REPUBLIC OF KENYA

COUNTY GOVERNMENT OF NYAMIRA

URBAN CLIMATE RISK PROFILE

NYAMIRA MUNICIPALITY

2026

Prepared by:

	Name	Department
1	Morara Mokua	Lands, Housing, Municipality & Physical Planning-Municipality
2	Morris Abere	Lands, Housing, Municipality & Physical Planning-Municipality
3	Paul Omanwa	Lands, Housing, Municipality & Physical Planning-Municipality
4		Lands, Housing, Municipality & Physical Planning-Municipality
5	Elizabeth Agwata	Department of Environment, Water, Energy, Mining, Natural Resources and Climate change-directorate of Environment and natural resources
6	Isaac Mainye	Department of Environment, Water, Energy, Mining, Natural Resources and Climate change-directorate of Environment and natural resources
7	Jacob Keror	Agriculture, Livestock and Fisheries
8	Teddy Kiage	Finance, ICT and planning-directorate of Economic Planning
9	Protus Musawa	National Environment Management Authority (NEMA)
10	Douglas mbura	Department of Environment, Water, Energy, Mining, Natural Resources and Climate change –directorate of Water services
11	Vinicah Mobisa	Department of Environment, Water, Energy, Mining, Natural Resources and Climate change-directorate of Environment and natural resources
12	Henry Sese	Kenya Meteorological Department
13	Morris Abere	Lands, Housing, Municipality & Physical Planning-Municipality
14	Alex Nyachae	Department of Environment, Water, Energy, Mining, Natural Resources and Climate change-directorate of Climate Change
15	Maira Joseph	Department of Environment, Water, Energy, Mining, Natural Resources and Climate change-directorate of Climate Change

Foreword

Climate change presents a direct and ever-increasing risk to Kenya's development trajectory and to the realization of national aspirations under Kenya Vision 2030. At the local level, municipalities such as Nyamira are already experiencing the tangible effects of a changing climate. Irregular rainfall patterns, prolonged dry spells, flash floods, landslides, and rising temperatures are increasingly disrupting livelihoods, infrastructure systems, public health, and economic productivity. Nyamira Municipality, as a devolved urban centre within Nyamira County, faces distinct climate vulnerabilities shaped by its topography, settlement patterns, infrastructure deficits, and reliance on climate-sensitive sectors such as small-scale agriculture, trade, and informal enterprise. Rapid urbanization, encroachment on riparian corridors, inadequate stormwater drainage, and limited solid waste management capacity further amplify exposure to climate risks.

Recognizing these realities, the Municipality has undertaken an Urban Climate Risk Assessment to systematically identify and analyze climate hazards, exposure patterns, and sectoral vulnerabilities across its administrative areas. This process has placed communities, local leaders, technical officers, and sector stakeholders at the centre of climate risk identification and prioritization. This assessment provides a founded and credible understanding of Nyamira's urban systems by drawing on both scientific evidence and local knowledge. This assessment underscores the urgent need to climate-proof municipal development. This includes strengthening urban infrastructure, enhancing ecosystem protection, improving land use management, safeguarding water resources, and integrating risk-informed planning into investment decisions. It also highlights the importance of building adaptive capacity at household, community, and institutional levels, particularly among vulnerable groups.

This climate profile builds upon the broader legislative and policy framework established under Climate Change Act 2016, and county-level instruments, including the Nyamira County Integrated Development Plan 2022-2027. These frameworks affirm the responsibility of local governments to mainstream climate risk management into development processes and to empower communities to participate meaningfully in decision-making.

I encourage all stakeholders, residents, the private sector, civil society, development partners, and technical institutions, to actively engage in implementing the recommendations of this profile. Climate resilience is a shared responsibility. Through collective action, sound planning, and sustained commitment, Nyamira Municipality can transition toward a greener, safer, and more resilient urban future.

Hon. Amos Kimwomi Nyaribo.

Governor Nyamira County

NYAMIRA MUNICIPAL MANAGER
COUNTY GOVERNMENT OF NYAMIRA
LAND, HOUSING & URBAN DEVELOPMENT
P. O. Box 434 - 40500 NYAMIRA

Executive Summary

The rapid climate risk assessment for Nyamira Municipality was conducted to identify and evaluate key climate-related hazards affecting the area, assess the level of exposure and vulnerability of communities and infrastructure, and determine the overall risk levels. The assessment aimed to support informed decision-making and guide the integration of climate adaptation and resilience measures into local planning and development processes.

The assessment identified five primary climate hazards affecting Nyamira Municipality: extreme heat, changes in precipitation patterns, pluvial flooding, drought, and hailstorms. These hazards were selected based on historical climate observations, community feedback, and projected climate trends. Overall, the findings indicate that most risks fall within the low to moderate range, suggesting manageable but important climate-related challenges that require proactive planning to prevent escalation in the future.

Extreme heat was identified as a moderate risk, particularly affecting vulnerable populations such as the elderly, children, and outdoor workers. Increasing temperatures may lead to heat stress, reduced agricultural productivity, and increased demand for water. However, the presence of vegetation cover and relatively moderate baseline temperatures reduces overall exposure.

Changes in precipitation patterns were assessed as a moderate risk, with rainfall becoming more unpredictable in terms of timing and intensity. This variability has implications for agriculture, water availability, and soil stability, but current adaptive practices such as mixed farming and local water sources help reduce vulnerability.

Pluvial flooding was classified as a low to moderate risk, mainly occurring in poorly drained or low-lying urban areas during intense rainfall events. While localized flooding can disrupt transport and damage property, the limited extent of highly impervious surfaces reduces widespread flood risk.

Drought was assessed as a moderate risk due to its potential to affect water supply, agriculture, and livelihoods during prolonged dry periods. Although Nyamira generally receives adequate rainfall, seasonal dry spells and environmental degradation of water catchments increase vulnerability.

Hailstorms were identified as a low risk hazard due to their relatively infrequent occurrence and localized impacts. However, hailstorms can occasionally damage crops, roofing materials, and vegetation, particularly in exposed areas.

Key takeaways from the assessment highlight the importance of strengthening climate resilience through practical and locally appropriate measures. Priority actions include improving stormwater drainage to reduce pluvial flooding, protecting water sources and promoting water harvesting to address drought risks, increasing tree planting and green infrastructure to reduce heat exposure, and promoting

climate-smart agriculture to cope with rainfall variability. Strengthening early warning systems and community awareness can further reduce vulnerability to extreme weather events such as hailstorms.

Overall, while climate risks in Nyamira Municipality are currently assessed as mostly low to moderate, proactive adaptation measures will be essential to prevent future escalation and to support sustainable urban and rural development.

Table 1: Summary of Extreme heat risks for Nyamira Municipality

	Time Horizon & Climate Scenario	Current	2050 SSP2-4.5	2050 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5
	Hazard Level					
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	Low	Low	Low	Low	Low	Low
Water & Wastewater Management	Low	Low	Low	Low	Low	Low
Solid Waste Management	Low	Low	Low	Low	Low	Low
Transport and Mobility	Low	Low	Low	Low	Low	Low
Energy	Low	Low	Low	Low	Low	Low
Economic Infrastructure	Low	Low	Low	Low	Low	Low
Social Infrastructure	Low	Low	Low	Low	Low	Low
Emergency Services	Low	Low	Low	Low	Low	Low
Populations	Low					
Urban Residents	Low	Low	Low	Low	Low	Low
Informal Settlement Residents	Low	Moderate	Moderate	Moderate	Moderate	Moderate
Vulnerable and Marginalized Groups	Low	Moderate	Moderate	Moderate	Moderate	Moderate
Natural Assets	Low					
Urban Green Infrastructure	Low	Low	Low	Low	Low	Low
Peri-urban and Agricultural Systems	Low	Low	Low	Low	Low	Low

Table 2:Summary of Change in Precipitation risks for Nyamira Municipality

	Time Horizon & Climate Scenario	Current	2050 SSP2-4.5	2050 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5
	Hazard Level					
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	Low	Low	Low	Low	Moderate	Moderate
Water & Wastewater Management	Low	Low	Low	Low	Moderate	Moderate
Solid Waste Management					Moderate	Moderate
Transport and Mobility	Low	Low	Low	Low	Moderate	Moderate
Energy	Low	Low	Low	Low	Moderate	Moderate
Economic Infrastructure	Low	Low	Low	Low	Moderate	Moderate
Social Infrastructure	Low	Low	Low	Low	Moderate	Moderate
Emergency Services	Low	Low	Low	Low	Moderate	Moderate
Populations						
Urban Residents	Low	Low	Low	Low	Moderate	Moderate
Informal Settlement Residents	Low	Low	Low	Low	Moderate	Moderate
Vulnerable and Marginalized Groups	Low	Low	Low	Low	Moderate	Moderate
Natural Assets						
Urban Green Infrastructure	Low	Low	Low	Low	Moderate	Moderate
Peri-urban and Agricultural Systems	Low	Low	Low	Low	Moderate	Moderate

Table 3:Summary of Pluvial flooding risks for Nyamira Municipality

	Time Horizon & Climate Scenario	Current	2050 SSP2-4.5	2050 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5
	Hazard Level					
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	Low	Low	Low	Low	Low	Low
Water & Wastewater Management	Low	Low	Low	Low	Low	Low
Solid Waste Management	Low	Low	Low	Low	Low	Low
Transport and Mobility	Low	Low	Low	Low	Low	Low
Energy	Low	Low	Low	Low	Low	Low
Economic Infrastructure	Low	Low	Low	Low	Low	Low
Social Infrastructure	Low	Low	Low	Low	Low	Low
Emergency Services	Low	Low	Low	Low	Low	Low
Populations						
Urban Residents	Low	Low	Moderate	Moderate	Moderate	Moderate
Informal Settlement Residents	Low	Low	Moderate	Moderate	Moderate	Moderate
Vulnerable and Marginalized Groups	Low	Low	Moderate	Moderate	Moderate	Moderate
Natural Assets						
Urban Green Infrastructure	Low	Low	Moderate	Moderate	Moderate	Moderate
Peri-urban and Agricultural Systems	Low	Low	Moderate	Moderate	Moderate	Moderate

Table 4:Summary of Drought risks for Nyamira Municipality

	Time Horizon & Climate Scenario	Current	2050 SSP2-4.5	2050 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5
	Hazard Level					
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	Low	Low	Low	Low	Medium	Medium
Water & Wastewater Management	Low	Low	Low	Low	Medium	Medium
Solid Waste Management	Low	Low	Low	Low	Medium	Medium
Transport and Mobility	Low	Low	Low	Low	Medium	Medium
Energy	Low	Low	Low	Low	Medium	Medium

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

Table 5:Summary of Hailstorms risks for Nyamira Municipality

	Time Horizon & Climate Scenario	Current	2050 SSP2-4.5	2050 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5
	Hazard Level					
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	Low	Low	Low	Low	Low	Low
Water & Wastewater Management	Low	Low	Low	Low	Low	Low
Solid Waste Management	Low	Low	Low	Low	Low	Low
Transport and Mobility	Low	Low	Low	Low	Low	Low
Energy	Low	Low	Low	Low	Low	Low
Economic Infrastructure	Low	Low	Low	Low	Low	Low
Social Infrastructure	Low	Low	Low	Low	Low	Low
Emergency Services	Low	Low	Low	Low	Low	Low
Populations						
Urban Residents	Low	Low	Low	Low	Low	Low
Informal Settlement Residents	Low	Low	Low	Low	Low	Low
Vulnerable and Marginalized Groups	Low	Low	Low	Low	Low	Low
Natural Assets						
Urban Green Infrastructure	Low	Low	Low	Low	Low	Low
Peri-urban and Agricultural Systems	Low	Low	Low	Low	Low	Low

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1. Context

1.1. Objective

This Urban Climate Risk Profile aims to provide an evidence-based assessment of current and projected climate risks affecting Nyamira Municipality and to establish a structured foundation for climate-informed urban planning and investment. Specifically, the profile seeks to:

- Identify and characterize key climate hazards affecting the municipality
- Assess exposure, sensitivity, and adaptive capacity across critical sectors, infrastructure systems, and population groups
- Analyze spatial patterns of vulnerability within the municipal boundary
- Inform the integration of climate risk considerations into the Integrated Development Plan (IDP), sector plans, and budgeting processes; and
- Guide the preparation of a prioritized Climate Change Action Plan and Adaptation Plan aligned with national and county policy frameworks.

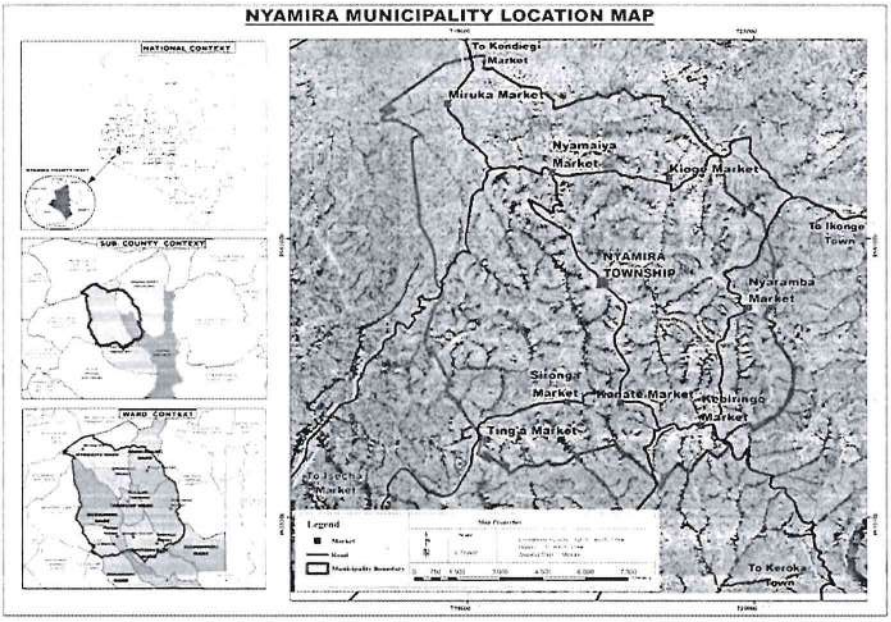
The profile operationalizes Kenya's obligations under the Climate Change Act and supports the implementation of the National Climate Change Action Plan and the National Adaptation Plan at the municipal scale.

1.2. Urban Context

1.2.1. Geographic area

Nyamira County is one of the Forty-Seven (47) Counties in Kenya. The County borders Homabay County to the North, Kisii County to the West, Bomet County to the East, Narok to the South and Kericho County to the Northeast. Nyamira County lies between Latitude 00 30'and 00 45'South and between Longitude 34 00'East and covers an approximate area of

899.4 Km. Nyamira Municipality is one of the municipalities established across the 47 counties in Kenya under the provision of Urban Areas and Cities Act, 2011 (amended 2019). The municipality covers sections of Borabu, Nyamira North and Nyamira South Sub-Counties. The Municipality covers an approximate area of 155 km^2



1.2.2. Governance Structure

Nyamira Municipality operates within Kenya's devolved system of governance established under the Constitution of 2010, which assigns planning, service delivery, and local development functions to county governments while providing for the establishment of urban management entities. The Municipality is administered by a Municipal Board constituted in accordance with the Urban Areas and Cities Act. The Board provides oversight on urban governance, strategic direction, budgeting priorities, and service delivery within the designated municipal boundary.

The Municipality functions under the County Government of Nyamira County, which retains overall legislative and executive authority. The County Executive Committee Member responsible for Lands, Physical Planning, Urban Development, Environment, and related portfolios provides policy oversight, while technical implementation is undertaken through relevant county departments.

Climate governance within the municipality is guided by the Climate Change Act at the national level and domesticated through the Nyamira County Climate Change Act and the Nyamira County Climate Change Policy. These instruments establish institutional mechanisms for coordinating climate action, mainstreaming climate considerations into sector planning, and mobilizing climate finance.

Key institutional structures relevant to the Urban Climate Risk Profile include:

- County Department of Environment and Climate Change: Provides technical leadership on adaptation and mitigation planning, environmental management, and climate finance coordination. It also Coordinates implementation of climate-related programmes, reporting, and stakeholder engagement.

- County Department of Finance and Economic Planning: Leads preparation and review of the County Integrated Development Plan (CIDP), Annual Development Plans, and sectoral strategies into which climate risks must be integrated.
- Municipal technical departments (e.g., physical planning, engineering, public health, water, and environment): Responsible for sector-specific data provision, infrastructure planning, and implementation of resilience measures.
- Ward-level planning structures: Facilitate community participation and bottom-up identification of priorities, particularly for climate-related investments.

The governance framework is therefore multi-tiered, combining municipal oversight, county-level policy direction, and community participation mechanisms. The preparation of the Urban Climate Risk Profile is embedded within this structure to ensure institutional ownership, integration into statutory planning instruments, and alignment with budgeting and implementation processes.

1.2.3. Socio-economic Context

Nyamira Municipality reflects the broader demographic structure of Nyamira County, characterized by a predominantly young population with significant implications for service delivery, employment creation, and long-term urban planning. Approximately half of the population falls within the 0–19 age bracket (50.6 percent), while the youthful cohort aged 20–34 accounts for about 21.7 percent, indicating a strong demographic momentum that will continue to shape labour market demand and social infrastructure needs. The youth population (15–34 years), estimated at 204,381 in 2020 and representing roughly one-third of the total population (33.3 percent), constitutes a critical productive segment but faces structural challenges including unemployment, skills gaps, early pregnancies, substance abuse, and vulnerability to HIV/AIDS. The working-age population (18–64 years) comprised 291,682 persons in 2019 (48.2 percent) and is projected to rise steadily to 332,841 by 2030, underscoring the urgency of expanding economic opportunities beyond subsistence agriculture, which currently absorbs the majority of the labour force. At the same time, dependents aged 0–18 and 65+ account for 55.7 percent of the population, creating sustained pressure on households and public resources. The elderly population (65 years and above), estimated at 30,721 in 2020 (5 percent), requires targeted health, social protection, and welfare interventions. These demographic characteristics highlight the need for diversified economic investment, skills development, youth empowerment initiatives, and inclusive social planning to ensure that the municipality's growing population becomes a driver of economic resilience rather than a source of socio-economic strain.

1.2.4. Economic Context

Nyamira Municipality has various economic activities that drive its economy. The main economic activities include; commerce, agriculture and informal trade (jua kali sector). Most of the commercial

activities are mainly concentrated at Nyamira Township and other Market Centres within the municipality. Nyamira Township being the core business and administrative centre has the bulk of the commercial activities within Nyamira municipality. List and categories of commercial activities within the municipality and urban centres.

Agriculture is one of the main economic activities due to the large rural hinterland in Nyamira Municipality. Agricultural activities entail both crop production and livestock keeping. Type of crops grown within the municipality:

- Main food crops; maize, finger millet, wheat beans, pulses, sweet potatoes etc.
- Main horticulture fruits and vegetables; avocados, bananas, pineapples, cabbages, kales, managu, saga, kunde, nderema, masosa, pumpkin leaves, spinach, tomatoes, onions (spike and bulb), coriander, bell pepper etc.
- Cash crops; tea and coffee

The cash crops are sold to different markets both local and international. Coffee is mainly sold to local millers while tea and pyrethrum majorly international companies. Tea processing is done mainly by KETEPA, coffee on other hand is handled by different millers including Sasini, Gusii union, Thika coffee millers and CMC millers. Most food crops are sold within the municipality and surplus sold to Kisumu, Nakuru, Eldoret and Nairobi. Nyamira Municipality is also endowed mining activities, which include, murram and bricks soil. Bricks are mainly made in Sironga while murram mining occurs mainly at Nyangoge. Both the bricks and murram are sold locally with about 50,000 bricks sold per month at a value of ksh 1,000,000 while murram is rated at about ksh 300,000 per month.

Projected economic growth will depend on infrastructure improvement, service expansion, and environmental stability. Without integrating climate resilience into urban investment decisions, economic gains may be undermined by recurrent climate shocks. Economic sector contributions, employment distribution, and projected growth trends should be presented in summary tables where data is available.

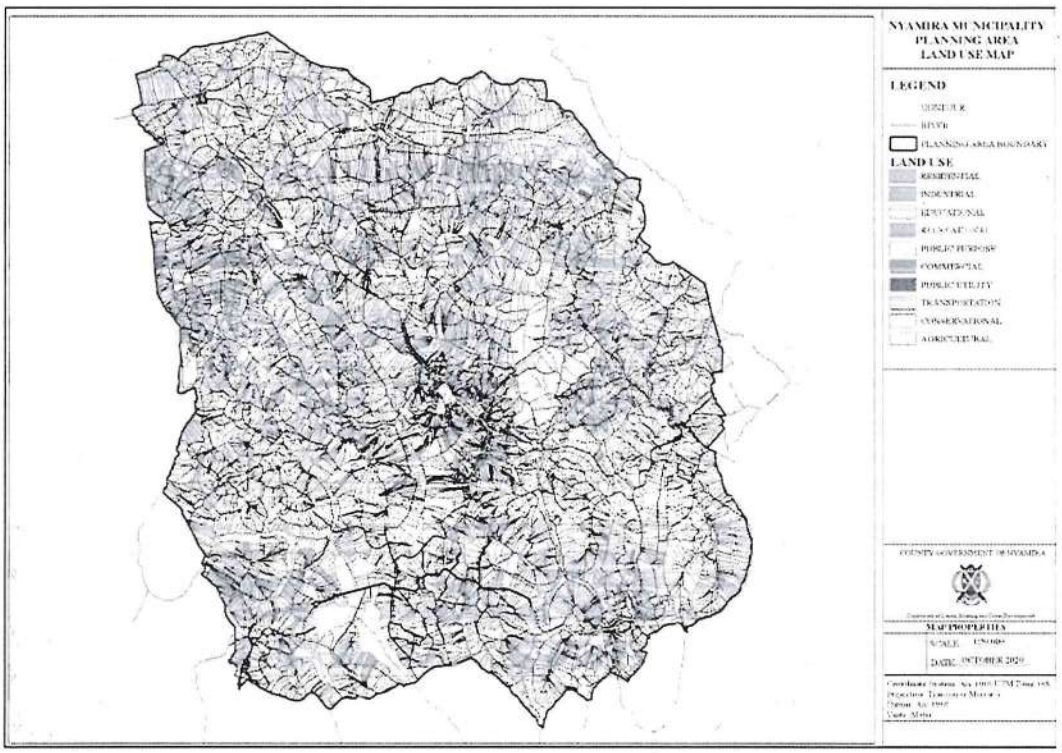
1.2.5. Land-use Context

About 85% of the land within the municipality is privately owned and the remaining 15% being public land. Most of the privately owned land is mainly used for agricultural activities within the municipality rural hinterland. Public land is mainly found within the Nyamira Township centres and public institutions.

There is an increased rate of urban population within most urban centres in the municipality. Nyamira Township being the Headquarter of the County Government of Nyamira and the National Government at the County level experiences a higher rate of urbanization. This has led to unplanned development

and continued urban sprawl mainly along major roads resulting in unharmonious urban development and land-use conflicts. The increased demand for commercial and residential activities is resulting in an unregulated land sub-division at the immediate Nyamira Township hinterland.

The main settlement pattern exhibited within Nyamira CBD is a linear development pattern along the major roads mainly for commercial activities. plate 21 below. However, a nucleated settlement pattern is also exhibited in some market centres.



1.3. Key Stakeholders & Inclusiveness

The aim of conducting a stakeholder analysis was to identify and engage key stakeholders at the County, Sub-county, and Ward levels who can contribute to and should be involved in the participatory climate risk assessment and climate action planning process. This includes representatives from marginalized groups and those who are particularly vulnerable to the impacts of climate change.

The identified all relevant stakeholders that fell within these four groups:

(i) Formally responsible for climate action and building resilience
(ii) Involved in climate action and responses to climate impacts
(iii) Knowledgeable and have expertise relevant to climate action and building resilience, including knowledge on the climate system and climate risks
(iv) Impacted by climate change.

The TWG later narrowed down the list to the most critical individuals and organizations that would take part in the workshop considering representation of ward committees, CBOs, women, youth, and persons with special needs. A list of 45-50 members of the technical working group was selected to lead the process at the community level. These members would be the lead facilitators during the PCRA.

The process undertook the wider engagement process at sub-county or ward level involving communities and other key local actors. The aim of this process was to ensure communities and other key local actors actively participate and have a strong voice in the participatory climate risk assessment and climate action planning process. Each ward was represented by between 10 to 15 members with inclusivity aspect considered. During the identification of the stakeholder the following sectors and types of stakeholders were considered: community based and grass roots organizations, civil society organizations, faith-based organizations/representatives, customary/traditional institutions, indigenous groups, local producer groups, local experts, community leaders and representatives (including traditional, spiritual and cultural), business groups and umbrella organizations, academia/research organizations, representatives of people living with disabilities youth groups, women groups, and traditionally marginalized and vulnerable groups.

Stakeholder	**Stakeholder expectations**	**Role climate risk management**
Nyamira Municipal Board	- Maintain integrity - High level performance - Effective delivery of services	- Oversight of climate-resilient urban planning - Approval of climate-informed infrastructure investments - Enforcement of development control to reduce flood and slope risks
County government of Nyamira	- Enhance access to county data and information - Provide technical support and resources needed by the municipality - Formulate policies and strategies	- Mainstream climate adaptation into CIDP and sector plans - Budget allocation for stormwater and resilience infrastructure - Strengthen inter-departmental coordination (planning, roads, water, environment)
Development partners	- Timely, efficient and cost-effective development Projects and programmes - Compliance with regulation and guidelines - Effectiveness, accountability and transparency - Timely, efficient and cost-effective development projects and programmes	- Provision of adequate and timely funding of projects and programmes - Effective collaboration - Technical assistance and capacity building

	- Compliance with regulation and guidelines - Effectiveness, accountability and transparency	
Public	- Clarity on the functions and mandate of the municipality - Access to information - Efficient and effective service delivery	- Adoption of household-level resilience measures - Avoid encroachment on drainage corridors - Participation in public consultations
National Government	- Coordination and implementation of government policies - Efficient and effective utilization of resources - Contribution to the realization of vision 2030 and Sustainable development goals - Generation and dissemination of appropriate data and information for development planning - Develop policies to address local issues and concerns - Coordination of government programmes	- Provide regulatory framework (climate policy, environmental law) - Climate data provision (e.g., meteorological services) - Technical oversight and co-financing of major infrastructure - Enforcement of riparian protection - Oversight of Environmental Impact Assessments - Prevention of development in environmentally sensitive areas - Protection of drainage corridors and water catchments - Regulation of riparian setbacks - Monitoring hydrological impacts of urbanisation
Nyamira Municipality Staff	- Provision of conducive working environment - Attractive terms and conditions of service - Availability and accessibility of accurate data and information - Involvement and participation in decisions by the municipality - Adequate resources to support work performance - Competency development Job security and career progression - Good working relations	- Technical implementation of risk reduction measures - Enforcement of development control - Data collection and monitoring of climate indicators
Political class	- Provide availability and access to Accurate data and information - Collaboration on development projects - Accountability, integrity and efficiency	- Approve budgets for climate adaptation - Provide political support for enforcement actions - Champion resilience projects at ward level

	- Equitable distribution of projects and programs	
Private sector	- Clarity on the role and functions of the municipality Access to data and information - Leadership in implementation of development projects in municipality - Effective collaboration in implementation and enforcement of policies	- Compliance with zoning and drainage standards - Incorporation of on-site stormwater retention - Investment in resilient commercial infrastructure
Media	- Collaboration in dissemination of data and information - Source of news	- Dissemination of early warnings - Public awareness on environmental compliance - Reporting on climate risk governance performance
Financial Institutions	- Risk mitigation - Stable investment environment	- Finance resilient infrastructure - Promote climate risk insurance products
Academic and Research Institutions	- Access to data - Research collaboration	- Provide climate modelling and risk analysis - Support evidence-based planning - Develop local adaptation innovations
Civil Society Organizations (CSOs) & CBOs	- Community empowerment - Transparency and accountability	- Community awareness of climate risks - Support participatory planning - Advocate for vulnerable groups

Stakeholder mapping for Nyamira Municipality

2. Hazard Assessment

The hazard assessment section identifies and describes the main climate-related hazards affecting Nyamira Municipality, focusing on their nature, occurrence, and potential impacts on the environment, infrastructure, and local communities. The assessment considers key hazards such as extreme heat, changes in precipitation patterns, pluvial flooding, drought, and hailstorms, which were identified through climate data, local observations, and stakeholder input. Understanding these hazards provides a foundation for evaluating exposure and vulnerability, and for determining the overall level of climate risk within the municipality.

2.1. Key Climate Hazards

Table 6:Hazard screening for Nyamira Municipality

Hazard	Hazard Likely (Y/N)	Significant Impact (Y/N)	High Priority (Y/N)	Key Hazard (Y/N)
Heat Stress				
Extreme heat	Y	Y	Y	Y
Flooding				
Changes in precipitation patterns	Y	Y	Y	Y
Pluvial (surface level) flooding, including flash flooding and urban flooding	Y	Y	Y	Y
Water Stress				
Drought (meteorological, hydrological)	Y	Y	Y	Y
Storms				
Hailstorms	Y	N	N	N
Mass Movement				
Landslides	Y	N	N	N

2.2. Climate Indicators and Hazard Thresholds

Table 7:Climate indicators and hazard thresholds selected for the assessment

Key Hazard	Climate indicator	Data source	Threshold		
			Low	Medium	High
Extreme heat	Number of days with heat index >35°C	Kenya - Climatology (ERA5) | Climate Change Knowledge Portal	Low		
Changes in precipitation patterns	Number of days with precipitation >50mm	Kenya - Climatology (ERA5) | Climate Change Knowledge Portal	Low		

Pluvial (surface level) flooding, including flash flooding and urban flooding	Number of days with precipitation >50mm	Kenya - Climatology (ERA5) | Climate Change Knowledge Portal	Low		
Drought (meteorological, hydrological)	SPEI Drought Index	SPEI database	Low		
Hailstorms	Number of days precipitation received.	Kenya - Climatology (ERA5) | Climate Change Knowledge Portal	Low		

2.3. Current Hazard Levels and Climate Projections

Table 8:Current and future hazards levels for Nyamira Municipality

	Hazard Level				
Hazard	**Current (Baseline)**	**2050 SSP2-4.5**	**2050 SSP5-8.5**	**2100 SSP2-4.5**	**2100 SSP5-8.5**
Extreme heat	Low	Low	Low	Low	Low
Changes in precipitation patterns	Low	Low	Low	Low	Low
Pluvial (surface level) flooding, including flash flooding and urban flooding	Low	Low	Low	Low	Low
Drought (meteorological, hydrological)	Low	Medium	Medium	Medium	Medium
Hailstorms	Low	Low	Low	Low	Low

For this Urban Climate Risk Profile, hazard levels should be interpreted in accordance with the table below.

Table 9: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

3. Exposure & Vulnerability Assessment

This section examines the extent to which people, infrastructure, services, and natural resources within Nyamira Municipality are exposed to identified climate hazards, as well as their capacity to cope with and adapt to these impacts. It considers the sensitivity of key sectors such as water, agriculture, infrastructure, and public health to hazards including extreme heat, changing precipitation patterns, pluvial flooding, drought, and hailstorms. The assessment also evaluates existing adaptive capacities, highlighting factors that either increase vulnerability or enhance resilience, and provides a basis for understanding the overall climate risk within the municipality.

3.1. Urban Elements

Table 10: Urban elements inventory

Category	Subcategory	Included in the RCRA (Y/N)	Available in GIS format (Y/N)	Description
Infrastructure & Services				
Stormwater Drainage	Stormwater drainage conveyance network	Y	N	Existing storm drains are old and not connected
	Stormwater storage	N	N	No existing network
Water & Wastewater Management	Pumping stations	Y	N	Existing structures
	Groundwater abstraction	Y	N	A number of existing boreholes within the municipality
	Water treatment facilities	Y	N	NYAWASSCO water treatment facility
	Water supply networks	Y	N	Existing water connection
	Sewer networks	N	N	No existing networks
	Wastewater treatment facilities	N	N	A majority of households within the municipality use onsite management systems
Solid Waste Management	Transfer facilities	Y	N	Approximately 5 collection points
	Landfills and dump sites	Y	N	Existing dumping site at Kebirigo
	Recycling centers	Y	N	10 recycling centres involved in plastic and metal recycling
	Collection fleet	Y	N	2 trucks, 3 tractors used in collection
Transport and Mobility	Road networks	Y	N	The Konate-Miruka highway managed by KENHA. The larger road network within the municipality is Murram road.
	Bridges	N	N	N/A
	Public transport networks (rail, bus, mini-bus, etc.)	Y	N	Bicycle, Motorcycle, Vehicle and Bus for public transport
	Transportation terminals	Y	N	Vehicle terminal station at the stage
	Vehicle depots	N	N	N/A

Category	Subcategory	Included in the RCRA (Y/N)	Available in GIS format (Y/N)	Description
	Non-motorized transport networks	Y	N	Close to 500m of walkway
	Freight and logistics hubs	N	N	N/A
Energy	Energy power plants	N	N	N/A
	Poles and power lines	Y	N	A number of powerlines and network cables.
	Transformers and substations	Y	N	A number of transformers have been set up within the municipality
	Streetlighting	Y	N	Existing solar powered and electricity street lights
Economic Infrastructure	Markets	Y	N	Existing markets affected by poor drainage
	Businesses and commercial hubs	Y	N	Existing business enterpises within the municipality
	Industrial zones/parks and logistics parks	Y	N	Up-coming industrial park at Sironga
Social Infrastructure	Government buildings and service centers	Y	N	National and County government offices, Key security agencies offices
	Education facilities	Y	N	Approximately 60 schools including Primary, Secondary and Colleges
	Healthcare facilities	Y	N	Nyamira county referral hospital and sub-county hospitals.
	Public spaces	Y	N	Existing space in Nyamira
	Faith-based buildings	Y	N	A number of interdenominational churches within the municipality
	Cultural and heritage assets	N	N	N/A
Emergency Services	Fire stations	Y	N	Existing fire station at Tente serves Township ward and the larger Nyamira County
	Police stations	Y	N	The Nyamira County Police headquarter and police posts in the periphery
	Telecommunications networks	Y	N	A number of telecommunication networks exist e.g Safaricom, Airtel and private service providers
	Early warning systems	N	N	N/A
	Disaster management centers and shelters	N	N	An existing site within the fire station at Tente
	Evacuation routes	N	N	N/A
Populations				
Urban Residents	Population	Y	N	Approximately 80,000 people served with the municipality
	Households	Y	N	Approximately 8000 households served with the municipality

Category	Subcategory	Included in the RCRA (Y/N)	Available in GIS format (Y/N)	Description
Informal Settlement Residents	Population living in informal settlements	Y	N	Existing informal settlement within Township ward
	Households lacking land tenure	N	N	N/A
	Households / residents lacking access to basic services	Y	N	A number of households lack access to the county water supply from NYAWASCO
Vulnerable and Marginalized Groups	Low-income households	Y	N	Projected populations are expected to rise with the prevailing economic conditions
	Women-headed households	Y	N	A number of women headed households could be considered vulnerable
	Children and youth	Y	N	N/A
	Elderly persons	Y	N	N/A
	People with disabilities (PWD)	Y	N	N/A
	Homeless populations	Y	N	N/A
	Unemployed or precariously employed workers	Y	N	N/A
	Seasonal workers / migrant laborers	N	N	N/A
	Nomadic groups in peri-urban areas	N	N	N/A
	Urban refugees and migrants	N	N	N/A
	Minority ethnic groups in urban areas	N	N	N/A
Natural Assets				
Urban Green Infrastructure	Urban parks and gardens	Y	N	Existing green garden within the county headquarters
	Green corridors	N	N	N/A
	Street landscaping	Y	N	N/A
	Urban forests and forest reserves	N	N	N/A
Urban Blue Infrastructure	Natural wetlands	Y	N	The Sironga Wetland
	Rivers	N	N	N/A
	Riparian zones	N	N	N/A
	Lakes, ponds and reservoirs	N	N	N/A
	Coastal ecosystems	N	N	N/A
	Urban agriculture	Y	N	Households practicing small holder agriculture
Peri-urban and Agricultural Systems	Peri-urban agriculture	Y	N	Households practicing small holder agriculture involving maize, vegetables and fodder production
	Agroforestry systems	N	N	N/A

Category	Subcategory	Included in the RCRA (Y/N)	Available in GIS format (Y/N)	Description
	Forests and forest reserves	Y	Y	Rangenyo forest within township ward
	Protected areas and national parks	N	N	N/A
	Savannahs and rangelands	N	N	N/A

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

For this Urban Climate Risk Profile, exposure and vulnerability levels should be interpreted in accordance with the table below.

Table 11: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, 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.

For this Urban Climate Risk Profile, the following matrix summarizes likely impacts on each urban element by combining the assigned exposure and vulnerability levels.

Table 12:Impact Matrix

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

Table 13:Exposure, Vulnerability, and Impacts of Extreme heat on Urban Elements

Hazard: Extreme heat

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Infrastructure & Services					
Stormwater Drainage	• Increased drying and cracking of drainage channels • Reduced runoff except during short intense storms	Low	**Sensitivity:** • Concrete cracking under prolonged heat • Reduced maintenance during dry periods… **Adaptive Capacity:** • Existing drainage network • Routine maintenance possible	Low	Low
Water & Wastewater Management	• Increased water demand during hot periods • Reduced water levels in sources	Moderate	**Sensitivity:** • •Dependence on surface water sources • Limited storage capacity… **Adaptive Capacity:** • Boreholes and springs available • Water rationing measures	Moderate	Moderate
Solid Waste Management	• Faster decomposition of organic waste • Odor generation from waste sit	Low	**Sensitivity:** • Open dumping practices • Limited waste collection frequency… **Adaptive Capacity:** • Existing collection system • Community clean-up programs	Low	Low
Transport and Mobility	• • Road surface weakening during hot days • Dust on unpaved roads	Low	**Sensitivity:** • Earth roads prone to dust • Limited road surfacing **Adaptive Capacity:** • Periodic road maintenance • Alternative routes available	Low	Low

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Energy	• Increased electricity demand for cooling • Overheating of transformers	Low	**Sensitivity:** • Limited grid coverage • Occasional outages **Adaptive Capacity:** • • Rural electrification • • Use of alternative energy (solar)	Low	Low
Economic Infrastructure	• Reduced productivity during hot hours • Heat stress in markets	Low	**Sensitivity:** • Open-air markets • • Informal businesses **Adaptive Capacity:** • Flexible working hours • Shaded stalls	Low	Low
Social Infrastructure	• Warmer classrooms and health facilities • Reduced comfort levels	Low	**Sensitivity:** • • Poor ventilation • • Overcrowding **Adaptive Capacity:** • Natural ventilation	Low	Low
Emergency Services	• Occasional heat-related illness cases • Increased response time during hot hours	Low	**Sensitivity:** • Limited emergency equipment • Few cooling facilities… **Adaptive Capacity:** • Health centers available • Community health workers	Low	Low
Populations					
Urban Residents	• Exposure to higher daytime temperatures • Heat discomfort indoors	Low	**Sensitivity:** • Iron sheet roofing • Limited cooling systems…	Low	Low

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
			Adaptive Capacity: • Access to water • Ability to modify houses…		
Informal Settlement Residents	• High indoor temperatures • Limited shaded areas	Moderate	**Sensitivity:** • Congested housing • Poor ventilation… **Adaptive Capacity:** • Community support • Informal adaptation measures	Moderate	Moderate
Vulnerable and Marginalized Groups	• • Heat stress among elderly and children • Dehydration risks… • …	Low	**Sensitivity:** • Pre-existing health conditions • Limited access to healthcare **Adaptive Capacity:** • Social support • Local clinics…	Moderate	Moderate
Natural Assets					
Urban Green Infrastructure	• Drying of vegetation • Reduced tree growth…	Low	**Sensitivity:** • Young trees vulnerable • Limited irrigation **Adaptive Capacity:** • Tree planting programs • Rain-fed systems	Low	Low
Peri-urban and Agricultural Systems	• • Crop moisture stress • • Reduced yields…	Low	**Sensitivity:** • Rain-fed agriculture • Poor soils… • …	Moderate	Moderate

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
			Adaptive Capacity: • Drought-tolerant crops • • Mulching practices • Irrigation		

Table 14:Exposure, Vulnerability, and Impacts of Changing Precipitation Patterns on Urban Elements

Hazard: Changing Precipitation Patterns

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Infrastructure & Services					
Stormwater Drainage	• Slight variation in rainfall intensity • Occasional minor runoff fluctuations	Low	**Sensitivity:** • Some blocked or undersized drains • Soil erosion around drainage lines **Adaptive Capacity:** • Existing drainage systems • Routine maintenance	Low	Low
Water & Wastewater Management	• Minor seasonal variation in water availability • Slight reduction in recharge of springs	Low	**Sensitivity**: • • Dependence on rainfall recharge • Limited water storage **Adaptive Capacity:** • Boreholes and springs • Rainwater harvesting	Moderate	Moderate
Solid Waste Management	• Occasional disruption of waste collection during rains • Minor waste scattering by runoff	Low	**Sensitivity** • Open dumping areas • Poor drainage near waste sites **Adaptive Capacity**: • Existing collection services • Community clean-ups	Low	Low

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Transport and Mobility	• Occasional slippery roads • Minor erosion on unpaved roads	Low	**Sensitivity:** • Earth roads prone to erosion • Limited stormwater control **Adaptive Capacity:** • Routine road grading • Community maintenance	Low	Low
Energy	• Minor disruptions from rainfall variability • Occasional damage to poles	Low	**Sensitivity:** • Overhead power lines • Limited backup systems **Adaptive Capacity:** • Maintenance programs • Alternative lighting sources	Low	Low
Economic Infrastructure	• Slight disruptions to markets during rainy periods • Reduced customer access	Low	**Sensitivity:** • Open-air markets • Poor drainage around shops **Adaptive Capacity:** • Temporary shelters • Flexible operations	Low	Low
Social Infrastructure	• Occasional rainwater intrusion • Damp conditions in buildings	Low	**Sensitivity:** • Poor roofing • Inadequate drainage … **Adaptive Capacity:** • Routine repairs • Existing buildings	Low	Low
Emergency Services	• Slight delays during rainy periods • Reduced accessibility in some areas	Low	**Sensitivity:** • Poor road conditions • Limited equipment **Adaptive Capacity:** • Available personnel • Local response systems …	Low	Low

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Populations					
Urban Residents	• Minor disruptions to daily activities • Occasional water shortage	Low	**Sensitivity:** • Dependence on rain-fed water sources • Limited storage… **Adaptive Capacity:** • Rainwater harvesting • Access to alternative sources	Low	Low
Informal Settlement Residents	• Occasional damp housing • Minor flooding in low areas	Low	**Sensitivity:** • Poor drainage • Temporary housing materials **Adaptive Capacity:** • Community coping mechanisms • Local drainage channels	Moderate	Moderate
Vulnerable and Marginalized Groups	• Slight reduction in water availability • Food insecurity risk … • …	Low	**Sensitivity:** • Limited income • Limited resource access **Adaptive Capacity:** • • Social support • • Relief programs	Moderate	Moderate
Natural Assets					
Urban Green Infrastructure	• Slight variation in plant growth • Minor moisture stress	Low	**Sensitivity:** • Young plants • Limited irrigation **Adaptive Capacity:** • Seasonal rainfall • Tree planting initiatives	Low	Low
Peri-urban and Agricultural Systems	• Slight changes in planting seasons • Minor yield variation	Low	**Sensitivity:** • Rain-fed agriculture • Limited irrigation	Moderate	Moderate

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
			Adaptive Capacity: • Crop diversification • Traditional knowledge		

Table 15:Exposure, Vulnerability, and Impacts of Pluvial flooding on Urban Elements

Hazard: Pluvial flooding

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Infrastructure & Services					
Stormwater Drainage	• Slight variation in rainfall intensity • Occasional minor runoff fluctuations		**Sensitivity:** • Some blocked or undersized drains • Soil erosion around drainage lines **Adaptive Capacity:** • Existing drainage systems • Routine maintenance	Low	Low
Water & Wastewater Management	• Minor seasonal variation in water availability • Slight reduction in recharge of springs		**Sensitivity:** • Dependence on rainfall recharge • Limited water storage **Adaptive Capacity:** • Boreholes and springs • Rainwater harvesting	Moderate	Moderate
Solid Waste Management	• Occasional disruption of waste collection during rains • Minor waste scattering by runoff		**Sensitivity:** • Open dumping areas • Poor drainage near waste sites … **Adaptive Capacity:** • Existing collection services • Community clean-ups	Low	Low
Transport and Mobility	• Occasional slippery roads • Minor erosion on unpaved roads		**Sensitivity:** • Earth roads prone to erosion • Limited stormwater control	Moderate	Moderate

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
			Adaptive Capacity: • Routine road grading • Community maintenance …		
Energy	• Minor disruptions from rainfall variability • Occasional damage to poles		**Sensitivity:** • Overhead power lines • Limited backup systems **Adaptive Capacity:** • Maintenance programs • Alternative lighting sources	Low	Low
Economic Infrastructure	• Slight disruptions to markets during rainy periods • Reduced customer access		**Sensitivity:** • Open-air markets • Poor drainage around shops **Adaptive Capacity:** • Temporary shelters • Flexible operations	Low	Low
Social Infrastructure	• Occasional rainwater intrusion • Damp conditions in buildings		**Sensitivity:** • Poor roofing • Inadequate drainage **Adaptive Capacity:** • Routine repairs • Existing buildings	Low	Low
Emergency Services	• Slight delays during rainy periods • Reduced accessibility in some areas		**Sensitivity:** • Poor road conditions • Limited equipment **Adaptive Capacity:** • Available personnel • Local response systems	Low	Low
Populations					

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Urban Residents	• Minor disruptions to daily activities • Occasional water shortages		**Sensitivity:** • Dependence on rain-fed water sources • Limited storage **Adaptive Capacity:** • Rainwater harvesting • Access to alternative sources	Low	Low
Informal Settlement Residents	• Occasional damp housing • Minor flooding in low areas		**Sensitivity:** • Poor drainage • Temporary housing materials … • … **Adaptive Capacity:** • Community coping mechanisms • Local drainage channels	Moderate	Moderate
Vulnerable and Marginalized Groups	• Slight reduction in water availability • Food insecurity risk		**Sensitivity:** • Limited income • Limited resource access … **Adaptive Capacity:** • Social support • Relief programs	Moderate	Moderate
Natural Assets					
Urban Green Infrastructure	• Slight variation in plant growth • Minor moisture stress		**Sensitivity:** • Young plants • Limited irrigation **Adaptive Capacity:** • Seasonal rainfall • Tree planting initiatives	Low	Low

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Peri-urban and Agricultural Systems	• Slight changes in planting seasons • Minor yield variation		**Sensitivity:** • Rain-fed agriculture • Limited irrigation **Adaptive Capacity:** • Crop diversification • Traditional knowledge	Moderate	Moderate

Table 16:Exposure, Vulnerability, and Impacts of Droughts on Urban Elements

Hazard: Drought

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Infrastructure & Services					
Stormwater Drainage	• Reduced surface runoff • Drying and cracking of drainage channels	Low	**Sensitivity:** • • Earthen drains prone to cracking • Limited maintenance … **Adaptive Capacity:** • Existing drainage layout • Periodic repairs	Low	Low
Water & Wastewater Management	• Reduced water levels in springs and boreholes • Increased demand for water	High	**Sensitivity:** • • Dependence on rain-fed sources • • Limited storage capacity **Adaptive Capacity:** • Boreholes available • Water rationing measures	High	High
Solid Waste Management	• Accumulation of waste due to limited water for cleaning • Increased odor and decomposition	Moderate	**Sensitivity:** • Open dumping sites • Irregular collection **Adaptive Capacity:** • Waste collection services • Community clean-ups	Moderate	Moderate

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Transport and Mobility	• Dusty roads and reduced visibility • Road surface degradation	Moderate	**Sensitivity:** • Many unpaved roads • Loose soils **Adaptive Capacity:** • Road maintenance • Watering of roads (limited)	Low	Low
Energy	• Increased demand for electricity •	Moderate	**Sensitivity:** • Water-dependent businesses • Informal sector reliance **Adaptive Capacity:** • Flexible operations • Water storage	Moderate	Moderate
Economic Infrastructure	• Reduced business activity • Higher cost of water	Moderate	**Sensitivity:** • Water-dependent businesses • Informal sector reliance **Adaptive Capacity:** • Flexible operations • Water storage	Moderate	Moderate
Social Infrastructure	• Water shortages in schools and health facilities • Reduced sanitation	Moderate	**Sensitivity:** • Limited water storage • High usage rates **Adaptive Capacity:** • Rainwater harvesting • Water conservation	Moderate	Moderate
Emergency Services	• Increased drought-related health issues • Greater service demand	Moderate	**Sensitivity:** • Limited equipment • Few response resources **Adaptive Capacity:** • Health centers • Community health workers	Moderate	Moderate
Populations					

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Urban Residents	• Water shortages • Increased water costs	Moderate	**Sensitivity:** • Dependence on piped water • Limited storage **Adaptive Capacity:** • Water vendors • Rainwater harvesting	Moderate	Moderate
Informal Settlement Residents	• Severe water shortages • Poor sanitation conditions	High	**Sensitivity:** • Limited water access • Poor housing conditions **Adaptive Capacity:** • Community support • Informal water supply	High	High
Vulnerable and Marginalized Groups	• Food and water insecurity • Health risks	High	**Sensitivity:** • Low income • Limited access to services **Adaptive Capacity:** • Social support • Relief programs	High	High
Natural Assets					
Urban Green Infrastructure	• Drying of vegetation • Tree mortality	Moderate	**Sensitivity:** • Young trees • Limited irrigation **Adaptive Capacity:** • Drought-resistant species • Mulching	Moderate	Moderate
Peri-urban and Agricultural Systems	• Crop failure • Reduced yields	High	**Sensitivity:** • Rain-fed agriculture • Poor soil moisture retention **Adaptive Capacity:** • Drought-tolerant crops • Soil conservation	High	High

Table 17:Exposure, Vulnerability, and Impacts of Hailstorms on Urban Elements

Hazard: Hailstorms

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Infrastructure & Services					
Stormwater Drainage	• Occasional blockage by hail accumulation • Short-term increase in runoff		**Sensitivity:** • Small or blocked drains • Sediment and debris accumulation **Adaptive Capacity:** • Existing drainage channels • Routine maintenance	Low	Low
Water & Wastewater Management	• Minor contamination from roof runoff • Temporary turbidity in water sources	Low	**Sensitivity:** • Roof catchment systems • Unprotected water points **Adaptive Capacity:** • Water treatment • Covered storage	Low	Low
Solid Waste Management	• Temporary scattering of waste during storms • Minor disruption of collection	Low	**Sensitivity:** • Open dumping areas • Poorly covered wast **Adaptive Capacity:** • Regular collection • Community clean-ups	Low	Low
Transport and Mobility	• Slippery road surfaces • Temporary disruption of movement	Low	**Sensitivity:** • Unpaved roads • Limited stormwater drainage **Adaptive Capacity:** • Road maintenance • Natural drainage	Low	Low

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Energy	• • Minor damage to overhead lines • Temporary outages	Low	**Sensitivity:** • Exposed power lines • Wooden poles **Adaptive Capacity:** • Maintenance teams • Quick restoration	Low	Low
Economic Infrastructure	• Minor damage to roofs and stalls • Short-term business disruption	Low	**Sensitivity:** • Light roofing materials • Open markets **Adaptive Capacity:** • Simple repairs • Temporary shelters	Low	Low
Social Infrastructure	• • Minor roof damage • Noise disruption during storms	Low	**Sensitivity:** • Iron sheet roofing • Aging buildings **Adaptive Capacity:** • Routine maintenance • Repairs	Low	Low
Emergency Services	• Occasional response to minor injuries • Limited service disruption	Low	**Sensitivity:** • Limited equipment • • Small response teams **Adaptive Capacity:** • Available health facilities • Community support	Low	Low
Populations					
Urban Residents	• Exposure to hail during storms • Minor property damage	Low	**Sensitivity:** • Iron sheet roofs • Outdoor activities **Adaptive Capacity:** • Shelter availability • Stronger roofing	Low	Low

Category	Exposure (Description)	Exposure Level	Vulnerability (Description)	Vulnerability Level	Impact Level
Informal Settlement Residents	• Roof damage • Exposure to hailstones	Low	**Sensitivity:** • Weak structures • Overcrowding **Adaptive Capacity:** • Community assistance • Quick repairs	Moderate	Moderate
Vulnerable and Marginalized Groups	• Risk of minor injuries • Limited protection	Low	**Sensitivity:** • Limited resources • Mobility challenges **Adaptive Capacity:** • Social support • Access to shelters	Moderate	Moderate
Natural Assets					
Urban Green Infrastructure	• Minor leaf damage • Broken branches	Low	**Sensitivity:** • Young trees, Plants • Soft vegetation **Adaptive Capacity:** • Natural regrowth • Maintenance	Low	Low
Peri-urban and Agricultural Systems	• Minor crop damage • Leaf bruising	Low	**Sensitivity:** • Tender crops • Small farms **Adaptive Capacity:** • Crop recovery • Replanting	Low	Low

4. Climate Risk Assessment

[Write a short paragraph to introduce the section.]

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 18:Risk matrix

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

For this Urban Climate Risk Profile, risk levels should be interpreted based on the table below.

Table 19: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.

4.1. Current and Future Climate Risks on Urban Elements

[Complete the table below by following the steps under Section-3 for each key hazard.

- Use outputs from Step-2.3. to fill the "Hazard Levels" row.
- Use outputs from Step-3.3. to fill the "Impact" column.
- Refer to Step-4.1. to fill the "Risk Level" columns, using the Risk Matrix.

The rows for urban elements not included in the assessment, if any, can be removed.]

Table 20:Summary of Extreme heat risks for Nyamira Municipality

	Time Horizon & Climate Scenario	Current	2050 SSP2-4.5	2050 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5
	Hazard Level					

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	Low	Low	Low	Low	Low	Low
Water & Wastewater Management	Low	Low	Low	Low	Low	Low
Solid Waste Management	Low	Low	Low	Low	Low	Low
Transport and Mobility	Low	Low	Low	Low	Low	Low
Energy	Low	Low	Low	Low	Low	Low
Economic Infrastructure	Low	Low	Low	Low	Low	Low
Social Infrastructure	Low	Low	Low	Low	Low	Low
Emergency Services	Low	Low	Low	Low	Low	Low
Populations	Low					
Urban Residents	Low	Low	Low	Low	Low	Low
Informal Settlement Residents	Low	Moderate	Moderate	Moderate	Moderate	Moderate
Vulnerable and Marginalized Groups	Low	Moderate	Moderate	Moderate	Moderate	Moderate
Natural Assets	Low					
Urban Green Infrastructure	Low	Low	Low	Low	Low	Low
Peri-urban and Agricultural Systems	Low	Low	Low	Low	Low	Low

Table 21:Summary of Change in Precipitation risks for Nyamira Municipality

	Time Horizon & Climate Scenario	Current	2050 SSP2-4.5	2050 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5
	Hazard Level					
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	Low	Low	Low	Low	Moderate	Moderate
Water & Wastewater Management	Low	Low	Low	Low	Moderate	Moderate
Solid Waste Management					Moderate	Moderate

Transport and Mobility	Low	Low	Low	Low	Moderate	Moderate
Energy	Low	Low	Low	Low	Moderate	Moderate
Economic Infrastructure	Low	Low	Low	Low	Moderate	Moderate
Social Infrastructure	Low	Low	Low	Low	Moderate	Moderate
Emergency Services	Low	Low	Low	Low	Moderate	Moderate
Populations						
Urban Residents	Low	Low	Low	Low	Moderate	Moderate
Informal Settlement Residents	Low	Low	Low	Low	Moderate	Moderate
Vulnerable and Marginalized Groups	Low	Low	Low	Low	Moderate	Moderate
Natural Assets						
Urban Green Infrastructure	Low	Low	Low	Low	Moderate	Moderate
Peri-urban and Agricultural Systems	Low	Low	Low	Low	Moderate	Moderate

Table 22:Summary of Pluvial flooding risks for Nyamira Municipality

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

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

Table 23:Summary of Drought risks for Nyamira Municipality

	Time Horizon & Climate Scenario	Current	2050 SSP2-4.5	2050 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5
	Hazard Level					
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	Low	Low	Low	Low	Medium	Medium
Water & Wastewater Management	Low	Low	Low	Low	Medium	Medium
Solid Waste Management	Low	Low	Low	Low	Medium	Medium
Transport and Mobility	Low	Low	Low	Low	Medium	Medium
Energy	Low	Low	Low	Low	Medium	Medium
Economic Infrastructure	Low	Low	Low	Low	Medium	Medium
Social Infrastructure	Low	Low	Low	Low	Medium	Medium
Emergency Services	Low	Low	Low	Low	Medium	Medium
Populations						
Urban Residents	Low	Low	Low	Low	Medium	Medium
Informal Settlement Residents	Low	Low	Low	Low	Medium	Medium
Vulnerable and Marginalized Groups	Low	Low	Low	Low	Medium	Medium
Natural Assets						
Urban Green Infrastructure	Low	Low	Low	Low	Medium	Medium
Peri-urban and Agricultural Systems	Low	Low	Low	Low	Medium	Medium

Table 24:Summary of Hailstorms risks for Nyamira Municipality

	Time Horizon & Climate Scenario	Current	2050 SSP2-4.5	2050 SSP5-8.5	2100 SSP2-4.5	2100 SSP5-8.5
	Hazard Level					
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	Low	Low	Low	Low	Low	Low
Water & Wastewater Management	Low	Low	Low	Low	Low	Low
Solid Waste Management	Low	Low	Low	Low	Low	Low
Transport and Mobility	Low	Low	Low	Low	Low	Low
Energy	Low	Low	Low	Low	Low	Low
Economic Infrastructure	Low	Low	Low	Low	Low	Low
Social Infrastructure	Low	Low	Low	Low	Low	Low
Emergency Services	Low	Low	Low	Low	Low	Low
Populations						
Urban Residents	Low	Low	Low	Low	Low	Low
Informal Settlement Residents	Low	Low	Low	Low	Low	Low
Vulnerable and Marginalized Groups	Low	Low	Low	Low	Low	Low
Natural Assets	Low	Low	Low	Low	Low	Low
Urban Green Infrastructure	Low	Low	Low	Low	Low	Low
Peri-urban and Agricultural Systems	Low	Low	Low	Low	Low	Low

5. What's Next?

5.1. Key Findings

Climate change poses increasing risks to urban systems, populations, and natural resources through the intensification of climate-related hazards such as drought, flooding, and changing precipitation patterns. Identifying key hazards affecting infrastructure, communities, and ecosystems is essential for understanding current vulnerabilities and planning appropriate adaptation and resilience measures. These hazards influence the availability of water resources, the stability of infrastructure, the productivity of agricultural systems, and the overall well-being of the population.

Currently, the most significant climate-related risks include periodic drought conditions, minor pluvial flooding, and variability in rainfall patterns. Although some hazards such as hailstorms and extreme heat occur with relatively low frequency, they still present localized risks to infrastructure and livelihoods. Over time, climate projections indicate that the frequency and intensity of hazards such as drought and intense rainfall events are likely to increase, potentially leading to greater stress on essential services and natural systems.

This section outlines the key climate hazards affecting infrastructure and services, populations, and natural assets under current conditions and projected future scenarios for the mid-term (2050) and long-term (2100). Understanding these evolving risks provides a basis for identifying priority areas for climate adaptation and resilience planning.

Table 25:Summary of climate risks affecting urban elements for Nyamira Municipality

Category	List of Key Hazards		
	Current	Mid-term (2050)	Long-term (2100)
Infrastructure & Services			
Stormwater Drainage	• Minor pluvial flooding • Blocked drainage	• Minor pluvial flooding • Blocked drainage	• Minor pluvial flooding • Blocked drainage
Water & Wastewater Management	• • Seasonal water shortages • Drought impacts	• Seasonal water shortages • Drought impacts	• Seasonal water shortages • Drought impacts
Solid Waste Management	• Waste scattering during rains • Poor collection	• Waste scattering during rains • Poor collection	• Waste scattering during rains • Poor collection
Transport and Mobility	• Dusty roads during drought • Minor flooding	• Dusty roads during drought • Minor flooding	• Dusty roads during drought • Minor flooding
Energy	• Occasional power outages • Drought affecting supply	• Occasional power outages • Drought affecting supply	• Occasional power outages • Drought affecting supply
Economic Infrastructure	• Reduced productivity during drought • Minor disruptions	• Reduced productivity during drought • Minor disruptions	• Reduced productivity during drought • Minor disruptions
Social Infrastructure	• Water shortages in schools and health facilities	• Water shortages in schools and health facilities	• Water shortages in schools and health facilities
Emergency Services	• Drought-related emergencies • Limited response	• Drought-related emergencies • Limited response	• Drought-related emergencies • Limited response

Category	List of Key Hazards		
	Current	Mid-term (2050)	Long-term (2100)
Populations			
Urban Residents	• Water shortages • Heat discomfort	• Water shortages • Heat discomfort	• • Water shortages • Heat discomfort
Informal Settlement Residents	• Water shortages • Poor drainage	• Water shortages • Poor drainage	• Water shortages • Poor drainage
Vulnerable and Marginalized Groups	• Food insecurity • Water stress	• Food insecurity • Water stress	• Food insecurity • Water stress
Natural Assets			
Urban Green Infrastructure	• Vegetation stress during drought	• Vegetation stress during drought	• Vegetation stress during drought
Peri-urban and Agricultural Systems	• Reduced yields during drought	• Reduced yields during drought	• Reduced yields during drought

5.2. Climate Adaptation and Resilience Solutions

Climate adaptation and resilience solutions refer to strategies and actions taken to reduce the negative impacts of climate change and enhance the ability of systems, communities, and infrastructure to cope with climate-related hazards. These solutions aim to minimize vulnerability while improving the capacity to respond to and recover from climate shocks such as droughts, floods, and changing rainfall patterns.Adaptation solutions can be implemented at different time scales. Immediate actions often focus on low-cost and rapid interventions such as repairing damaged infrastructure, clearing drainage systems, promoting water conservation, and raising public awareness on climate risks. These actions help reduce current risks and prevent further damage.

Mid-term solutions involve improving systems and building capacity to better cope with climate variability. These may include upgrading drainage capacity, expanding water storage, improving waste management systems, strengthening roads, and promoting climate-smart agriculture. These interventions enhance the reliability and efficiency of essential services. Long-term solutions focus on sustainable and structural changes that strengthen resilience over time. Examples include climate-resilient infrastructure development, integrated urban planning, ecosystem restoration, renewable energy adoption, and protection of water catchment areas. These measures address the root causes of vulnerability and ensure sustainable development despite changing climate conditions. Effective climate adaptation requires the integration of infrastructure improvements, environmental conservation, and community participation. By combining immediate, mid-term, and long-term actions, communities and municipalities can better withstand climate risks while supporting sustainable livelihoods and environmental protection.

Table 26:Climate adaptation and resilience solutions recommended for Nyamira Municipality

Category	Recommended Solutions		
	Immediate	**Mid-term**	**Long-term**
Infrastructure & Services			
Stormwater Drainage	• Clear blocked drains • Repair damaged channels	• Clear blocked drains • Repair damaged channels	• Clear blocked drains • Repair damaged channels
Water & Wastewater Management	• Promote water conservation • Repair leaks	• Promote water conservation • Repair leaks	• Promote water conservation • Repair leaks

Category	Recommended Solutions		
	Immediate	**Mid-term**	**Long-term**
Solid Waste Management	• Organize clean-up exercises • Improve waste collection	• Organize clean-up exercises • Improve waste collection	• Organize clean-up exercises • Improve waste collection
Transport and Mobility	• Repair damaged roads • Clear roadside drains	• Repair damaged roads • Clear roadside drains	• Repair damaged roads • Clear roadside drains
Energy	• Repair damaged lines • Promote energy saving	• Repair damaged lines • Promote energy saving	• Repair damaged lines • Promote energy saving
Economic Infrastructure	• Support small businesses • Improve market drainage	• Support small businesses • Improve market drainage	• Support small businesses • Improve market drainage
Social Infrastructure	• Repair buildings • Improve sanitation	• Repair buildings • Improve sanitation	• Repair buildings • Improve sanitation
Emergency Services	• Raise awareness • Stock emergency supplies	• Raise awareness • Stock emergency supplies	• Raise awareness • Stock emergency supplies
Populations			
Urban Residents	• Raise awareness on climate risks • Promote water conservation	• Raise awareness on climate risks • Promote water conservation	• Raise awareness on climate risks • Promote water conservation
Informal Settlement Residents	• Improve drainage • Provide clean water	• Improve drainage • Provide clean water	• Improve drainage • Provide clean water
Vulnerable and Marginalized Groups	• Provide relief support • Conduct outreach programs	• Provide relief support • Conduct outreach programs	• Provide relief support • Conduct outreach programs
Natural Assets			
Urban Green Infrastructure	• Plant trees • Protect existing vegetation	• Plant trees • Protect existing vegetation	• Plant trees • Protect existing vegetation
Peri-urban and Agricultural Systems	• Promote mulching • Encourage drought-tolerant crops	• Promote mulching • Encourage drought-tolerant crops	• Promote mulching • Encourage drought-tolerant crops

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