John Kerich and Isaac Salat Road, Nyagacho Road, Talai Road, and Annex Roads, as well as residential areas and agricultural land. While Kericho is inland and not directly threatened by sea level rise, upstream hydrological changes in the region can exacerbate flooding

downstream. These events disrupt transport, damage property, threaten livelihoods, and increase public health risks.

1.4.1.2 Water Stress

Water stress is an emerging concern due to recurrent droughts, fluctuating rainfall, and rising demand from agriculture, industry, and households. Groundwater levels in some areas, including sources from the Mau Escarpments, which supply water to the municipality, are declining, reducing the availability of reliable water for domestic use and irrigation, particularly at the beginning of the year. Areas with intensive agriculture and poor water management may also experience salinization, which reduces soil fertility and crop productivity. Although saline intrusion from the sea is not a risk in this inland municipality, water quality challenges, including contamination from surface runoff, pose localized stress on water resources.

1.4.1.3 Heat Stress

Kericho has historically enjoyed a moderate highland climate; however, average surface temperatures have been increasing over recent years. Rising temperatures contribute to heat stress, particularly affecting vulnerable groups such as the elderly, children, and outdoor agricultural labourers. Higher temperatures also influence evapotranspiration rates, soil moisture deficits, and crop yields, and can amplify the impacts of droughts and other climate hazards.

1.4.1.4 Storms

Kericho Municipality is occasionally affected by extreme wind events as well as sand and dust storms, particularly during transitional dry periods. These storms can cause property damage, disrupt transport networks, and increase health risks from respiratory conditions. While less frequent or severe than in arid regions, such events are increasingly notable due to changing weather patterns and land use changes in surrounding areas.

Table 8:Climate indicator and hazards thresholds

Climate Hazard	Key Indicators	Hazard Thresholds / Triggers	Potential Impacts
Flooding	Seasonal rainfall, extreme rainfall events, number of heavy rainfall days (>50 mm/day), river flow, soil saturation, urban drainage capacity	Daily rainfall >50–70 mm, river flows above bank capacity, drainage failure leading to waterlogging	Surface flooding, flash floods, urban flooding, road and property damage, disruption of transport, health risks
Water Stress	Groundwater levels, river and spring flows, rainfall deficits, soil moisture, water demand vs availability, water quality	Groundwater below sustainable yield, river flow below minimum ecological flow, rainfall deficit >20% of normal seasonal average	Reduced domestic and irrigation water supply, crop yield reduction, soil fertility loss, water quality challenges
Heat Stress	Average daily maximum temperature, frequency of days >30°C, heatwave duration, nighttime minimum temperatures	Average maximum temperature >30–32°C, consecutive hot days >3–5 days	Health risks (heat exhaustion, dehydration), reduced crop and livestock productivity, increased evapotranspiration
Storms	Maximum wind speed, frequency of extreme wind events, dust/sand storm occurrence, storm duration	Wind speeds >50–60 km/h, frequent dust/sand storms reducing visibility or causing damage	Property damage, transport disruption, soil erosion, health risks

			from respiratory conditions

1.5 Current Climate Risk on Water Sources

Kericho Municipality boasts relatively abundant water resources due to its high rainfall, favourable topography, and proximity to key catchment areas such as the Mau Forest Complex. The municipality is drained by several rivers and streams, including **River Kimugul and River Timbilil**, which form part of the larger Lake Victoria basin. In addition, numerous springs and shallow groundwater sources support domestic, agricultural, industrial, and institutional water needs.

These water resources have historically ensured a reliable supply for households, tea estates, public institutions, and commercial activities. However, despite this apparent abundance, increasing climate variability, deforestation in upstream catchments, rapid urbanization, and rising demand are placing growing pressure on available water resources, highlighting the need for sustainable water management and climate-resilient supply systems.

The study sought to determine the water access situation in Kericho Municipality. Access to water is a crucial pillar under the United Nations Sustainable Development Goals (SDGs), and exposure to climate change risks such as droughts and floods directly affects both water availability and quality. In this assessment, respondents were asked to estimate the distance to the nearest water point as a key indicator of accessibility.

The findings showed that the majority of respondents (79%) could access water within one kilometre from their homes, and nearly half of the households (47%) spent less than five minutes to fetch drinking water. Approximately 55% of households had access to potable water, while only 8% had access to piped water. The study further probed to determine water access–related challenges faced by residents, including reliability of supply, water quality, affordability, and seasonal shortages, particularly during dry periods.

1.5.1 Historic Impacts of Climate Risks on Water Sector

Water resources serving Kericho Municipality are periodically affected by extreme weather events, particularly droughts and heavy rainfall. In addition to these extremes, there are observable changes in the length and timing of rainy and dry seasons. Such variations significantly influence the quantity and reliability of water resources available to consumers within the region.

During periods of drought, water springs and rivers experience reduced flows or dry up entirely, water levels decline, and increased siltation occurs. As a result, households are forced to collect water from more distant sources, while water quality deteriorates as pollutants become more concentrated in shrinking water bodies. Competition and conflicts over limited water resources may also increase among different user groups, including households, agriculture, and industry.

Conversely, during periods of heavy rainfall, floods adversely affect water quality by washing chemicals and other pollutants, including fertilizer and pesticide residues, into rivers and streams, potentially leading to eutrophication. Flooding also damages infrastructure such as roads, water intake systems, houses, and recreational facilities. These impacts can trigger secondary effects including food shortages, power disruptions, and widespread infrastructure damage, placing a heavy burden on both society and the local economy.

Current Climate Risk on Water Sector

The consequences of flooding in Kericho Municipality include the contamination of water sources , diseases and increased soil erosion, which leads to siltation of rivers. Flooding also contributes to the pollution of water resources through improper waste disposal, discharge of raw sewage, car washing activities, and over exploitation of natural resources such as papyrus reeds and trees along riverbanks and around water sources.

1.6 Climate Risk on Infrastructure Sector

Infrastructure plays a critical role in the social and economic development of society. In recent years, climate change has been identified as a growing threat to vital infrastructure systems, and numerous studies have been conducted to assess the vulnerability of critical infrastructure to climate-related risks. Climate change impacts such as erratic rainfall leading to flooding, hailstorms, strong winds and rising water levels can severely affect infrastructure, leading to property damage, service disruptions including drainage systems, roads and bridges disrupting transport and access to business

Understanding the impacts of climate change on infrastructure is therefore essential for designing effective adaptation measures and for developing climate-resilient systems. Integrating climate risk considerations into infrastructure planning, design , operation, and maintenance is key to climate-proofing infrastructure and ensuring the continued provision of essential services under current and future climate conditions.

Table 9: Climate Indicators and Thresholds

Hazard	Key Indicator	Data Source	Low	Medium	High	Notes / Rationale
Heat Stress	Maximum Daily Temperature	Kenya Meteorological Department	<25°C	25–30°C	>30°C	High temperatures increase health risks, energy demand, and outdoor work vulnerability.
Flooding	Monthly Rainfall / Peak Discharge	Kenya Meteorological Department & Municipal Drainage Records	<100 mm	100–150 mm	>150 mm	High rainfall combined with poor drainage triggers surface flooding in low-lying urban wards.
Drought	Rainfall Deficit (compared to long-term average)	Drought Monitoring Center	<20% deficit	20–40% deficit	>40% deficit	Prolonged deficits affect water supply, agriculture, and household livelihoods.
Landslides	Daily Rainfall Intensity	Geological Surveys / Slope Monitoring	<50 mm/day	50–80 mm/day	>80 mm/day	Steep peri-urban slopes with high-intensity rainfall are at risk of slope failure and structural damage.


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1.6.1 Historical and Current Climate Risk on Infrastructure Sector

Vital infrastructure systems for **energy supply, water supply, and transportation** are highly vulnerable to the impacts of climate change. Extreme weather events and rising water levels pose increasing risks to these critical assets. In particular, extreme weather negatively affects transportation infrastructure by damaging physical structures and increasing the costs of operation and maintenance. Rising temperatures accelerate heat stress on infrastructure, reducing the lifespan of asphalt roads and increasing stress on bridge expansion joints and other structural components. Transportation systems are essential for the efficient movement of food, energy, goods, and services, as well as for enabling workers and consumers to access employment opportunities and markets. Similarly, reliable energy infrastructure is fundamental for economic productivity, social services, and household welfare. Climate change can disrupt energy generation and distribution facilities, leading to power outages and service interruptions that cause significant economic losses and affect human well-being.

Flooding associated with extreme rainfall weakens the structural foundations of bridges and roads, increases sedimentation in water infrastructure, and heightens the risk of landslides. Floods also damage major freight routes, degrade energy infrastructure, and cause electricity outages. In addition, flooding can destroy water supply networks and wastewater systems, increasing public health risks. Public facilities such as hospitals, schools, shopping malls, and office buildings are also vulnerable to flood damage, further disrupting essential services and community life.

1.7 Climate Risk Levels on Storm Water Drainage Systems

Storm water drainage systems within Kericho Municipality play a critical role in managing surface runoff and preventing urban flooding. However, these systems are increasingly exposed to climate-related risks due to changing rainfall patterns, increased intensity of storm events, and rapid urbanization.

The storm water drainage conveyance network, which includes open channels, culverts, roadside drains, and underground pipes, faces a high climate risk level. Increased frequency of heavy rainfall events often exceeds the design capacity of existing drainage infrastructure, leading to blockages, overflows, and backflow of water into roads and residential areas. Poor maintenance, solid waste dumping, and sediment accumulation further reduce the efficiency of the conveyance

network. As a result, localized flooding is common, particularly in low-lying and densely built-up areas, causing damage to roads, buildings, and utilities.

Storm water storage systems, such as retention ponds, detention basins, wetlands, and natural floodplains, face a moderate to high climate risk level. Prolonged or intense rainfall can overwhelm storage capacity, resulting in overtopping and uncontrolled discharge into surrounding areas. In some locations, encroachment on natural drainage corridors and wetlands has reduced available storage space, increasing flood risks. Climate variability, including prolonged dry spells followed by intense rainfall, also affects the functionality of these systems by increasing sedimentation and reducing infiltration capacity.

Overall, the climate risk level for storm water drainage infrastructure in Kericho Municipality is high, and there is a strong need for upgrading drainage design standards, improving maintenance, restoring natural drainage systems, and integrating nature-based solutions to enhance flood resilience and reduce urban flood impacts.

1.7.1 Historical and Current Climate Risks on Water & Wastewater Management

Water and wastewater management systems in Kericho Municipality have historically been exposed to climate variability and are increasingly vulnerable to climate change impacts. Changes in rainfall patterns, rising temperatures, and the increasing frequency of extreme weather events such as floods and droughts pose significant risks to the functionality, reliability, and sustainability of these critical systems.

Groundwater has traditionally provided a reliable backup water source; however, recurrent droughts and reduced recharge rates have led to declining groundwater levels in some areas. Over-abstraction during dry periods further exacerbates depletion, increasing the risk of borehole failure, higher pumping costs, and deterioration of water quality.

Water treatment plants have historically faced challenges related to sedimentation and turbidity during heavy rainfall. Currently, extreme rainfall events introduce high loads of sediments, organic matter, and pollutants into raw water sources, increasing treatment complexity and costs. During droughts, reduced raw water availability compromises treatment capacity and reliability.

Water supply networks are increasingly vulnerable to climate risks. Flooding damages pipelines, causes leakages, and contaminates distribution systems, while droughts lead to water rationing and

increased pressure on aging infrastructure. Temperature increases also accelerate pipe deterioration and raise water demand.

Sewer systems have historically experienced blockages and overflows during heavy rains. Currently, intense rainfall frequently overwhelms sewer capacity, leading to sewer overflows, backflows into homes, and discharge of untreated wastewater into the environment, posing serious public health risks.

Wastewater treatment plants face increasing climate risks due to flooding and power disruptions. Flood events can inundate treatment facilities, damage mechanical and electrical components, and reduce treatment efficiency. During droughts, reduced inflows can affect biological treatment processes and increase pollutant concentrations.

Both historical and current climate risks demonstrate that water and wastewater infrastructure in Kericho Municipality is highly climate-sensitive. Without targeted adaptation measures, including infrastructure upgrading, flood protection, alternative water sources, and climate-resilient design, the reliability and sustainability of these systems will continue to decline under future climate conditions.

1.8 Historical and Current Climate Risks on Solid Waste Management

Solid waste management systems in Kericho Municipality are increasingly affected by climate variability and extreme weather events. Flooding, prolonged rainfall, rising temperatures, and drought conditions pose significant risks to the efficiency and sustainability of waste management infrastructure and services.

Historically, waste transfer points and temporary storage areas have been affected by heavy rainfall, leading to flooding, leachate generation, and the spread of waste into surrounding environments. Currently, increased rainfall intensity exacerbates these challenges by reducing accessibility, accelerating infrastructure deterioration, and increasing public health risks through the proliferation of disease vectors.

The existing dump sites are highly vulnerable to flooding and leaching, which can cause the dispersion of waste materials and contamination of nearby soil and water bodies. During periods of heavy rainfall, leachate runoff increases, leading to pollution of surface and groundwater. Rising temperatures also accelerate the decomposition of organic waste, increasing greenhouse gas emissions and odour-related problems. The municipality is in the process of acquiring land for a

designated sanitary landfill, which presents an opportunity to integrate climate-resilient design features.

Recycling facilities are exposed to climate risks such as flooding, which can damage equipment, contaminate sorted materials, and disrupt operations. High temperatures and prolonged dry periods also affect working conditions and increase fire risks, especially where recyclable materials are stored in open areas.

The waste collection fleet, currently comprising tipper lorries and tractors with attached trailers, is highly sensitive to extreme weather conditions. Heavy rains and flooding make access to certain neighborhoods difficult, particularly in informal and poorly drained areas. Poor road conditions during wet seasons increase vehicle breakdowns and maintenance costs, while heat stress accelerates wear and tear on machinery.

Solid waste management systems in Kericho Municipality face **moderate to high** climate risk levels, primarily due to inadequate infrastructure, and limited collection capacity. Climate-related disruptions increase the risk of environmental pollution, public health hazards, and service inefficiencies. Strengthening solid waste management through improved infrastructure, increased fleet capacity, climate-resilient landfill development, and integration of recycling and waste reduction strategies is essential for building long-term urban resilience.

1.9 Historical and Current Climate Risks on Economic Infrastructure

Economic infrastructure in Kericho Municipality including markets, business and commercial hubs, industrial zones, and logistics parks is highly vulnerable to climate variability and extreme weather events. Flooding and storms pose significant threats to economic activity, livelihoods, and the broader local economy.

Historically, open-air and semi-permanent markets in Kericho have been affected by heavy erratic rains and flooding, which disrupt trade, damage stalls and goods, and reduce market accessibility for vendors and consumers. Currently, intense rainfall events increasingly overwhelm drainage systems, leading to waterlogging, property damage, and temporary closure of markets. Flooding also contributes to contamination of water sources, affecting both traders and customers.

Businesses and commercial hubs, including shops, offices, and retail centers, have experienced disruptions due to extreme weather events. Flooding, hailstorms and strong winds damage buildings, inventory, and essential equipment. Rising temperatures increase operational costs due

to the need for cooling systems, while storm events can disrupt transport and supply chains, reducing business continuity. The accumulation of such events over time increases vulnerability to economic losses and reduced investor confidence.

Industrial facilities and logistics parks are particularly sensitive to flooding, storms, and extreme temperatures. Flooding can inundate production areas, damage machinery, interrupt power supply, and halt operations. Transportation services are affected by road and bridge failures during floods, which delay the movement of goods and increase operational costs.

Historical and current climate risks indicate that economic infrastructure in Kericho Municipality faces **moderate to high** vulnerability to climate impacts. Flooding, storms, and heatwaves threaten property, disrupt operations, and increase maintenance costs, with cascading effects on employment, trade, and local revenue generation. Strengthening the resilience of markets, commercial hubs, and industrial infrastructure through climate-proofing, improved drainage, and disaster preparedness planning is essential to safeguard economic activity and ensure sustainable development.

1.10 Historical and Current Climate Risks on Informal Settlement Residents

Residents living in informal settlements in Nyagacho and Mjini within Kericho Municipality represent one of the most climate-vulnerable population groups. These settlements are located in environmentally fragile and hazard-prone areas near Tionsoiyet wetland a riparian zone, and poorly drained lands, exposing households to recurrent flooding, waterlogging, and sanitation-related risks.

A significant proportion of the urban population resides in informal and unplanned settlements characterized by high population density, substandard housing, and limited infrastructure. These areas are particularly vulnerable to extreme weather events, including heavy rainfall, storms, and prolonged dry spells. Flooding frequently damages homes constructed from temporary materials, while poor ventilation and overcrowding increase susceptibility to heat stress and disease outbreaks.

Many households in informal settlements lack secure land tenure, which limits their ability to invest in permanent housing improvements and resilient infrastructure. Insecure tenure also discourages access to formal credit and insurance mechanisms, further increasing vulnerability to

climate-related shocks. Additionally, residents may face eviction risks, which compound social and economic insecurity during disaster events.

Limited access to essential services such as clean water, sanitation, transport, drainage, waste collection, electricity, and healthcare exacerbates climate vulnerability. During heavy rains, inadequate drainage systems lead to flooding and contamination of water sources. Lack of sewer infrastructure increases the risk of waterborne diseases, particularly after floods. During drought periods, informal settlement residents are disproportionately affected by water shortages and rising water costs.

Overall, informal settlement residents in Kericho Municipality face high climate risk exposure due to a combination of physical location, socio-economic vulnerability, inadequate infrastructure, and limited adaptive capacity. Targeted interventions including improved drainage, secure tenure arrangements, upgrading of housing, and expanded access to basic services are essential to enhance resilience and reduce climate-related risks in these communities.

1.11 Climate Risks on the Vulnerable & Marginalized Groups

Table 10: Climate Risks on the Vulnerable & Marginalized Groups

Vulnerable Group	Exposure to Climate Hazards	Sensitivity	Adaptive Capacity	Overall Risk Level
Low-Income Households	High – Often located in flood-prone or poorly serviced areas	High – Dependence on climate-sensitive livelihoods; limited assets	Low – Limited savings, insurance, or social protection	**High**
Women-Headed Households	Moderate to High – Water scarcity, food insecurity, flooding	High – Caregiving roles increase burden during climate shocks	Low to Moderate – Limited access to land, finance, and decision-making	**High**
Children and Youth	Moderate– Exposed to disease outbreaks, school disruptions	High – Physically vulnerable; dependent on caregivers	Moderate – Supported by families/schools but limited autonomy	**High**

Elderly Persons	Moderate- flooding, health risks	High – Reduced mobility and chronic health conditions	Low – Limited income and physical resilience	**High**
People with Disabilities (PWDs)	Moderate – Barriers during floods and emergencies	High – Mobility and communication challenges	Low – Limited accessible infrastructure and emergency systems	**High**
Unemployed / Informal Workers	High – Income highly sensitive to climate disruptions	High – Daily wage dependence	Low – No job security or insurance	**High**
Minority Ethnic Groups (Urban)	Moderate – Often reside in underserved areas	Moderate to High – Social exclusion increases vulnerability	Low to Moderate – Limited access to information and services	**Moderate to High**

Table 11: Climate Indicators and Thresholds

Hazard	Indicator	Data Source	Low	Medium	High
Heat Stress	Maximum Temperature	Kenya Meteorological Dept	<25°C	25–30°C	>30°C
Flooding	Monthly Rainfall	Meteorological Dept	<100 mm	100–150 mm	>150 mm
Drought	Rainfall Deficit	Drought Monitoring Center	<20%	20–40%	>40%
Hailstorms	Rainfall Intensity	Geological Surveys	<50 mm/day	50–80 mm/day	>80 mm/day
Strong winds	Strong winds	Meteorological Dept	<50%	50%–75%	>75%

SECTION 2: HAZARD ASSESSMENT

CHAPTER TWO

2.0 OVERVIEW

Climate hazards are physical events or processes linked to climate variability and climate change that can negatively affect people, infrastructure, ecosystems, and economic activities. These hazards can occur in two main forms depending on how quickly they develop and impact communities.

The baseline conditions of Kericho Municipality reveal a system characterized by ecological sensitivity, economic dependence on climate-sensitive sectors, infrastructure vulnerabilities, and evolving land-use patterns. Population growth and spatial expansion increase exposure, while socio-economic variability influences adaptive capacity.

These interacting factors create a risk landscape in which climate hazards can generate disproportionate impacts. The municipality's highland setting offers certain climatic advantages but also introduces slope-related vulnerabilities. Hydrological behavior is increasingly shaped by urbanization patterns, amplifying flood risks. This contextual analysis establishes the foundation for subsequent hazard characterization and risk integration.

2.1 Introduction

Understanding climate risk requires a comprehensive appreciation of the urban system within which hazards manifest. Climate impacts are not experienced in isolation; they interact with demographic patterns, economic structures, land-use dynamics, infrastructure systems, and institutional capacities. This chapter establishes the baseline urban conditions of Kericho, providing the structural context necessary to interpret subsequent hazard, exposure, and vulnerability assessments.

Kericho Municipality represents a distinctive highland urban system whose ecological setting, economic base, and spatial configuration shape its climate risk profile in unique ways. The municipality's elevation, rainfall regime, and agricultural orientation differentiate it from arid and semi-arid urban centers, yet these same characteristics generate specific hydrological and slope-related vulnerabilities.

2.2 Geographic and Ecological Setting

Kericho Municipality is situated within Kenya's western highlands at an elevation averaging approximately 2,000 meters above sea level. This altitude contributes to relatively moderate temperatures and historically abundant rainfall. The municipality lies within a broader highland plateau characterized by rolling topography interspersed with steeper slopes and drainage valleys.

2.2.1 Topography and Slope Characteristics

The terrain of Kericho significantly influences hydrological behavior. Surface runoff patterns are shaped by slope gradients that accelerate water movement during intense rainfall events. In areas where vegetation cover has been reduced or soils have been compacted through urbanization, runoff coefficients increase, reducing infiltration capacity. This dynamic contributes to flash flooding in low-lying areas and elevates slope instability risks in steeper zones.

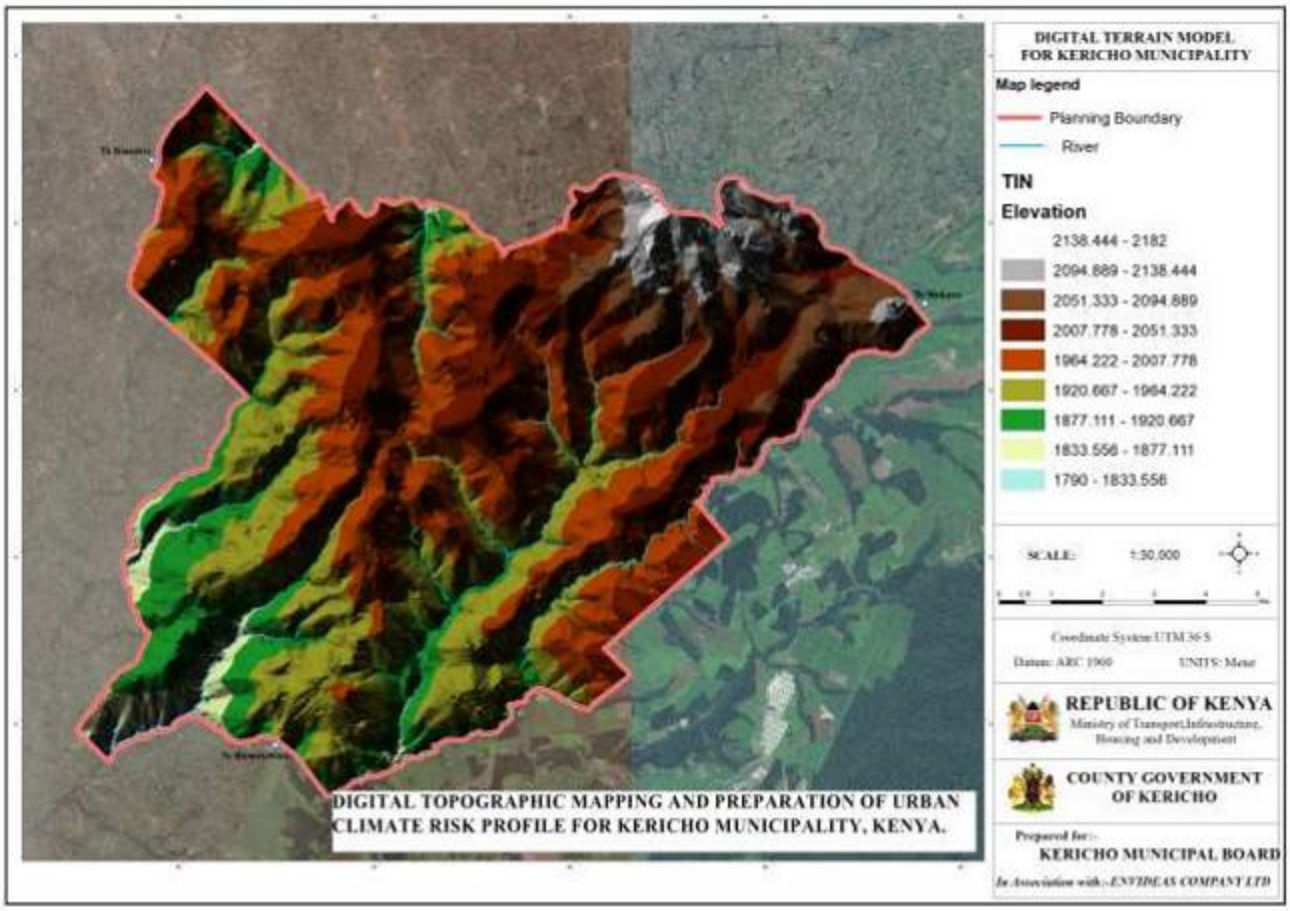

Figure 3: Digital Terrain Model, Kericho Municipality

Urban expansion into slope adjacent areas has altered natural drainage pathways. Where cut-and-fill construction practices are undertaken without adequate engineering stabilization, soil saturation during prolonged rainfall can trigger localized landslides or erosion events. Thus, topography constitutes both a defining ecological feature and a fundamental determinant of climate hazard amplification.

2.2.2 Hydrological Systems

Kericho lies within catchment systems that support surface water flows through seasonal and perennial streams.

Rainfall intensity, rather than total annual rainfall alone, is increasingly critical. High-intensity precipitation events overwhelm drainage systems, particularly in areas where impermeable surfaces such as paved roads and rooftops have expanded. The interaction between topography and hydrology thus forms a central axis of the municipality's climate risk landscape.

Table 12: Geographic and Ecological Setting

Feature	Description	Implications for Climate Risk	Notes
Elevation	~2,000 meters above sea level	Moderate temperatures, high rainfall	Influences hydrology and slope stability
Topography	Rolling highland plateau with interspersed steep slopes and drainage valleys	Accelerates runoff, increases landslide susceptibility	Urban development on slopes amplifies risk
Soil & Vegetation	Mixed forest cover, agricultural lands, and cleared urban areas	Vegetation loss reduces infiltration and slope stability	Deforestation in development zones increases hazard exposure

Hydrological Systems	Seasonal and perennial streams, wetlands	Critical for water supply, flood mitigation	Overwhelmed drainage and wetland encroachment increase flood risk
Rainfall Patterns	Historically abundant, increasingly variable		Intensifies flood and landslide risks

2.3 Demographic Dynamics

Demographic characteristics strongly influence exposure and vulnerability patterns. Kericho Municipality has experienced steady population growth driven by natural increase, rural-to-urban migration, and economic opportunities linked to agro-processing and business trade.

2.3.1 Population Growth and Density

Population growth has resulted in increased residential density within the urban core and expansion into peri-urban areas. Densification without proportional infrastructure expansion increases pressure on drainage systems, water supply networks, and road infrastructure. In flood-prone areas, higher density translates directly into greater numbers of exposed individuals.

Moreover, informal housing expansion often occurs in marginal lands, including low-lying zones and slope-adjacent areas, where land values are lower but hazard exposure is higher. Population density therefore interacts with land market dynamics to shape spatial risk distribution.

2.4 Socio-Economic Profile

Socio-economic diversity within Kericho Municipality is significant. While formal employment opportunities exist within tea estates and processing facilities, a substantial proportion of residents depend on informal trade, casual labor, and small-scale enterprise. Income variability and limited savings reduce adaptive capacity in the face of climate shocks.

Table 13: Demographic and Socio-Economic Profile

Category	Description	Climate Vulnerability Implication	Spatial / Risk Notes
Informal Settlements	Areas with limited planning, basic infrastructure, and inadequate services	High structural fragility; increased exposure to flood and landslide impacts	Often situated in floodplains, drainage corridors, or slope-adjacent zones
Socio-Economic Status	Mix of formal employment, informal trade, and casual labor	Limited financial resilience; reduced capacity to recover from climate shocks	Low-income households face prolonged disruption after hazard events
Household Infrastructure	Housing ranges from durable to temporary materials	Weaker structures more prone to damage during floods and landslides; low insurance uptake	Temporary or semi-permanent dwellings concentrated in high-risk wards

Low-income households are more likely to reside in structurally vulnerable housing constructed from materials that are less resistant to prolonged moisture exposure. These households may also lack insurance coverage or financial buffers to recover from flood-related damage. Thus, socio-economic characteristics directly influence vulnerability dimensions within the climate risk equation.

2.5 Economic Structure

The economic identity of Kericho is strongly associated with tea cultivation and agro-processing. The presence of extensive tea estates and related industries defines both employment patterns.

2.5.1 Agricultural Dependence and Climate Sensitivity

Tea cultivation is climate-sensitive. Variations in rainfall timing, temperature ranges, and humidity influence yield quality and productivity. Increased rainfall intensity may cause soil erosion in plantation areas, while prolonged dry spells can reduce output. Climate variability therefore has direct implications for household incomes, municipal revenue streams, and regional export earnings.

Beyond tea, small-scale agriculture, milk production and horticulture contribute to food security and income diversification. These sectors are similarly sensitive to rainfall patterns and soil moisture variability. The cumulative economic exposure to climate hazards underscores the systemic nature of risk.

2.5.2 Urban Commerce and Infrastructure Interdependence

Commercial activities within the municipality rely on functional road networks, reliable electricity supply, and consistent water access. Flood-induced Road disruptions impede the movement of goods and labor. Recurrent infrastructure damage increases maintenance costs and diverts fiscal resources away from long-term development projects.

2.6 Land Use Patterns

Land use patterns reveal how human settlement interacts with ecological systems. Kericho Municipality exhibits a mixture of formal residential areas, informal settlements, commercial zones, agricultural land, and remnant natural ecosystems.

Table 14: Land Use Distribution

Land Use Type	Estimated Share
Residential	45%
Commercial	10%
Industrial	5%
Green/Open Space	15%
Agriculture / Peri-urban	25%

2.6.1 Residential Expansion

Formal residential neighborhoods are generally located in planned areas with access to basic infrastructure. In contrast, informal settlements often emerge in peri-urban zones where regulatory enforcement is limited. Such settlements may lack adequate drainage, road surfacing, and slope stabilization.

The spatial distribution of residential expansion influences exposure to flood and landslide hazards. Where development has occurred in riparian zones or along drainage pathways, flood risk is heightened.

2.6.2 Agricultural–Urban Interface

The boundary between agricultural land and urban development is increasingly fluid. Conversion of agricultural plots into residential or commercial uses alters infiltration rates and increases surface runoff. The reduction of vegetative cover diminishes natural water retention capacity, thereby intensifying downstream flooding.

Land-use change is therefore not merely a spatial phenomenon but a hydrological transformation that influences hazard dynamics.

2.7 Infrastructure Systems

Infrastructure systems represent critical points of exposure and vulnerability within the urban environment.

2.7.1 Transport Infrastructure

Road networks in Kericho include paved arterial routes and unpaved secondary roads. During intense rainfall, poorly drained sections become impassable. Repeated saturation weakens pavement structures and accelerates deterioration. In slope areas, erosion undermines road embankments, increasing maintenance requirements.

Transport infrastructure disruption not only affects mobility but also emergency response capacity. Flooded or damaged roads may delay access to health facilities and disaster response zones.

2.7.2 Water and Sanitation Systems

Water supply systems rely on surface water sources and distribution networks that are sensitive to rainfall variability. Heavy rainfall may increase turbidity and contamination risks, while dry spells reduce yield reliability.

Sanitation infrastructure, particularly in informal settlements, may be vulnerable to overflow during flooding events. Inadequate drainage exacerbates contamination risks, contributing to public health concerns.

2.7.3 Public Facilities

Schools, health centers, and administrative buildings represent critical infrastructure assets. Their location relative to hazard-prone areas determines service continuity during extreme events. Flooding of health facilities, for instance, can have disproportionate impacts on community resilience.

2.8 Environmental Systems and Ecosystem Services

Natural ecosystems provide protective functions that mitigate climate impacts. Wetlands, forested slopes, and riparian vegetation contribute to water regulation, erosion control, and microclimate stabilization.

2.8.1 Forest Cover and Slope Stability

Vegetative cover stabilizes soils and enhances infiltration. Deforestation or land clearing for development reduces slope integrity. In high rainfall contexts such as Kericho, slope destabilization can occur rapidly when root structures are removed.

2.8.2 Wetlands and Flood Regulation

Wetlands act as natural retention basins, absorbing excess rainfall and reducing downstream flood peaks. Encroachment into wetland areas diminishes this buffering capacity. Restoration and protection of such ecosystems may therefore constitute effective nature-based adaptation strategies.

Table 15: Demographic and Socio-Economic Profile

Category	Subcategory / Feature	Current Condition	Climate Risk Implications	Notes
Land Use	Agricultural & peri-urban interface	Tea estates, small-scale farms	Sensitive to rainfall variability	Soil erosion and drought affect productivity
Transport	Roads & bridges	Paved arterial, unpaved secondary; some poor drainage	Flooding and erosion disrupt mobility	Slopes and weak surfaces prone to damage
Water & Sanitation	Supply pipelines, reservoirs, sanitation networks	Functional but sensitive to extreme events	Floods contaminate, drought reduces yield	Vulnerable in informal settlements
Public Facilities	Schools, health centers, municipal offices	Mixed protection from hazards	Service disruption during floods or landslides	Critical infrastructure for community resilience
Environmental Systems	Forests, wetlands, riparian buffers	Partially degraded	Reduced slope stability and flood mitigation	Restoration improves natural adaptation

Hazard	Hazard Likely (Y/N)	Significant Impact (Y/N)	High Priority (Y/N)	Key Hazard (Y/N)
1. Flooding				
Changes in precipitation patterns	Y	Y	Y	Y
Pluvial (surface level) flooding, including flash flooding and urban flooding	Y	Y	Y	Y
Fluvial (river) flooding	N	N	N	N
Waterlogging	Y	Y	N	N
2. Water Stress				
Drought (meteorological, hydrological)	Y	Y	Y	Y
Groundwater salinization	Y	Y	Y	Y
Saline intrusion	N	N	N	N
3. Storms				
Extreme wind	Y	Y	Y	Y
Hailstorms	Y	Y	Y	Y
Heat Stress				
Average surface temperature increase	Y	Y	Y	Y

Climate indicators are measurable variables that reflect long-term trends or the current state of the climate system. They help track how the climate is changing and can inform planning and adaptation strategies.

Hazard thresholds are critical values of climate variables that, when exceeded, trigger significant impacts on humans, infrastructure, or ecosystems. Exceeding these thresholds often leads to an abrupt increase in risk or a system change. They help decision-makers identify when adaptation or emergency response actions are needed.

Table 16:Table Showing key hazard thresholds

Key Hazard	**Climate Indicator**	**Data Source**	**Threshold**	**Low**	**Medium**	**High**
Flooding	Number of days with precipitation >50 mm	World Bank Climate Change Knowledge Portal / Kenya Meteorological Department	1day/season	Rare, localized flooding in valley bottoms	2–3 days/season; moderate flooding of low-lying urban areas	>3 days/season; significant flooding in Kericho town, river valleys, and poorly drained neighborhoods
Water Stress (Drought)	SPEI Drought Index	SPEI database;	2.1 (SPEI drought index)	Minor water stress; short dry spells manageable by rain-fed sources	Moderate water stress; temporary reduced availability in peri-urban and smallholder farming zones	Severe water stress; extended dry spells affecting agriculture, water supply, and small reservoirs
Storms (Strong Winds / Severe Weather	Number of days with precipitation >50 mm / associated wind events	World Bank Climate Change Knowledge Portal / Kenya	1 day/season	Localized minor wind damage	Moderate damage to light structures, roadside trees, and	Widespread damage to light roofs, urban trees, informal settlements,

		Meteorological Department			temporary structures	and small businesses
Heat Stress	Number of days with heat index >35°C (mean)	World Bank Climate Change Knowledge Portal / Kenya Meteorological Department	2 days/season	Outdoor workers experience minor discomfort; temperatures below critical highland norms	Moderate discomfort; temporary impacts on outdoor labor productivity and health	High heat stress; risk to vulnerable groups (elderly, children, outdoor workers); significant health and labor productivity impacts

2.9 Current Hazard Levels and Climate Projections

2.9.1 Urban Flood

In Kericho Municipality, urban flood hazard is generally very low according to available modeled flood data. Most of the municipality is situated on highland terrain with good natural drainage, which reduces the likelihood of damaging river floods.

- Probability: The chance of life-threatening river floods occurring in the next 10 years is less than 1% (equivalent to a return period of ~1 in 1,000 years).
- Implication: For most urban projects in Kericho town and surrounding neighborhoods, flood hazard is not a significant concern and does not require major mitigation measures for riverine flooding.
- Caveat: Localized surface water flooding may still occur in valley bottoms, poorly drained urban pockets, and near small streams during extremely heavy rainfall. These events are generally minor and can be managed through routine stormwater drainage maintenance and localized urban planning interventions.

Based on current data from sources such as Think Hazard! and local rainfall/flood models, flooding does not need to be explicitly considered as a high-risk factor for most development projects within Kericho Municipality.

2.9.2 Storms

When strong winds occur in Kericho Municipality, they tend to cause:

- Roof and structural damage to lightly constructed buildings, kiosks, boda-boda sheds, and other small structures, especially those with metal roofing sheets that are poorly anchored.
- Fallen trees and branches, which can block roads, damage property, and disrupt traffic, particularly along roadsides, in parks, or near residential areas where trees are older, weakened, or exposed.
- Power and communication disruptions if fallen trees or debris strike electricity lines, poles, or telecommunications infrastructure during wind-associated storms.

In Kericho municipality:

- The risk is localized; it mainly affects urban centers, peri-urban settlements, and areas along exposed ridges.
- Tea plantation areas are generally less affected because dense vegetation reduces wind speed, although occasional tree damage may occur.
- Most residential and commercial buildings in the town are moderately resilient, so widespread destruction is uncommon, but informal settlements and temporary structures remain vulnerable.

This localized nature of wind hazards means that planning, tree management, and proper roofing installation are key to reducing impacts.

2.9.3 Water Stress

In Kericho Municipality, water scarcity and drought risk is generally classified as moderate according to Think Hazard, while the SPEI drought index indicates a low risk. There is an up to 20% chance of drought occurring within the next 10 years.

The impact of drought should be considered in all phases of planning, design, and construction. Personnel and stakeholders may face temporary water shortages affecting operations, labor productivity, and health. Buildings and infrastructure should be designed with measures to reduce water dependency and enhance water efficiency, such as rainwater harvesting, water storage tanks, or drought-resilient landscaping. Project planning should account for potential interruptions to water supply in both urban and peri-urban areas, especially during short dry spells.

2.9.4 Heat Stress

In Kericho Municipality, extreme heat hazard is classified as low according to modeled data from Think Hazard (2025). There is a 5–25% chance that at least one period of prolonged exposure to extreme heat, resulting in heat stress, will occur in the next five years.

Heat stress risk is generally limited due to Kericho's highland climate and cooler average temperatures (~25.3°C).Vulnerable groups, such as outdoor laborers (tea farm workers, market vendors, boda-boda riders), school children, and the elderly, may experience temporary discomfort

or reduced productivity during heat events. Urban areas with dense built infrastructure (Kericho town center) may experience localized "heat islands," but overall risk remains low.

Table 17. Current and future hazards levels for Kericho Municipality

			Hazard Level		
Hazard	**Current (Baseline)**	**2050 SSP2-4.5**	**2050 SSP5-8.5**	**2100 SSP2-4.5**	**2100 SSP5-8.5**
Flooding	Low	21mm	35 mm	9 mm	67 mm
Water Stress (Drought)	Medium	0.3 oC	0.3 oC	0.2 oC	0.5 oC
Storms	Low	21mm	35 mm	9 mm	67 mm
Heat Stress	Low	-2 days	-2 days	-2 days	2 days

Kericho municipality Climate Risk Profile, hazard levels were interpreted in accordance with the table below.

Table 18:Interpretation of hazard levels

Level	Interpretation
High	Hazard events that are likely to occur with high frequency and/or intensity
Medium	Hazard events that are likely to occur with moderate frequency and/or intensity
Low	Hazard events that are likely to occur with low frequency and/or intensity

SECTION 3: EXPOSURE AND VULNERABILITY ASSESSMENT

CHAPTER THREE

3.0 Introduction

An exposure and vulnerability assessment evaluates how likely an asset or population is to be affected by a hazard (exposure) and their susceptibility to harm (vulnerability). This is a critical process for understanding and managing risk, involving identifying hazards, analyzing what could be impacted, and assessing the likelihood and potential consequences of damage. This information helps prioritize actions to build resilience, particularly in the context of climate change or other hazards.

3.1 Urban Elements

Table 19:Urban elements inventory

Category	Subcategory	Included in the RCRA (Y/N)	Available in GIS format (Y/N)	Description
Infrastructure & Services				
Storm water drainage	Storm water drainage conveyance network	Y	Y	• Currently draining at Tionsoiyet Wetland within the municipality
	Storm water storage	N	N	
Water & Wastewater Management	Pumping stations	Y	Y	• Kimugu river is the main source of water suppling the treatment plant to KEWASCO and water is supplied through gravity
	Groundwater abstraction	N	N	• Boreholes within the municipality are mainly privately owned

Category	Subcategory	Included in the RCRA (Y/N)	Available in GIS format (Y/N)	Description
	Water treatment facilities	Y	Y	• Located along Cereals road near Kericho Town Dumpsite
	Water supply networks	Y	Y	• The networks for water supply available at KEWASCO
	Sewer networks	Y	Y	• Urban sewerage services in Kericho Municipality are provided by Kericho Water and Sanitation Company Ltd (KEWASCO), which is mandated to manage water supply and sanitation infrastructure and services in the town and peri-urban areas
Solid Waste Management	Transfer facilities	Y	Y	• The municipality has no transfer stations other than skips (huge bulky containers used to hold waste before the transportation to the final disposal site
	Landfills and dump sites	N	N	• The Municipality has one designated disposal site (Kericho town dumpsite) that is full to capacity and is in the process of identifying a land for relocation and Material Recovery Facility
	Recycling centers	N	N	• Currently there are no formal recycling centers other than private waste recyclers who are the intermediaries in the waste value chain

Category	Subcategory	Included in the RCRA (Y/N)	Available in GIS format (Y/N)	Description
	Collection fleet	Y	Y	The Municipality has one tipper lorry, two tractors one with trailer and the other is a skip loader
Transport and Mobility	Road networks	Y	Y	Kericho municipality's' Physical Land Use Plan 2019-2028 the maps for all road networks within the municipality wards
	Bridges	Y	Y	Kericho municipality's' Physical Land Use Plan 2019-2028 the maps for all road networks within the municipality wards
	Public transport networks (rail, bus, mini-bus, etc.)	Y	Y	Kericho main bus park located within the CBD along John Kerich-Stadium road Kapsoit trading center currently has become a stop over station for trailers overnight.
	Transportation terminals	Y	N	Buses have designated bus station within the town centre and along the exit routes
	Vehicle depots	N	N	

Category	Subcategory	Included in the RCRA (Y/N)	Available in GIS format (Y/N)	Description
	Non-motorized transport networks	N	N	Walking and cycling are the most common forms of NMT, providing affordable and accessible transport. The municipality has some pedestrian footpaths and crossings, infrastructure is generally limited, and sidewalks are often encroached upon by informal activities, creating safety challenges. Bicycle lanes are largely absent, requiring cyclists to share roads with motorized vehicles, which increases the risk of accidents. County development plans recognize the need to expand footpaths, introduce dedicated cycling lanes, and improve pedestrian safety, aiming to promote sustainable mobility, reduce congestion, and enhance public health within the growing urban centre.

Category	Subcategory	Included in the RCRA (Y/N)	Available in GIS format (Y/N)	Description
	Freight and logistics hubs	N	N	These facilities accommodate loading and unloading areas, storage warehouses, and truck parking, enabling consolidation of shipments for onward transport via road networks. Although the municipality does not yet have fully developed, modern logistics parks, existing hubs are essential in reducing transport delays, minimizing congestion in the town centre, and supporting timely delivery of goods. Challenges include limited space for expansion, inadequate mechanization for handling high volumes of freight, and congestion along key access roads. Planned interventions aim to upgrade existing hubs, improve road connectivity, and integrate logistics planning with urban development strategies, ensuring that freight operations remain efficient while supporting the sustainable growth of Kericho's urban economy
Energy	Energy power plants	N	N	Energy power plants provide electricity to support urban services, industries, and households. While the town primarily relies on grid electricity from the national supply KPLC.

Category	Subcategory	Included in the RCRA (Y/N)	Available in GIS format (Y/N)	Description
	Poles and power lines		N	The municipality is well-served, with overhead lines providing reliable access to electricity for households, businesses, and industrial zones. Peripheral and informal settlement areas often have old poles and lines, which may be poorly maintained, leading to frequent outages and safety risks.
	Transformers and substations	Y	N	Kericho Municipality's electrical network is supported by medium- and low-voltage transformers and substations that distribute power to residential, commercial, and industrial areas. Maintenance is uneven, with some peri-urban areas experiencing frequent outages due to aging equipment
	Streetlighting	N	N	Streetlighting is concentrated in central business districts (CBD) and along streets and major roads. Peripheral neighborhoods and informal settlements often lack adequate lighting, contributing to safety concerns during nighttime

Category	Subcategory	Included in the RCRA (Y/N)	Available in GIS format (Y/N)	Description
Economic Infrastructure	Markets	Y	Y	Market, such as Kericho Main Market, serve as key nodes for trade in agricultural produce, especially horticultural crops. These markets are critical for food security and livelihoods but often face congestion and poor sanitation.
	Businesses and commercial hubs	Y	Y	The town hosts retail businesses, banking institutions, and service providers primarily along Temple road, Tengecha lane, Kenyatta road and Uhuru Road. These hubs support the municipal economy but face challenges with parking, traffic management, and waste disposal.
	Industrial zones/parks and logistics parks	Y	Y	Industrial activities are mainly agro-processing (tea, dairy, and horticulture) with small logistics and warehousing hubs located on the outskirts to facilitate transport. Limited zoning regulations sometimes result in mixed-use development near residential areas.
Social Infrastructure	Government buildings and service centers	Y	Y	Municipal offices, the County Headquarters, and service centers are centralized, providing governance, licensing, and public services. Accessibility from peri-urban areas can be limited due to transport gaps.

Category	Subcategory	Included in the RCRA (Y/N)	Available in GIS format (Y/N)	Description
	Education facilities	Y	Y	Universities, schools and colleges, including public and private institutions, are distributed across Kericho, but rural and informal settlement zones face shortages of classrooms and teaching resources
	Healthcare facilities	Y	Y	Hospitals, clinics, and dispensaries serve the population, with Kericho County Referral Hospital being a major facility and other private facilities within the Municipality. Rural and peri-urban areas experience uneven healthcare coverage, with limited access to specialized services
	Public spaces	Y	Y	Public spaces include playgrounds, sports fields, and open green areas Kiprugut Chumo Staidum, Moi Gargens and Uhuru Gardens are the most equipped spaces within the Muncicipality. Some are well-maintained in central areas, while others in informal settlements are degraded or encroached.
	Faith-based buildings	N	N	Churches, mosques, and temples are integral to community life, serving spiritual, social, and sometimes educational functions.
	Cultural and heritage assets	N	N	Heritage buildings and community cultural centers preserve local history and traditions, though some are at risk from urban expansion and neglect.

Category	Subcategory	Included in the RCRA (Y/N)	Available in GIS format (Y/N)	Description
Emergency Services	Fire stations	N	N	Fire services are limited, with one fire station in Jericho 4km from the CBD, reducing response capacity in peri-urban zones.
	Police stations	Y	Y	Police stations are spread across Kericho but often face logistical and staffing constraints, affecting security in remote settlements
	Telecommunications networks	N	N	Mobile networks and fiber connectivity cover central and urban zones effectively; however, coverage gaps exist in peri-urban and rural fringes
	Early warning systems	N	N	Early warning systems for floods, landslides, and extreme weather are in early development stages, relying on county-level alerts and national meteorological advisories.
	Disaster management centers and shelters	N	N	Disaster Management unit is in place at the County and domiciled in the Department of Public Service Management with inadequate staff Existing disaster shelters, usually school halls or community centers, are sparsely distributed, limiting accessibility for affected populations.

Category	Subcategory	Included in the RCRA (Y/N)	Available in GIS format (Y/N)	Description
	Evacuation routes	N	N	Main highways and arterial roads double as evacuation routes during emergencies, though secondary roads in informal settlements may be impassable during floods.
Populations				
Urban Residents	Population	Y	Y	Kericho Municipality has a diverse population with a mix of urban, peri-urban, and rural residents. Population density is higher in the town center and along major transport corridors
	Households	N	N	Household sizes vary, with many extended families living together, especially in informal settlements and peri-urban zones.
Informal Settlement Residents	Population living in informal settlements	Y	N	Residents face challenges including poor housing structures, lack of sanitation, and insecure tenure. Informal settlements are concentrated near railway lines and industrial outskirts
	Households lacking land tenure	N	N	Many residents in informal settlements do not have legal land ownership, limiting access to utilities and credit services.
	Households / residents lacking access to basic services	Y	N	Inadequate water supply, sanitation, electricity, and waste collection are common in peri-urban and informal settlements

Category	Subcategory	Included in the RCRA (Y/N)	Available in GIS format (Y/N)	Description
Vulnerable and Marginalized Groups	Low-income households	Y	N	These households rely on informal labor, small-scale trade, or agriculture and are vulnerable to economic shocks and climate impacts
	Women-headed households	N	N	Women often face higher vulnerability due to limited income, social support, and land access.
	Children and youth	Y	N	Young people are a significant demographic, with access to education and recreation unevenly distributed.
	Elderly persons	Y	N	Elderly populations often depend on family support and face barriers accessing healthcare and social services
	People with disabilities (PWD)	Y	N	PWD face mobility, communication, and accessibility challenges, especially in informal settlements and public buildings without inclusive design.
	Homeless populations	N	N	Small but present, mostly in central business areas, often relying on informal employment or begging
	Unemployed or precariously employed workers	N	N	Many work in the informal sector, including casual labor, petty trade, and seasonal agricultural work.
	Seasonal workers / migrant laborers	N	N	Tea estates attract seasonal labor, who often live in temporary housing with limited social services

Category	Subcategory	Included in the RCRA (Y/N)	Available in GIS format (Y/N)	Description
	Nomadic groups in peri-urban areas	N	N	Rare but occasionally present, especially in peri-urban zones practicing pastoralism or transhumance.
	Urban refugees and migrants	N	N	Small numbers from neighboring countries or counties reside in Kericho, often integrating into informal settlements
	Minority ethnic groups in urban areas	N	N	Include non-Kalenjin communities, the Talai and Ogiek often concentrated in business hubs, facing cultural integration and socio-economic challenges
Natural Assets				
Urban Green Infrastructure	Urban parks and gardens	Y	Y	The municipality has two urban parks Moi Gardens and Uhuru Gardens within the CBD
	Green corridors	Y	Y	Located along Uhuru Road, Kenyatta Road, Isaac salat road, Hospital Road and Kalenjin Road
	Street landscaping	Y	Y	Located along Uhuru Road, Kenyatta Road, Isaac salat road, Hospital Road and Kalenjin Road
	Urban forests and forest reserves	N	N	Located along Kisumu Road and Kenya Highlands University
Urban Blue Infrastructure	Natural wetlands	Y	Y	Tionsoiyet Wetland is a natural wetland located within the Municipality
	Rivers	Y	Y	Tionsoiyet wetland is from a water source named Ainaptindinyek

Category	Subcategory	Included in the RCRA (Y/N)	Available in GIS format (Y/N)	Description
	Riparian zones	Y	Y	There a four main riparian zones are within the municipality Tionsoiyet wetland, Kevoko, Kaptiondo and Kimungen.
	Lakes, ponds and reservoirs	Y	Y	Kericho municipality does not have lakes. Ponds and reservoirs store water for domestic use small scale irrigation and ecological services
	Coastal ecosystems	N	N	None is available
	Urban agriculture	Y	Y	Major parts of the informal settlements Nyagacho and Talai practice livestock keeping (cows and pigs) and kitchen gardens.
Peri-urban and Agricultural Systems	Peri-urban agriculture	Y	Y	Major parts of the peri-urban areas including, Kapkugerwet, Chaik, Kapsuser, Kipchimchim and Ainamoi practice medium to large scale agriculture mainly being tea plantations
	Agroforestry systems	Y	Y	Commonly practiced within the tea farms where farmers intercrop tea with shade trees
	Forests and forest reserves	N	N	There are no natural forests within the municipality other than the riparian buffer zones
	Protected areas and national parks	Y	Y	Protected and gazette areas within the Municipality is the sensitive areas including wetlands and urban parks and green spaces

Category	Subcategory	Included in the RCRA (Y/N)	Available in GIS format (Y/N)	Description
	Savannahs and rangelands	N	N	This is limited since the municipality is located within the highland and a tea growing zone

3.2 Exposure, Vulnerability, and Impacts of Climate Hazards on Urban Elements

Exposure, vulnerability, and impacts are key components of climate change risk in urban areas. Exposure refers to the presence of people and assets in harm's way, vulnerability is the predisposition to be adversely affected, and impacts are the resulting adverse effects on urban elements.

Kericho Municipality Climate Risk Profile, exposure, and vulnerability levels were interpreted in accordance with the table below.

Table 20:Interpretation of exposure and vulnerability levels

Level	Exposure Level Interpretation	Vulnerability Level Interpretation
High	Few or no critical urban elements lie within the hazard footprint or area of impact.	The urban element is vulnerable to the climate hazard due to high natural sensitivity considering physical and non-physical characteristics and limited adaptive capacity.
Medium	A moderate number or a mix of low- and medium-value urban elements are located within the hazard footprint.	The urban element is somewhat vulnerable to the climate hazard due to moderate sensitivity and adaptive capacity.
Low	A large number and high-value urban elements (e.g., critical infrastructure, dense neighborhoods, and major economic assets) are located within the hazard footprint.	The urban element is minimally vulnerable to the climate hazard due to limited sensitivity and/or a high degree of adaptive capacity.

The climate change impact matrix below is a systematic tool used to assess and prioritize climate risks by evaluating the potential consequences of climate change impacts against their likelihood. This Climate Risk Profile used the matrix to summarize likely impacts of each hazard by combining the assigned exposure and vulnerability levels.

Table 21:Impact Matrix

		Vulnerability Level		
		Low	**Medium**	**High**
Exposure Level	**High**	Moderate	Major	
	Medium	Minor	Moderate	Major
	Low	Insignificant	Minor	Moderate

3.2.1 Hazard 1: Flooding (Changes in precipitation patterns Pluvial (surface level) flooding, including flash flooding and urban flooding Waterlogging)

Table 22:Exposure, Vulnerability, and Impacts of Hazards on Urban Elements

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Infrastructure & Services					
Storm Water Drainage	Heavy rainfalls can overwhelm drainage channels causing urban flooding and damage to roads and properties. This is caused by the poor state of storm water drainage infrastructure including undeveloped drainage channels, unmaintained infrastructure, and open drainage channels.	Medium	**Sensitivity:** Siltation affecting roads Business in temporary structures affected Water sources contamination **Adaptive Capacity:** Discourage solid waste dumping Developing closed drainage to promote safety	Medium	Moderate

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Water & Wastewater Management	Flood storage facilities reduce flood peaks by temporarily storing excess stormwater. Wastewater systems may experience sewer overflows, contaminating water sources and increasing the risk of waterborne diseases.	Medium	**Sensitivity:** Infrastructure damage and treatment plants disruptions Contamination risks Operational challenges from sediment flows **Adaptive Capacity:** Set rainwater harvesting system provisions Infrastructure upgrades Natural flood management using wetlands and ponds to reduce peak surges	High	Major
Solid Waste Management	Poor waste management practices including indiscriminate dumping increases floods sensitivity by clogging drainage systems	Medium	**Sensitivity:** Collection disruptions Contamination form leachate leaks and disease outbreaks Drainage blockages from indiscriminate dumping	Medium	Moderate

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
	raising localized depths		**Adaptive Capacity:** Upgrading to flood resistant infrastructure like MRFs Sensitization and awareness on behavior change		
Transport and Mobility	Low-lying roads, unpaved streets, and poorly drained urban roads are prone to inundation, restricting vehicle and pedestrian movement. Bus stops, stages, and matatu routes may become inaccessible during	Medium	**Sensitivity:** Most urban roads are poorly drained, or low-lying, making them highly sensitive to floodwater inundation Poorly maintained drainage, culverts, and bridges increase sensitivity to water accumulation and structural damage	Medium	Moderate

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
	floods, disrupting commuter movement		**Adaptive Capacity:** Regular clearing of drains, debris, and sediment can improve resilience of roads and pathways. Gradual upgrading of roads to bitumen standards Defining and lining storm water drainage		
Energy	The electric poles are at risk of accidents when floods occur within the municipality. Disruption form trees falling may damage power lines	Medium	**Sensitivity:** Service disruption electricity poles are at risk of falling and causing accidents During floods and storms, power black outs are frequent interrupting services and communication	Medium	Moderate
			Adaptive Capacity: Advancements in technology innovations like solar energy and battery storage		

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Economic Infrastructure	The municipality is connected with major and minor roads supporting mobility in the area	Low	**Sensitivity:** Floods interfere with murram roads in the peri- urban parts of the municipality. Low money circulation from agricultural activities due to losses	Medium	Minor
			Adaptive Capacity: Regular maintenance of roads Encouraging banks to adopt agricultural insurances due to climate change risks		

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Social Infrastructure	Social infrastructure in Kericho Town includes a range of facilities in education, healthcare, housing, transportation, and public services, which support its growing status as a municipality and regional hub.	Low	**Sensitivity:** In the peri-urban areas, the roads cut off by erosion because of the flood hindering access to health care, economic activities and public services **Adaptive Capacity:** Regular maintenance of infrastructure	Medium	Minor
Emergency Services	Emergency services are exposed to flooding due to heavy rains inadequate storm water drainages. Dependency on road networks for	Low	**Sensitivity:** Heavy rains can affect power outages, mobility and water contamination increasing operational demands on emergency services	Medium	Minor

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
	rapid responses and simultaneous occurrence of multiple hazards during flood		**Adaptive Capacity:** Communication and transport networks and power supply for emergency facilities may include redundant or flood-resilient systems. Coordination with municipal authorities: Integration with storm water management, disaster risk reduction, and early warning systems supports flood response.		
Populations					
Urban Residents	Population density and settlement patterns in the informal settlements are particularly vulnerable to flooding in the rainy seasons.	Low	**Sensitivity:** Blocked undersized storm water drainage systems Poor infrastructure including \houses, roads and drainage systems Sewer overflow and poor sanitation	Medium	Minor

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
			Adaptive Capacity: Early warning systems to allow residents to prepare The storm drains need to be unblocked and expanded Enforcement of zoning regulations		
Informal Settlement Residents	Most the informal settlements including Nyagacho and Talai are characterized by poor infrastructure and a lack of secure land tenure.	Low	**Sensitivity:** Poor sanitation facility leads to waterborne diseases The poor states of housing is risking the lives of the children and women.	Medium	Minor
			Adaptive Capacity: The provision of sanitation interventions to the households The development of storm drains and cut off drains		

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Vulnerable and Marginalized Groups	Vulnerable groups include orphans and vulnerable children the elderly and persons with disability, widows and youth facing challenges like poverty and lack of access to resources.	Low	**Sensitivity:** Allocation of funds to disaster management is low within the municipality budget. **Adaptive Capacity:** There are organizations supporting these vulnerable population on need to need basis Multi sectoral interventions need to be co-designed to support the populations	Medium	Minor
Natural Assets					
Urban Green Infrastructure	The existing urban green spaces experiences water	Low	**Sensitivity:** Landscaped spaces may loss vegetation	Medium	Minor

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
	logging during heavy rainfall making them unsuitable for serving its purpose. Wetlands absorbs excess storm water reducing flooding in built up spaces		**Adaptive Capacity:** Integration of rain gardens and permeable surfaces to help control storm water There is need to allocate funds for maintenance and rehabilitation		
Urban Blue Infrastructure	Tionsoiyet wetland serves as a natural storage and conveyance for excess rainfall reducing the pressure on piped drainage systems. It also serves a flood mitigation by acting as a sponge absorbing peak surges and reducing velocity of storm water runoff from Nyagacho and Kericho town CBD	Low	**Sensitivity:** Floods interferes with the turbidity of the water from the wetland feeding into small streams and major water sources. Contamination from raw sewage being released from households	Medium	Minor
			Adaptive Capacity: Implementation of Tionsoiyet Wetland Management Plan		

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Peri-urban and Agricultural Systems	The municipality relies on the agricultural produce from the peri urban areas. Floods has caused losses to maize and horticulture farms in particular.	Low	**Sensitivity:** The unpredictable rainfall has caused farmers to encroach riparian areas due to the water retention capability **Adaptive Capacity:** The farmer needs to adopt irrigation mechanism and move towards upper areas of the municipality. The practice SLM practices to control water within and around the farms.	Medium	Minor

3.2.2 Hazard 2: Water stress (Prolonged dry spells)

Table 23:Exposure, Vulnerability, and Impacts of Water Stress on Urban Elements

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Infrastructure & Services					
Storm-water Drainage	During dry seasons drainage channels remain dry and can lead vegetation growth or build up of waste	Low	**Sensitivity:** Storm water drainage may invade weeds and shrubs **Adaptive Capacity:** Regular maintenance by routinely cleaning to prevent blockage	Medium	Minor
Water & Wastewater Management	During this season water demand exceeds supply. Reduced water	Low	**Sensitivity:** Irregular water supply by KEWASCO	Medium	Minor

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
	input decreases velocity leading to sediment KEWASCO water treatment plant rely on water to convey and treat sewage, water stress can limit dilution capacity impacting on treatment efficiency.		**Adaptive Capacity:** Water storage and alternative water supply Water rationing		
Solid Waste Management	Organic waste decomposes faster in high temperatures producing leachate and methane gas. Open dumpsites are directly exposed to sunlight and heat is	Low	**Sensitivity:** Heat stress affect waste decomposition, operations efficiency, safety of workers and environmental quality	Medium	Minor

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
	at a high risk of fire outbreaks		**Adaptive Capacity:** Awareness creation on waste segregation and recycling limits risks of combustion and fire risks Construction of shades to reduce heat exposure		
Transport and Mobility	Drought impacts transportation by limiting roads (murram and tarmac) navigation, causing damage to	Low	**Sensitivity:** Damage to roads from heat and dust Health related issues relate to dust	Medium	Minor

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
	roads from heat and soil shrinkage, and increasing health related issues related to dust.		**Adaptive Capacity:** Development of climate resilient road network with temperature and precipitation in context.		
Energy	The municipality is over-reliant on biomass and electricity.	Medium	**Sensitivity:** Communities often rely on biomass for energy, and drought conditions can affect the availability of these resources	Medium	Moderate

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
			Adaptive Capacity: Renewable energy sources adoption such as solar power. Leverage on last mile electricity provision		
Economic Infrastructure	Most livelihoods are dependent on climate-sensitive sectors like agriculture	Medium	**Sensitivity:** Prolonged dry spells cause substantial losses in crop quantity and quality, Drought leads to inadequate water supply, which affects both domestic use and agricultural water-control systems.	Medium	Moderate

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
			Adaptive Capacity: Promoting drought-tolerant and early-maturing crop varieties. Developing resilient infrastructure that can withstand climate shocks.		

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Social Infrastructure	Prolonged dry spells primarily strain essential services such as health, water supply, and education facilities. The municipality's high vulnerability to climate change, including recurring droughts and floods, exacerbates existing infrastructure challenges.	Medium	**Sensitivity:** Droughts led to water scarcity from the water utility KEWASCO Increased incidence of waterborne diseases put additional pressure on health infrastructure Drought conditions and associated impacts like food insecurity can disrupt learning	Medium	Moderate

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
			Adaptive Capacity: Solarization of water infrastructure and water pipeline extension Ward climate committees to help prioritize and implement local adaptation actions.		
Emergency Services	Drought through the need for food and water assistance, particularly in vulnerable areas	Medium	**Sensitivity:** Drought leads to crop failure and reduced yields. Drought increases the risk of fire outbreaks	Medium	Moderate

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
			Adaptive Capacity: Emergency health and fire services to strengthen outreach programs and responding to disease and fire outbreaks. Emergency services to improve access to safe water and emergency responses		
Populations					

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Urban Residents	Urban populations, particularly those living in informal settlements, face significant vulnerability due to limited access to basic services and resources for adaptation.	Medium	**Sensitivity:** Droughts led to drying up of water sources Droughts contribute to hygiene-related diseases. Excess heat affects residents in informal settlements	Medium	Moderate

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
			Adaptive Capacity: Alternative water sources and invest in rain water harvesting systems Conservation and protection of water sources and the development of better storm water and sewerage systems		

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Informal Settlement Residents	Prolonged dry spells leads to severe water scarcity, increased living costs, and heightened vulnerability. Informal settlements are mostly affected during water rationing because formal water connections tend to prioritized planned residential areas and commercial zones.	Medium	**Sensitivity:** Rationing of water mostly affects the informal settlements Heavy reliance on shared water points and vendors which may be costly Poor sanitation and hygiene **Adaptive Capacity:** Purchasing water from water vendors Storage of water from water kiosks, rivers source and when water is available in the taps	Medium	Moderate

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Vulnerable and Marginalized Groups	Many vulnerable households experience great exposure to water shortage due to socio economic and physical barriers that limit their access to water sources	Medium	**Sensitivity:** Limited financial resources make it difficult to afford water from vendors forcing them to reduce water consumption which negatively affect hygiene sanitation and health	Medium	Moderate

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
			Adaptive Capacity: Storage of water Support from government initiatives and community organization can strengthen adaptive capacity of the VMGs.		
Natural Assets					

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Urban Green Infrastructure	Urban parks roadside trees and landscaped public spaces may experience reduce vegetation cover and drying of soils which can diminish their ability to providing ecosystem services Riparian ecosystem may also be affected by reduced water levels	Medium	**Sensitivity:** Reduced vegetation cover can weaken the ability of urban green infrastructure to Informal settlements with limited basic services suffer from heat stress **Adaptive Capacity:** Developing zonal water conservation and demand management strategies Efforts to limit deforestation and promote tree planting	Medium	Moderate

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Urban Blue Infrastructure	Straining water sources, compromising water quality, and hindering the development of resilient urban water systems.	Medium	**Sensitivity:** Water scarcity and contamination from illegal waste water release and car washing activities Lower water levels can concentrate pollutants and degrade water quality	Medium	Moderate
			Adaptive Capacity: Critical public utilities like storm water and sewerage systems to address current infrastructural gaps		

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Peri-urban and Agricultural Systems	Peri-urban and agricultural systems are vulnerable due to the region's high dependence on climate-sensitive, rain-fed activities	Medium	**Sensitivity:** Significantly reduce the yields of tea production Prolonged dry spells impact livestock feeds becoming costly	Medium	Moderate
			Adaptive Capacity: Promoting on-farm small water harvesting techniques and developing water reservoirs for irrigation. Sustainable drought risk reduction approaches to enhance crop yields.		

3.3.3 Hazard 3: *Storms* (Strong winds and Hailstorms)

Table 24:Exposure, Vulnerability, and Impacts of Storms on Urban Elements

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Infrastructure & Services					
Stormwater Drainage	Stormwater drainage systems are highly exposed to storm events, particularly intense rainfall, strong winds, and	Medium	**Sensitivity:** Increased surface runoff overwhelms existing storm drains disruption mobility and public safety	Medium	Moderate

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
	thunderstorms that generate large volumes of surface runoff within a short period. During heavy storms, rainfall intensity may exceed the design capacity of existing drainage infrastructure, resulting in overflow, localized flooding, and damage to drainage channels.		**Adaptive Capacity:** Replacement of undersized or damage drains and installation of reinforced culverts increase systems resilience and high-intensity storms Early systems warning advisories warning residents to prepare for strong winds and potential flash floods		
Water & Wastewater Management	Extreme winds and hailstorms in Kericho County, often linked to climate change,	Medium	**Sensitivity:** Strom waters mix with sewage and other pollutants, degrading water quality	Medium	Moderate

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
	cause significant disruption and contaminating water sources.		**Adaptive Capacity:** KEWASCO to manage sewer backflow and invest in infrastructure upgrade to minimize seepage into the sewers		
Solid Waste Management	Strong winds and hailstorms significantly exacerbate existing challenges in solid waste management, primarily by damaging waste infrastructure and	Medium	**Sensitivity:** Increased contamination risks from open containers Most waste infrastructure are uncovered making it prone to damage by hailstorms	Medium	Moderate

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
	contaminating water sources with waste. Disruption of waste collection schedules from impassable roads and overflow of waste collection points		**Adaptive Capacity:** Rapid response to emergencies to manage overflowed waste and after storm events Integration of waste management with drainage planning to ensure drains are clear of waste to reduce flooding impacts		
Transport and Mobility	Strong winds and hailstorms cause significant disruption to transport and mobility from the trees	Medium	**Sensitivity:** Impassable roads make it difficult to access critical health and education facilities, especially in peri urban areas	Medium	Moderate

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
	felling disrupting road networks and bridges, cutting off access to essential services		**Adaptive Capacity:** Upgrading earth roads to all-weather murram roads and improving drainage systems. Removal of unsafe soft wood trees that may be affected by strong winds		
Energy	Strong windstorms have been reported to blow away rooftops, fell trees damaging buildings and property, which suggests they can damage energy infrastructure like power lines leading to power outages and supply disruptions.	Medium	**Sensitivity:** Roads, buildings and bridges are affected by the impact from extreme storm events **Adaptive Capacity:** Infrastructure maintenance Safe removal of trees that can potentially affect power lines or plant trees that don't grow to higher heights disruption buildings and energy transmission cables	Medium	Moderate

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Economic Infrastructure	Strong winds and hailstorms is known to be high in Ainamoi, Kapsuser and causes damage to tea plantations, crops, livestock, and property. This is contributed to proximity to Mau Forest Complex	Medium	**Sensitivity:** Destruction of crops Disruptions of business activities and normal operations in the open air markets **Adaptive Capacity:** Adoption of climate information services to the farmers Investment in closed infrastructure	Medium	Moderate
Social Infrastructure	Strong winds pose a significant threat to social infrastructure, particularly in informal settlements and to already underserved public facilities	Low	**Sensitivity:** Destruction of physical infrastructure and disruption of service including communication and electrical connections **Adaptive Capacity:** Adoption of improved construction mechanisms in risk areas Planting of trees as wind breakers in the premises	Medium	Minor

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Emergency Services	Strong winds in Kericho Municipality impact emergency services by causing power outages (fallen lines), damaging infrastructure (uprooting trees, blowing off roofs) and disrupting transport.	Low	**Sensitivity:** Frequent power outages Disrupting transport due to trees and impassable roads **Adaptive Capacity:** Emergency preparedness by the relevant agencies Allocation of funds in the emergency kitty in the municipality	Medium	Minor
Populations					
Urban Residents	In Kericho Municipality, strong winds, often accompanying the rainy seasons, pose several risks to urban residents, including potential	Medium	**Sensitivity:** Blow off roofs and uproot trees Damage road networks, energy facilities, and water/sewerage infrastructure,	Medium	Moderate

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
	structural damage to buildings and infrastructure disruption.		**Adaptive Capacity:** The local government is implementing urban planning and infrastructure projects to mitigate these and other climate-related challenges.		
Informal Settlement Residents	Strong winds are a recurring climatic hazard posing a significant threat to residents of informal settlements due to the vulnerability of their housing and location in hazard-prone areas.	Low	**Sensitivity:** Heavy rainfall leads to water pollution and an increase in waterborne diseases **Adaptive Capacity:** Improve the living conditions and infrastructure within informal settlements,	Medium	Minor
Vulnerable and Marginalized Groups	Strong winds, as a form of extreme weather damaging poorly constructed	Low	**Sensitivity:** Damaging poorly constructed housing in informal settlements	Medium	Minor

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
	housing in informal settlements, disrupting livelihoods, exacerbating health issues, and causing financial and mental stress.		**Adaptive Capacity:** Integrate land use planning and provide strategies for climate change adaptation		
Natural Assets					
Urban Green Infrastructure	Strong winds can destroy public and private property from trees falling	Low	**Sensitivity:** Damage and leading to associated problems like starvation and disease in affected communities.	Medium	Minor
			Adaptive Capacity: The implementation emphasizes community-led development and citizen engagement to ensure the successful adoption and maintenance of these green initiatives.		

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Urban Blue Infrastructure	Strong winds cause to potential damage to water supply systems and the exacerbation of water-related issues like contamination and flooding.	Low	**Sensitivity:** Damage above-ground water infrastructure such as elevated steel storage tanks, treatment plants **Adaptive Capacity:** Operation and maintenance plans to ensure infrastructure is well-maintained and better able to withstand climate conditions.	Medium	Minor
Peri-urban and Agricultural Systems	Strong winds pose challenges to both peri-urban and agricultural systems by causing physical damage, increasing	Low	**Sensitivity:** Strong winds causing physical damage, increasing water loss, and promoting soil erosion	Medium	Minor

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
	water loss, and promoting soil erosion.		**Adaptive Capacity:** Planting trees can reduce wind speed in fields and around settlements, significantly decreasing soil erosion and physical crop damage.		

3.3.4 Hazard 4: Heat stress (Average surface temperature increase)

Table 25:Exposure, Vulnerability, and Impacts of Heat Stress on Urban Elements

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Infrastructure & Services					
Storm water Drainage	Heat stress primarily impacts storm water drainage systems indirectly by altering the hydrological cycle, increasing the intensity of rainfall events, and potentially accelerating the degradation of infrastructure materials.	Low	**Sensitivity:** Higher surface temperatures lead to increased evaporation and atmospheric moisture capacity, resulting in more intense, short-duration rainfall events **Adaptive Capacity:** Integrating land use and infrastructure planning to improve the built environment and adapt to climate change.	Medium	Minor
Water & Wastewater Management	Heat stress pose significant challenges to the water and wastewater systems in Municipality, exacerbating existing issues like water	Low	**Sensitivity:** When water becomes scarce, sewage systems can fail, and the threat of waterborne diseases like cholera surges.	Medium	Minor

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
	scarcity, contamination, and infrastructure gaps		**Adaptive Capacity:** Spatial framework for sustainable land use and address challenges like urbanization and spatial imbalances.		
Solid Waste Management	Heat stress significantly worsens already poor solid waste management (SWM) by accelerating waste decomposition, increasing foul odors and pests, affecting worker health	Low	**Sensitivity:** Open dumpsites and burning of waste experiences intensified foul smells, attracting more vectors. **Adaptive Capacity:** Encourage households to separate waste at source	Medium	Minor

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Transport and Mobility	High temperatures can lead to thermal expansion and deterioration of road infrastructure asphalt roads and concrete pavements absorb and retain heat	Low	**Sensitivity:** Unlimited shaded infrastructure Heavy reliance on motorcycle and walking High temperatures can accelerate the wear and tear of road pavements, leading to damage, deformation, and an increase in maintenance **Adaptive Capacity:** Urban greening initiatives Integrations of climate resilient considerations in transport infrastructure planning.	Medium	Minor
Energy	Energy systems are exposed to heat stress due to rising ambient temperatures increased electricity demand overheating transformers potentially leading to power failures	Low	**Sensitivity:** Heat stress drive high electricity demands and consumption straining grid and increasing blackout from load shedding Maintenance constrains	Medium	Minor

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
			Adaptive Capacity: Equipment upgrade and backup systems Encourage the uptake of clean and sustainable technologies to reduce the reliance one source		
Economic Infrastructure	This includes facilities and systems that support commerce, industry, trade, and economic activities, such as markets, commercial buildings, industrial plants, warehouses, banks, and transport hubs. These systems are critical for the urban	Low	**Sensitivity:** Extreme heat directly reduces work capacity, Economic infrastructure is physically and operationally exposed to heat stress, with potential consequences for productivity, safety, and economic continuity.	Medium	Minor

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
	economy, livelihoods, and municipal revenue. Dense urban areas with high impervious surfaces amplify local temperatures, increasing thermal stress on commercial and industrial facilities		**Adaptive Capacity:** Promoting the development of heat-resilient infrastructure. (Cooling and climate control) Integrating climate resilience into urban planning policies and land use development plans		
Social Infrastructure	Urban facilities that provide essential services for health, education, community welfare, and recreation. This includes schools,	Low	**Sensitivity:** Limited ventilation and absence pf cooling systems make facilities highly sensitive to heat stress	Medium	Minor

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
	hospitals, clinics, community centers, playgrounds, and public gathering spaces. In Kericho Municipality, social infrastructure is exposed to heat stress due to rising temperatures, prolonged dry spells and inadequate climate adaptation in building design and operation		**Adaptive Capacity:** Enhancing urban green spaces, planting trees, and developing green corridors can reduce local temperatures by creating cooler microenvironments. Integration with municipal heat action plans, water supply programs, and urban greening initiatives enhances facility resilience.		
Emergency Services	Emergency services in urban areas include fire services, medical response teams, police, rescue units, and disaster management personnel. These services are critical for maintaining public safety, responding to accidents, and addressing climate-related emergencies.	Low	**Sensitivity:** Emergency services are susceptible to heat stress in terms of personal health, operation efficiency and infrastructure performance during high temperatures Limited cooling facilities for infrastructure	Medium	Minor

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
			Adaptive Capacity: Training and preparedness of personnel Resource allocation to improve readiness during extreme events Proper coordination of municipal services including water supply, health facilities and community alert systems.		
Populations					
Urban Residents	Urban residents are at risk of heat stress, a problem exacerbated by urbanization and the Urban Heat Island (UHI) effect, which disproportionately affects vulnerable populations in low-income and informal settlements.	Low	**Sensitivity:** The clearing of vegetation and green land to make way for new developments significantly reduces natural cooling.	Medium	Major
			Adaptive Capacity: Planting trees and creating green corridors can significantly reduce local temperatures and improve urban climate.		

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Informal Settlement Residents	Residents of informal settlements including Nyagacho face significant heat stress, primarily due to poor housing materials, lack of green space, and limited access to cooling resources.	Low	**Sensitivity:** Informal settlements are typically characterized by high population density, a lack of vegetation trees and green spaces	Medium	Minor
			Adaptive Capacity: Developing and implementing targeted early warning systems via mobile technology can alert vulnerable communities to impending heat waves.		

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Vulnerable and Marginalized Groups	These groups are often most affected by climate hazards due to social, economic and physical limitations. Vulnerable populations in informal settlements often lack a shaded area, green spaces increasing exposure to high temperatures	Low	**Sensitivity:** Low income house hold often cannot afford cooling appliances, women face high exposure from the nature of their roles in search for water and markets. **Adaptive Capacity:** Adjusting to work schedules including morning hour farming/ business activities and limiting outdoor activities during peak heat. Low-cost interventions like reduced clothing and help reduce	Medium	Minor
Natural Assets					
Urban Green Infrastructure	Areas with high impervious surface coverage roads, pavement and roof tops	Low	**Sensitivity:** Urban heat amplification compunding heat stress on vegetation	Medium	Minor

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
	increase local temperature exposing green infrastructure to higher thermal loads Urban areas typically experience an "Urban Heat Island" (UHI) effect, where they are significantly warmer than surrounding rural areas due to human activity and surfaces that absorb and retain heat.		**Adaptive Capacity:** Urban greening initiatives including green corridors and municipal tree planting programs help in reducing local temperatures during dry spells		
Urban Blue Infrastructure	Tionsoiyet Wetland has over time been affected by the increasing demand pressures from car washing activities and encroachment for settlement. This has	Low	**Sensitivity:** Drying up of the wetland from over abstraction of water leads to lower levels from overdependence during dry spells	Medium	Minor

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
	adversely affected water quality and quantity especially during dry seasons		**Adaptive Capacity:** Water management strategies such as maintaining reservoir levels conservation of the wetlands and monitoring water quality enhances resilience during urban stress Local awareness initiatives' and community led wetland protection will help reduce encroachment and car washing activities indirectly improving adaptive capacity on UBI		
Peri-urban and Agricultural Systems	This systems support food security local livelihoods and rural-urban ecological balance Heat stress significantly impacts both peri-urban and agricultural systems	Low	**Sensitivity:** High temperatures lead to heat stress in livestock and crops affecting the production and food security in the peri urban areas	Medium	Minor

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
	by reducing crop yields, impairing livestock productivity and health, and diminishing the work capacity of farmers.		**Adaptive Capacity:** Shifting to drought-tolerant crop varieties Diversification of crops and livestock reduce risks from single-event failures		

SECTION 4: CLIMATE RISK ASSESSMENT

CHAPTER FOUR

4.1 Introduction

This climate risk assessment is a structured process to evaluate how climate change hazards, such as extreme weather and sea-level rise, could impact the municipality. This evaluation helps to identify and prioritize risks, estimate their magnitude, and develop strategies for adaptation and resilience.

Climate hazards do not exist as abstract meteorological events; they materialize when atmospheric processes intersect with ecological systems, built environments, and human settlement patterns in ways that generate potential for harm. The transition from climatic variability to climate hazard occurs at the point where thresholds of tolerance are exceeded whether those thresholds relate to drainage capacity, soil stability, infrastructure design standards, or human adaptive capacity. This chapter undertakes a systematic identification and characterization of climate-related hazards affecting Kericho Municipality, grounding each hazard in both physical processes and spatial dynamics.

The analytical approach adopted here distinguishes clearly between hazard and risk.

1. Hazard refers strictly to the probability and intensity of a potentially damaging climatic event, independent of who or what is exposed.
2. Risk, by contrast, emerges only when hazard interacts with exposure and vulnerability.

Accordingly, the present chapter isolates and interrogates the hazard dimension alone, examining its typology, intensity, frequency, and spatial distribution within the municipality. This disciplined separation enhances analytical clarity and prevents conflation of physical processes with socio-economic outcomes.

Given Kericho's highland setting, rainfall driven hazards dominate the local climate risk profile. However, additional hazard categories including slope instability, heat stress, convective storms, and short-term hydrological variability are also emerging in response to observed and projected climatic shifts. The following sections examine each hazard category in turn, situating it within both climatic science and urban environmental dynamics.

4.1.1 Hazard Level and The Estimated Impact Level

For this Urban Climate Risk Profile, the following matrix summarizes overall risk for each urban element by combining the assessed hazard level and the estimated impact level.

Table 26:hazard level and the estimated impact level

		Hazard Level		
		Low	**Medium**	**High**
Impact Level	**Catastrophic**	High	Very High	Very High
	Major	Medium	High	Very High
	Moderate	Low	Medium	High
	Minor	Low	Low	Medium
	Insignificant	Very Low	Low	Low

The risk levels were interpreted based on the table below.

4.1.2 Interpretation of risk levels

Table 27:Table Interpretation of risk levels

Level	Interpretation
Very High	Very high risks are unacceptable. Risk should be avoided, reduced or transferred. Immediate planning and implementation of risk reduction measures is required. Allocate resources and coordinate interventions to prevent or minimize impact.
High	High risks should be actively addressed. Develop and implement mitigation actions promptly. Monitor environmental indicators and ensure readiness of emergency or adaptation measures.
Medium	Medium risks should be managed. Plan and implement mitigation activities to reduce them to acceptable levels. Regularly review climate data and risk levels.
Low	Low risks are acceptable under current conditions. Minimal control or monitoring is needed, provided they remain stable and do not escalate.
Very Low	Very low risks are negligible in terms of likelihood and consequences. No immediate action is required beyond routine monitoring and periodic review.

4.2 Current and Future Climate Risks on Urban Elements

4.2.1 Summary of Flooding risks for Kericho Municipality

Table 28 Summary of Flooding risks for Kericho Municipality

	Time Horizon & Climate Scenario	Current	2050 SSP2-4.5	2050 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5
	Hazard Level	**Low**	**Low**	**High**	**Medium**	**High**
Categories	**Impact**			**Risk Levels**		
		Current	**2050 SSP2-4.5**	**2050 SSP5-8.5**	**2100 SSP2-4.5**	**2100 SSP5-8.5**
Infrastructure & Services						
Stormwater Drainage	Moderate	Low	Low	High	Medium	High
Water & Wastewater Management	Major	Low	Low	Medium	Low	Medium
Solid Waste Management	Moderate	Low	Low	High	Medium	High
Transport and Mobility	Moderate	Low	Low	High	Medium	High
Energy	Moderate	Low	Low	High	Medium	High
Economic Infrastructure	Minor	Low	Low	Medium	Low	Medium
Social Infrastructure	Minor	Low	Low	Medium	Low	Medium
Emergency Services	Minor	Low	Low	Medium	Low	Medium
Populations						
Urban Residents	Minor	Low	Low	Medium	Low	Medium
Informal Settlement Residents	Minor	Low	Low	Medium	Low	Medium

Vulnerable and Marginalized Groups	Minor	Low	Low	Medium	Low	Medium
Natural Assets						
Urban Green Infrastructure	Minor	Low	Low	Medium	Low	Medium
Urban Blue Infrastructure	Minor	Low	Low	Medium	Low	Medium
Peri-urban and Agricultural Systems	Minor	Low	Low	Medium	Low	Medium

4.2.2 Summary of Water stress risks for Kericho Municipality

Table 29:Summary of Water stress risks for Kericho Municipality

	Time Horizon & Climate Scenario	Current	2050 SSP2-4.5	2050 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5
	Hazard Level	Low	Low	High	Medium	High
Categories	Impact	Risk Levels				
		Current	2050 SSP2-4.5	2050 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5
Infrastructure & Services						
Stormwater Drainage	Minor	Low	Low	Medium	Low	Medium
Water & Wastewater Management	Minor	Low	Low	Medium	Low	Medium
Solid Waste Management	Minor	Low	Low	Medium	Low	Medium
Transport and Mobility	Minor	Low	Low	Medium	Low	Medium
Energy	Moderate	Low	Low	High	Medium	High
Economic Infrastructure	Moderate	Low	Low	High	Medium	High
Social Infrastructure	Moderate	Low	Low	High	Medium	High
Emergency Services	Moderate	Low	Low	High	Medium	High
Populations						
Urban Residents	Moderate	Low	Low	High	Medium	High
Informal Settlement Residents	Moderate	Low	Low	High	Medium	High

Vulnerable and Marginalized Groups	Moderate	Low	Low	High	Medium	High
Natural Assets						
Urban Green Infrastructure	Moderate	Low	Low	High	Medium	High
Urban Blue Infrastructure	Moderate	Low	Low	High	Medium	High
Peri-urban and Agricultural Systems	Moderate	Low	Low	High	Medium	High

4.2.3 Summary of storms risks for Kericho Municipality

Table 30:Summary of storms risks for Kericho Municipality

	Time Horizon & Climate Scenario	Current	2050 SSP2-4.5	2050 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5
	Hazard Level	Low	Low	High	Medium	High
Categories	Impact			Risk Levels		
		Current	2050 SSP2-4.5	2050 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5
Infrastructure & Services						
Stormwater Drainage	Moderate	Low	Low	High	Medium	High
Water & Wastewater Management	Moderate	Low	Low	High	Medium	High
Solid Waste Management	Moderate	Low	Low	High	Medium	High
Transport and Mobility	Moderate	Low	Low	High	Medium	High
Energy	Moderate	Low	Low	High	Medium	High
Economic Infrastructure	Moderate	Low	Low	High	Medium	High
Social Infrastructure	Minor	Low	Low	Medium	Low	Medium
Emergency Services	Minor	Low	Low	Medium	Low	Medium
Populations						
Urban Residents	Moderate	Low	Low	High	Medium	High
Informal Settlement Residents	Minor	Low	Low	Medium	Low	Medium
Vulnerable and Marginalized Groups	Minor	Low	Low	Medium	Low	Medium

Natural Assets						
Urban Green Infrastructure	Minor	Low	Low	Medium	Low	Medium
Urban Blue Infrastructure	Minor	Low	Low	Medium	Low	Medium
Peri-urban and Agricultural Systems	Minor	Low	Low	Medium	Low	Medium

4.2.4 Summary of Heat stress risks for Kericho Municipality

Table 31:Summary of Heat stress risks for Kericho Municipality

	Time Horizon & Climate Scenario	**Current**	**2050 SSP2-4.5**	**2050 SSP5-8.5**	**2100 SSP2-4.5**	**2100 SSP5-8.5**
	Hazard Level	**Low**	**Low**	**High**	**Medium**	**High**
Categories	**Impact**	**Risk Levels**				
		Current	**2050 SSP2-4.5**	**2050 SSP5-8.5**	**2100 SSP2-4.5**	**2100 SSP5-8.5**
Infrastructure & Services						
Stormwater Drainage	Minor	Low	Low	Medium	Low	Medium
Water & Wastewater Management	Minor	Low	Low	Medium	Low	Medium
Solid Waste Management	Minor	Low	Low	Medium	Low	Medium
Transport and Mobility	Minor	Low	Low	Medium	Low	Medium
Energy	Minor	Low	Low	Medium	Low	Medium
Economic Infrastructure	Minor	Low	Low	Medium	Low	Medium
Social Infrastructure	Minor	Low	Low	Medium	Low	Medium

Emergency Services	Minor	Low	Low	Medium	Low	Medium
Populations						
Urban Residents	Major	Low	Low	Medium	Low	Medium
Informal Settlement Residents	Minor	Low	Low	Medium	Low	Medium
Vulnerable and Marginalized Groups	Minor	Low	Low	Medium	Low	Medium
Natural Assets						
Urban Green Infrastructure	Minor	Low	Low	Medium	Low	Medium
Urban Blue Infrastructure	Minor	Low	Low	Medium	Low	Medium
Peri-urban and Agricultural Systems	Minor	Low	Low	Medium	Low	Medium

Synthesis of Hazard Severity

Integrating climatic projections with physical geography and land-use dynamics suggests that rainfall-driven hazards particularly pluvial flooding and flash flooding constitute the highest-severity threat to Kericho Municipality. Landslide hazard is significant but spatially concentrated. Hydrological variability presents moderate but economically relevant risk. Heat and wind hazards are emerging concerns with increasing trajectory under warming scenarios.

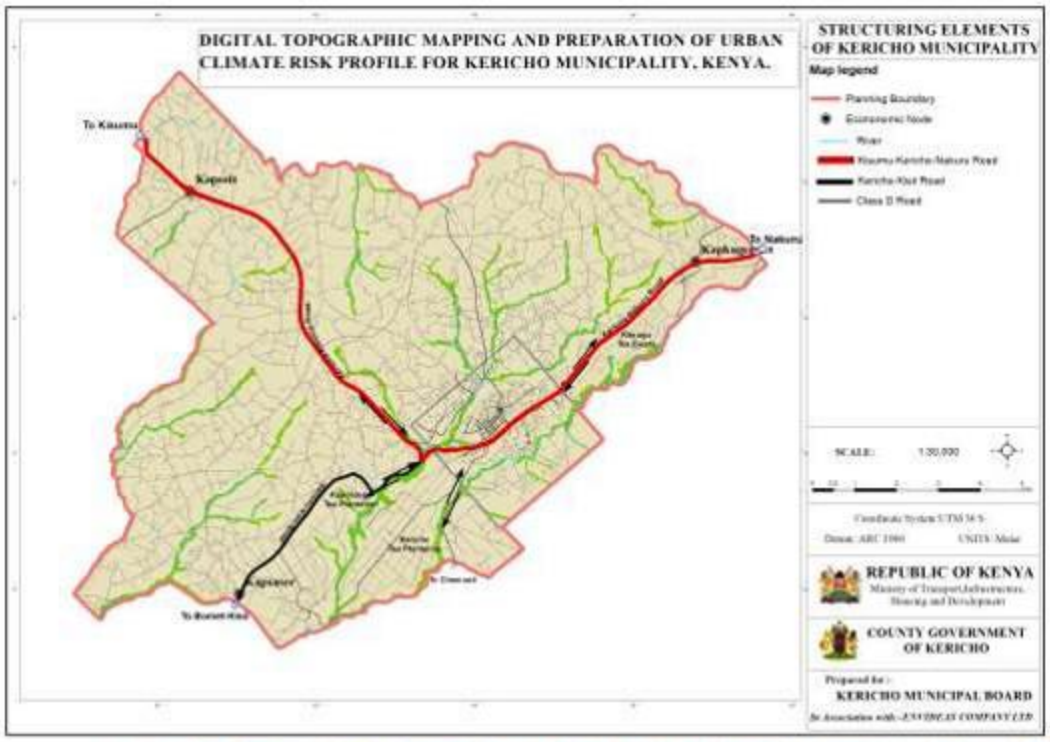

Figure 4: Structuring Models- Kericho Municipality

SECTION 5: CLIMATE RISK HOTSPOTS

CHAPTER FIVE

5.1 Urban Flooding

Kericho lies within the highland region of Kenya and is characterized by undulating terrain, river valleys, and areas with poorly drained soils, especially around valley bottoms and riparian zones. Some parts of the municipality include wetlands and seasonal drainage areas that act as natural water storage systems during heavy rainfall. These areas are prone to surface runoff accumulation and localized flooding, particularly where natural drainage channels have been altered by urban development.

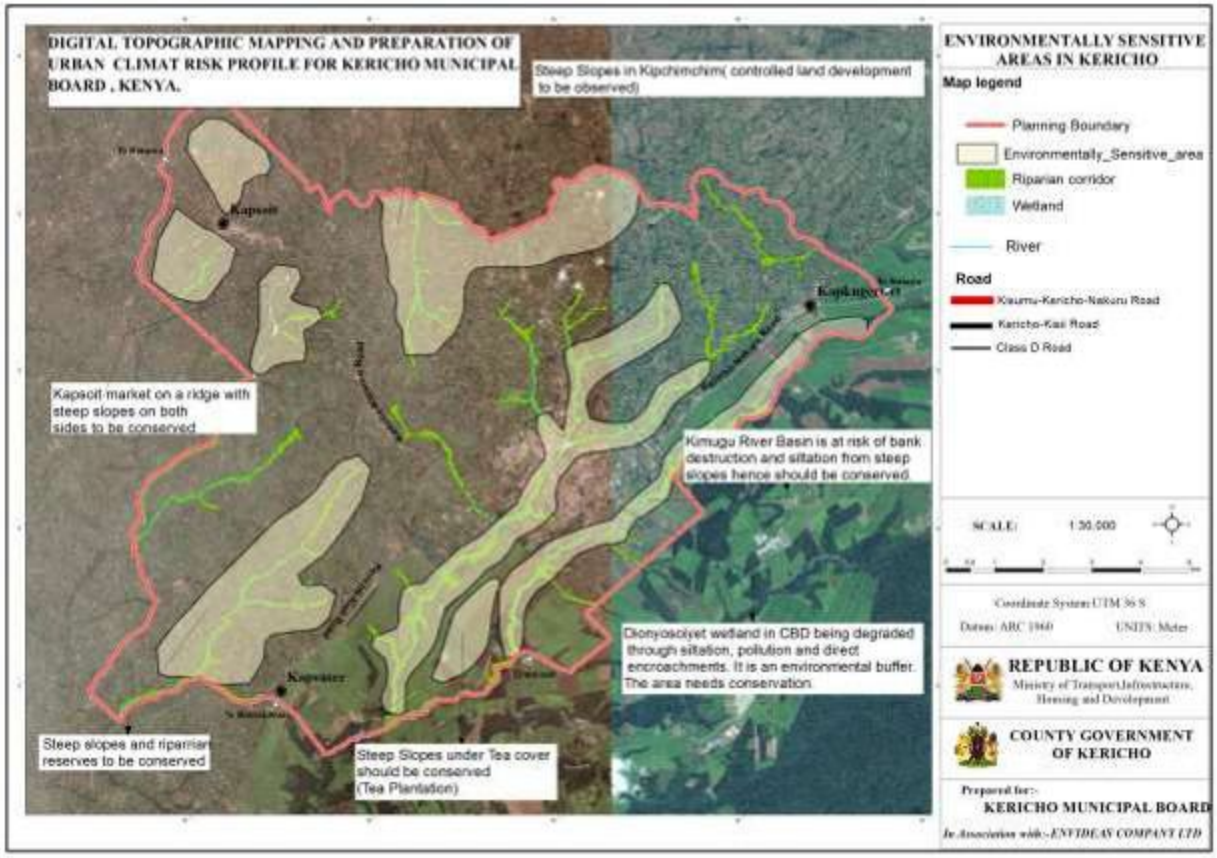

Figure 5: Environmentally sensitive Areas in Kericho

How Flood Risk Varies Locally in Kericho Municipality

Higher-Risk Zones

Low-lying town areas near wetlands (e.g., Tioyon soiyet) are more prone to surface flooding during heavy rains. Peripheral settlements with poor drainage especially informal or peri-urban areas tend to suffer more waterlogging and inundation.

Lower-Risk Zones

Elevated northern outskirts and hilly areas above ~1,300 m tend to drain better and are less prone to persistent flood inundation compared to flat wetlands and riparian strips.

Distribution Patterns

There's no detailed public flood susceptibility map at the municipal ward level yet, but the patterns above (lowlands/wetlands vs elevated terrain) largely determine which parts of Kericho are more at-risk during climate-driven flood events.

5.2 Water stress

Kericho County generally receives high and relatively reliable rainfall compared to many other parts of Kenya due to its highland climate and location within the Lake Victoria basin catchment area. Rainfall distribution within the county, however, varies slightly with altitude and topography. The central and western highland areas of Kericho, where Kericho Municipality is located, receive higher and more consistent rainfall, supporting extensive tea cultivation.

Most parts of Kericho fall within the humid to sub-humid agro-ecological zones (Upper Midlands – UM1/UM2) and receive approximately 1,800–2,200 mm of rainfall annually, making the area one of the wetter regions in the country. In contrast, some lower elevation areas toward the eastern and southern parts of the county may receive slightly lower rainfall amounts and experience more variability, though they still remain relatively well watered compared to semi-arid regions of Kenya. This rainfall pattern contributes to high agricultural productivity, but it can also increase the risk of soil erosion, waterlogging, and localized flooding, particularly in poorly drained valley bottoms and riparian areas

Higher rainfall highland zones:

Most parts of Kericho Municipality lie within Kenya's humid highland agro-ecological zones, characterized by relatively high and reliable rainfall. Areas within and around Kericho town, including tea-growing landscapes and surrounding wards, typically receive abundant and well-distributed rainfall throughout the year. This climatic pattern supports extensive tea cultivation and other agricultural activities.

However, despite the generally high rainfall, variations in topography and drainage mean that some areas particularly riparian zones, and poorly drained soils can experience waterlogging or localized flooding during intense rainfall periods. Because Kericho is situated in the Upper Midland (UM1/UM2) agro-ecological zones, rainfall is generally more consistent than in Kenya's lower midland regions, although short dry spells can still occur and affect water availability in some settlements and agricultural areas.

Moderate Drought Exposure Zones

Within Kericho Municipality, areas located on moderately elevated ridges or well-drained slopes may experience slightly lower drought stress compared to valley bottoms. These zones often benefit from better soil drainage and relatively consistent rainfall, although short dry spells can still occur. During such periods, agricultural activities, water availability for households, and small-scale farming may still be affected, especially where water storage and irrigation systems are limited.

Lower Relative Drought Risk

Some parts of the municipality that lie in higher elevation areas or near key water catchments and forested zones tend to have lower relative drought sensitivity. These areas benefit from higher rainfall, cooler temperatures, and proximity to natural water sources such as rivers and springs. However, the differences in drought risk across the municipality are not very pronounced, since most of Kericho lies within a humid highland climate zone where rainfall is generally reliable compared to many other regions of Kenya.

Table 32:Summary of water stress Risk Distribution in Kericho Municipality

Zone	Drought Exposure Level	Key Drivers
Riparian zones and poorly drained areas within the municipality	Moderate	Temporary water stress during dry spells, dependence on rain-fed agriculture, limited water storage
Central Kericho urban and peri-urban areas	Low to Moderate	Increasing water demand, seasonal rainfall variability, urban expansion affecting natural water infiltration
Slightly elevated ridges and upland tea-growing zones	Low	Higher and more reliable rainfall, cooler temperatures, better soil moisture retention due to vegetation cover

5.3 Storms

Strong winds in the municipality is usually associated with: Thunderstorms during the rainy seasons (especially long rains March–May and short rains October–December); Storm fronts and convective systems that develop over the Lake Victoria Basin; Climate variability, which is increasing the unpredictability of wind events.

Areas with Relatively Higher Wind Impact

Within Kericho Municipality, areas that are more exposed, elevated, or densely built-up tend to experience stronger wind effects during storms. The Kericho town centre and surrounding urban neighbourhoods often report more noticeable wind-related damage because of the higher concentration of buildings, iron-sheet roofs, commercial structures, and roadside trees that can be affected during strong winds.

Storm winds that accompany heavy rainfall and thunderstorms can occasionally blow off roofing sheets, damage temporary structures such as kiosks and sheds, and break tree branches, particularly in open commercial areas, road corridors, and settlements on exposed ridges. Rapid urban development and the use of light roofing materials in some residential areas can also increase the vulnerability of structures to wind damage during intense storm events.

Areas with Relatively Lower Wind Exposure

Within Kericho Municipality, settlements that are surrounded by dense vegetation, tea plantations, or clusters of trees tend to experience reduced wind intensity during storm events. Vegetation such as tea bushes, woodlots, and riparian tree cover can act as natural windbreaks, helping to slow down or redirect strong winds before they reach residential structures.

Residential areas located within closely built neighbourhoods or compounds with surrounding buildings and vegetation may also experience slightly lower peak wind speeds, as nearby structures and landscape features provide partial shelter from open-field gusts. Additionally, areas located in valley bottoms or gently sheltered terrain within the municipality can be less exposed to strong winds compared to open ridges or elevated sections where wind flows more freely.

5.4 Heat Stress

Higher Heat Stress Exposure Zones

Although Kericho generally has a cooler highland climate, certain parts of the urban center and densely built neighbourhoods can experience localized heat buildup. Areas with paved roads, commercial buildings, metal-roofed houses, and limited tree cover tend to absorb and radiate heat, creating localized warming similar to a mild urban heat island effect.

Workers who spend long hours outdoors such as street vendors, boda-boda riders, market traders, construction workers, and informal sector workers may face higher exposure to heat during warmer periods. Limited shaded public spaces and reduced tree canopy in busy commercial areas can further increase daytime heat exposure for residents and workers.

Moderate to Lower Heat Stress Zones

Areas within the municipality that are surrounded by vegetation such as tea plantations, woodlots, and riparian vegetation tend to experience lower heat stress levels. These vegetated landscapes help cool the local environment through shading and evapotranspiration, which reduces peak daytime temperatures.

Residential areas located near green spaces, agricultural land, or tree-covered compounds are therefore less exposed to intense heat compared to densely built-up zones, providing a natural buffer against heat stress for both residents and outdoor workers.

5.5 Summary of Heat Stress Distribution in Kericho Municipality

Table 33:Summary of Heat Stress Distribution in Kericho Municipality

Area Type	Relative Heat Stress Exposure	Why?
Kericho Town Centre (urban areas)	Moderate	Dense buildings, paved roads, metal roofing, and limited tree cover create localized heat buildup similar to a mild urban heat island effect
Open farms and agricultural zones (tea farms, mixed farms)	Moderate	Workers spend long hours outdoors under direct sunlight, although surrounding vegetation slightly moderates temperatures
Vegetated areas (tea plantations, woodlots, riparian zones)	Low to Moderate	Vegetation provides natural shading and cooling through evapotranspiration, creating a cooler microclimate
Valley bottoms and river corridors	Low	Presence of rivers, wetlands, and dense vegetation helps regulate temperatures and maintain cooler and more humid microclimates

5.6 Conclusion

Table 34:Key Findings

Climate Risk	Description	Population at Risk	Trends
Flooding	Riparian zones, poorly drained urban areas, and river corridors are most affected.	~25,000–30,000	Residents along riparian zones, poorly drained neighborhoods, and areas near Kimugul and Timbilil rivers. Schools, markets, and low-lying settlements are also vulnerable.
Water Stress (Drought)	Short dry spells can reduce water availability, particularly in peri-urban and agricultural zones with limited water storage.	~15,000–20,000	Small-scale farmers, tea estate workers, and peri-urban households relying on rain-fed water sources are most affected. Overall risk is relatively low due to high rainfall.
Storms (Strong Winds / Severe Weather)	Urban and peri-urban infrastructure, light roofing, and trees exposed to wind gusts during heavy rains.	~10,000–12,000	Households with iron-sheet roofs, kiosks, small businesses, and roadside trees are most affected. Incidents often coincide with intense rainfall.
Heat Stress	Localized heat in urban centers affects residents and outdoor laborers; vegetated zones experience lower stress.	~30,000–35,000	Outdoor workers (tea farm laborers, market vendors, boda-boda riders), school children, and elderly populations are most exposed. Heat stress is generally moderate compared to lowland regions.

5.5 Summary of climate risks affecting urban elements for Kericho Municipality

Category	Current	Mid-term (2050)	Long-term (2100)
Infrastructure & Services			
Stormwater Drainage	Limited localized flooding in riparian zones	Urban Floods during intense rainfall	Urban Floods and drainage system stress
Water & Wastewater Management	Adequate under current rainfall	Localized water stress during dry spells	Water stress and storm impacts
Solid Waste Management	Mostly functional	Localized disruptions from storms	Storm impacts on waste collection and disposal
Transport and Mobility	Minor disruptions in rainy season	Urban Flooding and storm-induced road damage	Floods and storms affecting key transport routes
Energy	Stable supply	Local outages during floods, water stress affecting hydropower & storms	Floods, storms, and water stress impacting energy infrastructure
Economic Infrastructure	Generally stable	Local disruptions from water stress and storms	Water stress and storm impacts on businesses and markets
Social Infrastructure	Functional	Water stress affecting schools and health facilities	Water stress and storm impacts on social services
Emergency Services	Operational	Increased demand due to water stress and storms	Water stress and storm impacts on emergency response
Populations			
Urban Residents	Generally safe	Storms and water stress affecting urban neighborhoods	Storms and water stress

Informal Settlement Residents	Some flood-prone areas	Water stress and localized flooding	Water stress and storm impacts
Vulnerable and Marginalized Groups	Generally low risk	Water stress impacts on livelihoods	Water stress and storm vulnerability
Natural Assets			
Urban Green Infrastructure	Healthy coverage	Water stress affecting vegetation	Water stress and storms affecting green spaces
Urban Blue Infrastructure	Rivers, wetlands functional	Water stress affecting water bodies	Water stress and storm impacts on rivers, wetlands
Peri-urban and Agricultural Systems	Productive due to reliable rainfall	Water stress during dry spells	Water stress and storms affecting crops and tea estates

5.7 Climate Adaptation and Resilience Solutions

Table 35:Climate adaptation and resilience solutions recommended for Kericho Municipality

Category	Immediate	Mid-term	Long-term
Infrastructure & Services			
Stormwater Drainage	Develop a Municipal Stormwater Master Plan for Kericho town and surrounding wards. Routine maintenance and clearing of drains before and after rainy seasons.	Implement the Master Plan using climate projections and drainage mapping to direct stormwater away from vulnerable urban areas and valleys. Install urban green infrastructure (vegetated swales, permeable pavements, retention basins) to reduce runoff.	Monitor rainfall patterns and climate data to adjust drainage capacity and maintenance schedules. Engage residents and ward climate committees to report blocked drains and flood hotspots as part of participatory resilience.

Category	Immediate	Mid-term	Long-term
Water & Wastewater Management	Rehabilitate aging water and sewer infrastructure. Support water user associations to monitor supply, prevent conflicts, and manage water sources. Promote renewable energy in water pumping where feasible.	Expand sewer networks and improve effluent treatment within Kericho town. Promote decentralized sanitation solutions (community blocks, septic systems) where central sewerage is not available.	Invest in hydrological and climate monitoring (rainfall, river levels, groundwater trends).Develop emergency water distribution plans for dry spells or supply disruptions.
Solid Waste Management	Adopt a Municipal Solid Waste Management Policy. Promote recycling chains for plastics, metals, glass, paper. Ensure waste trucks and equipment operate efficiently.	Mandate waste segregation at source. Expand professional refuse collection to all municipal zones, including markets, schools, and residential areas.	Integrate waste management into climate risk dashboards. Continuous public education campaigns on climate-sensitive waste management, recycling, and composting.

Category	Immediate	Mid-term	Long-term
Transport and Mobility	Climate-proof new and rehabilitated roads. Prioritize maintenance of flood-prone sections. Plant shade trees and landscaping along walkways to reduce urban heat stress.	Expand Non-Motorised Transport (NMT) infrastructure. Protect road reserves, drainage corridors, and NMT spaces from encroachment.	Improve traffic management, designated stages for boda-bodas and public transport to reduce congestion and emissions. Leverage county budgets, national programmes (KUSP, FLLoCA), and development partners.
Energy	Promote clean and renewable energy to reduce reliance on fossil fuels and enhance resilience.	Transition to renewable sources such as solar, small-scale wind, and decentralized generation.	Develop smart grids and decentralized electricity systems; provide incentives and tariffs to support renewable energy adoption.
Economic Infrastructure	Integrate resilience into roads, markets, and business premises to mitigate flood and drought risk.	Ensure mobility during climate extremes through improved transport infrastructure.	Enhance ecosystem resilience through tree planting and green infrastructure supporting local businesses and livelihoods.

Category	Immediate	Mid-term	Long-term
Social Infrastructure	Expand piped water and community standpipes to reduce vulnerability to drought and waterborne diseases.	Improve water supply, sewer systems, hospital supplies, and maternal care to increase resilience to climate-linked health shocks.	Implement climate education programs, school clubs, and integrate climate resilience into urban social service delivery.
Emergency Services	Streamline municipal flood preparedness plans and train local volunteer teams.	Integrate early warning systems using drought/flood data. Include climate adaptation planning in water, sanitation, and health sectors.	Mainstream Disaster Risk Reduction (DRR) policies across municipal departments and services.
Populations			
Urban Residents	Community clean-ups and sanitation campaigns. Access to basic water and sanitation services.	Participatory planning to influence municipal climate and hygiene standards. Urban resilience initiatives, including green spaces and preparedness systems.	Climate education and awareness programs targeting youth and community members.
Informal Settlement Residents	Provide clean water points, toilets, and waste management to reduce disease risk during climate extremes.	Clearing drains and implementing local flood mitigation measures.	Training on climate impacts and adaptive responses to empower residents.

Category	Immediate	Mid-term	Long-term
Vulnerable and Marginalized Groups	Targeted support for women and female-headed households via climate-smart agriculture and awareness programs.	Support children via school climate clubs and tailored awareness programs.	Participatory climate planning for marginalized households; support inclusion and adaptive livelihoods.
Natural Assets			
Urban Green Infrastructure	Expand tree cover for shade, carbon sequestration, and improved air quality.	Develop parks and recreational spaces to support biodiversity and public health.	Establish buffer zones around streams and wetlands to protect ecosystems and water quality.
Urban Blue Infrastructure	Expand climate-resilient water delivery and wastewater services. Structured stormwater drainage to reduce flooding.	Support conservation of wetlands and water catchments. Promote rainwater harvesting and decentralized water systems.	Align blue infrastructure investments with county climate plans to ensure resilient water access and disease prevention.
Peri-urban and Agricultural Systems	Promote drought-tolerant crops, climate-smart agriculture (CSA) practices to improve yields under erratic weather.	Use soil cover, minimum tillage, and certified seeds to improve soil health and moisture retention.	Link farms to value chains and processing centers to strengthen market access, income, and long-term agricultural resilience.

6.0 CONCLUSION

Toward Enduring Climate-Resilient Urban Transformation in Kericho Municipality

This Urban Climate Risk Profile provides a systematic assessment of climate-related risks affecting Kericho Municipality. The analysis shows that hazards such as intense rainfall and localized flooding interact with urban growth patterns, drainage systems, settlement distribution, and governance structures to determine the level of risk. Because these risks are largely shaped by urban systems, they can be reduced through improved planning, infrastructure development, and coordinated governance.

The assessment highlights that climate resilience cannot be achieved through isolated actions. Effective risk reduction requires integrated approaches that combine improved drainage, sound spatial planning, infrastructure investment, and stronger institutional enforcement. Climate resilience must therefore be treated as a central principle of urban governance rather than a single-sector responsibility.

The findings also show that climate vulnerability is unevenly distributed, with lower-income communities and informal settlements facing the greatest risks. Addressing these inequalities is essential for achieving inclusive and sustainable urban development.

The report proposes a phased resilience pathway. Short-term actions focus on addressing high-risk hotspots and infrastructure gaps. Medium-term measures strengthen planning systems and promote green infrastructure, while long-term strategies integrate climate considerations into governance, planning, and budgeting processes.

Building climate resilience will also strengthen Kericho's economic stability by protecting infrastructure, improving fiscal predictability, and supporting sustainable development. Achieving this transformation will depend on strong institutions, clear policies, transparent data systems, and consistent implementation.

With sustained commitment, Kericho Municipality can move from reactive risk management to proactive climate resilience, safeguarding its communities and positioning itself as a model for climate-responsive secondary cities.

Table 36: List of Annexes

Annex No.	Title	Description / Content
Annex 1	Stakeholder Mapping Tables	Detailed tables showing municipal, county, NGO, and community stakeholders with influence and interest levels (from Chapter 1).
Annex 2	Historical Climate and Rainfall Data	Raw rainfall, temperature, and extreme event records (2000–2025) used for hazard modeling.
Annex 3	Ward-Level Hazard, Exposure, and Vulnerability Scores	Comprehensive dataset used for integrated risk scoring (Chapter 7), including individual indices.
Annex 4	Drainage and Infrastructure Inventory	Full list of culverts, stormwater channels, bridges, and critical facilities with location, capacity, and condition.
Annex 5	GIS Maps and Spatial Analysis Outputs	High-resolution hazard maps, exposure maps, vulnerability maps, integrated risk maps, slope gradient maps, and land-use overlays.
Annex 6	Socio-Economic Survey Data	Raw and processed data from household and business surveys on income, occupation, housing type, and adaptive capacity.
Annex 7	Informal Settlement Profiles	Ward-by-ward description of informal settlements, population density, structural fragility, and adaptive constraints.
Annex 8	Technical Methodology	Detailed explanation of modeling approaches, risk index calculations, weighting schemes, and data sources.
Annex 9	Adaptation Investment Cost Estimates	Detailed cost tables for drainage rehabilitation, settlement upgrading, green infrastructure, and fiscal planning instruments (Chapter 8).

Annex 10	Legal and Policy Alignment Reference Tables	Mapping of municipal bylaws, county regulations, and national legislation relevant to climate resilience (Chapter 9).
Annex 11	Monitoring and Evaluation Indicators	Full list of metrics, their measurement methodology, and ward-level targets for tracking resilience implementation.
Annex 12	Public Engagement Records	Minutes, attendance, and feedback summaries from community workshops, ward forums, and stakeholder consultations.
Annex 13	Scenario and Sensitivity Analysis Outputs	Data from alternative climate scenarios and nonlinear risk amplification sensitivity testing (Chapter 7–10).
Annex 14	References for Data Sources and Modeling Tools	URLs, datasets, and software packages used for GIS, hydrological modeling, and statistical analysis.

6.1 INSTITUTIONAL AND GOVERNANCE FRAMEWORK

Table 37:Climate Resilience Institutional Roles and Coordination

Entity/Unit	Core Responsibility	Reporting Line	Coordination Mechanism
Climate Resilience Directorate	Update risk assessments, oversee adaptation sequencing	Municipal Manager and Board	Inter-departmental meetings, quarterly reports
Planning Department	Integrate hazard mapping into zoning & permits	Director, Planning	GIS monitoring system & approval workflows
Public Works / Engineering	Design and maintain drainage & green infrastructure	Director, Public Works	Monthly project review with directorate
Finance Department	Budget tagging, resilience fund management	Municipal Accountant	Climate budget dashboard, quarterly audit
Health Department	Post-disaster health monitoring & disease surveillance	Director, Health	Early warning coordination & rapid response
Community & Ward Committees	Public engagement, local risk reporting	Sub county Admin	Sub County resilience forums, SMS alerts
County & National Agencies	Meteorological forecasting, disaster response support	County Disaster Office / National Disaster Unit	Data sharing, joint planning workshops

Notes: Institutional coherence reduces fragmentation and ensures vertical integration with county and national climate resilience efforts.

REFERENCES / BIBLIOGRAPHY

1. Government and Institutional Reports

Kenya National Bureau of Statistics (KNBS). *Kenya Population and Housing Census 2019*. Nairobi: KNBS, 2019.

Ministry of Environment and Forestry, Kenya. *National Climate Change Action Plan 2023–2027*. Nairobi: Government of Kenya, 2023.

County Government of Kericho. *Kericho County Spatial Plan 2020–2030*. Kericho: County Government, 2020.

National Disaster Management Authority (NDMA). *Flood Hazard and Risk Assessment Guidelines*. Nairobi: NDMA, 2021.

Kericho Municipality. *Municipal Infrastructure Inventory and Maintenance Report 2022*. Kericho: Municipal Engineering Office, 2022.

2. International Guidelines and Frameworks

Intergovernmental Panel on Climate Change (IPCC). *Climate Change 2023: Impacts, Adaptation and Vulnerability*. Cambridge: Cambridge University Press, 2023.

United Nations Office for Disaster Risk Reduction (UNDRR). *Global Assessment Report on Disaster Risk Reduction 2022*. Geneva: UNDRR, 2022.

World Bank. *Urban Climate Resilience Toolkit for Secondary Cities*. Washington DC: World Bank Group, 2021.

United Nations Human Settlements Programme (UN-Habitat). *Climate Change and Urban Vulnerability in Africa*. Nairobi: UN-Habitat, 2020.

3. Academic Literature

Adger, W. N. (2006). "Vulnerability." *Global Environmental Change*, 16(3), 268–281.

Cutter, S. L., Boruff, B. J., & Shirley, W. L. (2003). "Social Vulnerability to Environmental Hazards." *Social Science Quarterly*, 84(2), 242–261.

Ouma, G., & Tateishi, R. (2014). "Urban Flood Risk Mapping Using Remote Sensing Data in Kenya." *Natural Hazards*, 70, 1215–1233.

Mutiso, G., & Mwangi, H. (2020). "Informal Settlements and Urban Flood Risk in Secondary Cities of Kenya." *African Journal of Urban Studies*, 5(1), 45–62.

4. Technical and Data Sources

Kenya Meteorological Department. *Rainfall and Hydrological Data for Kericho County, 2000–2023*. Nairobi: KMD, 2023.

Digital Elevation Models (DEM) and Land Use/Land Cover Datasets, sourced from USGS Earth Explorer, 2022.

Satellite Imagery: Sentinel-2 and Landsat 8, 2019–2022, European Space Agency.

OpenStreetMap contributors. *Kericho Municipality Infrastructure Layers*. 2023.

5. Policy, Legal, and Regulatory References

Environmental Management and Coordination Act (EMCA), Cap 387, Laws of Kenya, revised 2020.

Physical and Land Use Planning Act, Cap 286, Laws of Kenya, revised 2020.

Disaster Risk Management Policy, Government of Kenya, 2019.

County Government Act, 2012, Laws of Kenya.

6. Online and Digital Resources

World Resources Institute (WRI). *Aqueduct Flood Risk Mapping Tool*. https://www.wri.org/aqueduct

Climate Data Portal, Kenya Meteorological Department. https://www.kmd.go.ke

UNDRR Risk Information Tools. https://www.undrr.org/risk-information-tools