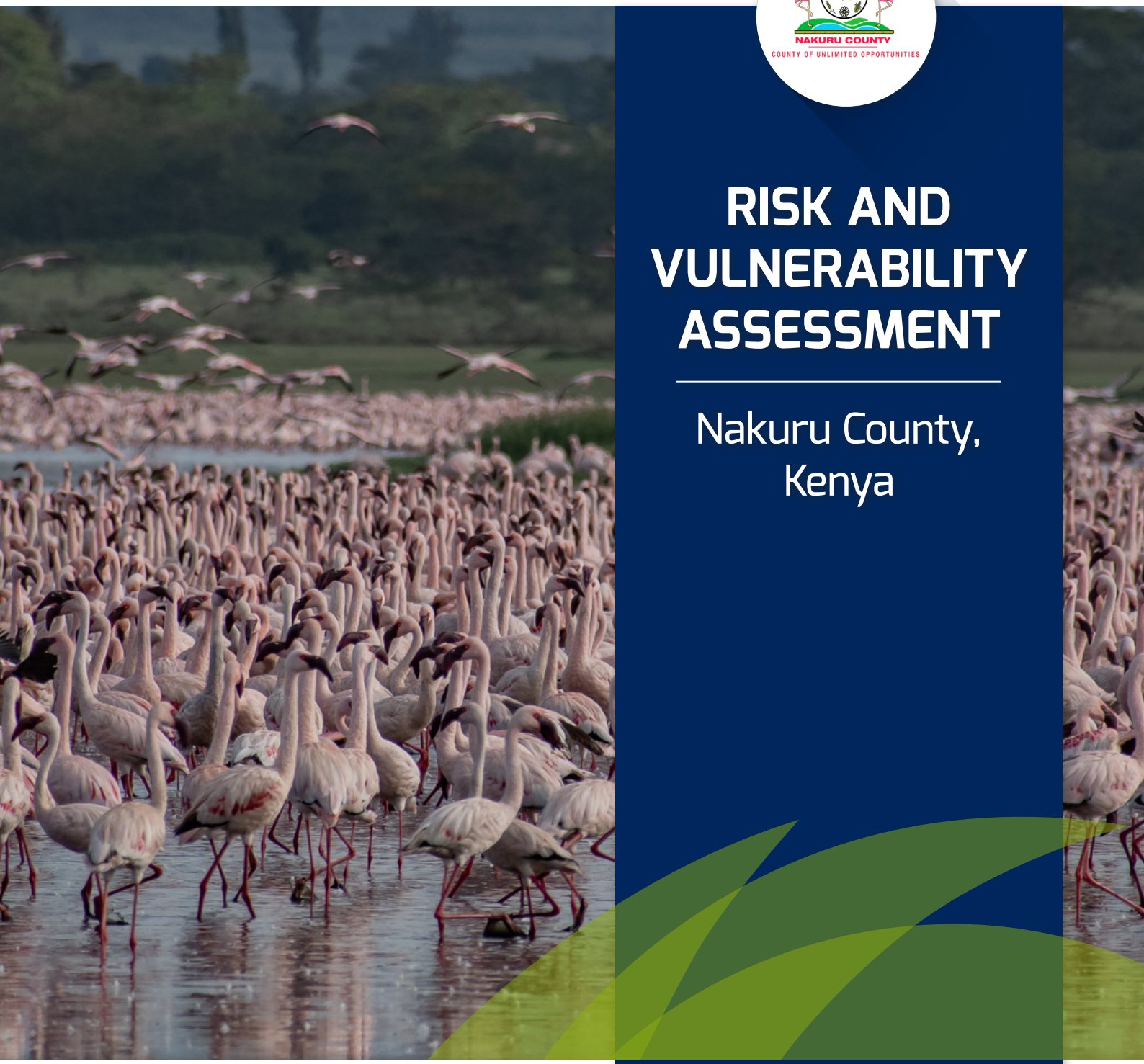
Covenant of Mayors
in Sub-Saharan Africa

NAKURU COUNTY
COUNTY OF UNLIMITED OPPORTUNITIES



RISK AND VULNERABILITY ASSESSMENT

Nakuru County, Kenya

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Contents

Abbreviations

BEI	Baseline Emissions Inventory
CDD	Community-driven development
CFA	Community Forest Association
CIDP	County Integrated Development Plan
CIP	Climate Information Platform
CoM SSA	Covenant of Mayors in Sub-Saharan Africa
CSA	Climate Smart Agriculture
CSAG	Climate Systems Analysis Group
DRM	Disaster Risk Management
EC	European Commission
EU	European Union
GCF	Green Climate Fund
GCoM	Global Covenant of Mayors for Climate & Energy
GHG	Greenhouse gases
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
HHS	Household Survey
ICLEI Africa	ICLEI-Local Governments for Sustainability
IPCC	Intergovernmental Panel on Climate Change
JRC	Joint Research Centre of the European Union
KIHBS	Kenya Integrated Household Budget Survey
KMD	Kenya Meteorological Department
KNBS	Kenya National Bureau of Statistics
MTP	Medium Term Plan
NAP	National Adaptation Plan
NCCAP	National Climate Change Action Plan
NDC	Nationally Determined Contribution
RVA	Risk and Vulnerability Assessment
SCODE	Sustainable Community Development Services
SDGs	Sustainable Development Goals
SEACAP	Sustainable Energy Access and Climate Action Plan
UCT	University of Cape Town
WRUAs	Water Resource User Associations

List of tables

List of figures

1. The Covenant of Mayors Sub-Saharan Africa (CoM SSA) and Sustainable Energy Access and Climate Action Plans (SEACAPs)

1.1 The Covenant of Mayors Sub-Saharan Africa (CoM SSA)

The Covenant of Mayors in Sub-Saharan Africa (CoM SSA) is an initiative launched by the European Union (EU) to support local authorities in Sub-Saharan Africa in the climate challenge and in their efforts in ensuring access to clean energy. It is the "regional covenant" or chapter of the Global Covenant of Mayors for Climate & Energy. CoM SSA is delivered through a partnership of global and local city networks as well as initiatives funded by the European Commission (EC). It is a bottom-up and voluntary initiative that invites cities to define and meet ambitious and realistic energy access and climate targets set by themselves, in line with GCoM requirements. This means that targets are at least as ambitious as cities' respective government's Nationally Determined Contribution (NDC) under the Paris Agreement. Furthermore, targets need to be in line with National Adaptation Plans (where these exist) and be consistent with the principles around energy access and urban sustainability embodied in the Sustainable Development Goals (SDGs). Local authorities are encouraged to voluntarily commit to the implementation of a climate and energy action plan in their area of influence. They are also encouraged to define long-term vision actions towards a sustainable future based on the pillars of climate change mitigation and adaptation, and sustainable, affordable and secure access to energy. CoM SSA is open to any city in Sub-Saharan Africa, regardless of the size. In order to translate the political commitment into practical measures, CoM SSA signatories commit to produce and implement a strategic and operational document called the Sustainable Energy Access and Climate Action Plan (SEACAP).

1.2 Sustainable Energy Access and Climate Action Plans (SEACAPs)

The Sustainable Energy Access and Climate Action Plan (SEACAP) is the key document that sets the strategies, plans and actions for a sustainable and low greenhouse gas (GHG) emission development pathway, while including climate adaptation actions and ensuring access to secure, affordable and sustainable energy, in response to the current and future impacts of climate change in the region. The SEACAP is both a strategic and an operational document. It uses the results of the Baseline Emission Inventory (BEI) to identify the best fields of action and opportunities for reaching the local authority's greenhouse gas (GHG) emission reduction targets. It is based on the climate change Risk and Vulnerability Assessment (RVA), which identifies the most relevant city climate hazards and vulnerabilities. It also includes an Access to Energy Assessment, which articulates a plan to improve the access to secure, sustainable, affordable and reliable energy. The SEACAP defines concrete measures for climate mitigation, adaptation and access to sustainable energy, with timeframes and assigned responsibilities, translating the long-term strategy into action.

1.3 Phases of the SEACAP development within the Adaptation pillar

The Adaptation pillar of the Sustainable Energy Access and Climate Action plan (SEACAP) development involves four phases:

i. **Initiation phase** – Activities in this phase include the identification of national action plans on adaptation, mobilizing and engaging stakeholders and affirming political commitment of the heads of the municipality and the national government to the SEACAP development.

ii. **Planning phase** – This phase includes pre-assessment and development stages. Thus, it involves developing a risk and vulnerability assessment (this document) which highlights the climate hazards which affect a local government and indicates the sectors and populations groups within that city most heavily impacted by climate hazards. The risk and vulnerability assessment offers an opportunity for local government authorities to obtain data specific to the local government, thus increasing awareness on the existing status and providing a premise for further action to improve the status quo. Post the development of the risk and vulnerability assessment, targets are set for each sector considered to be particularly vulnerable to climate change and thereafter actions are set to achieve these targets.

iii. **Implementation phase** – This phase involves delivering practical actions starting with the ones identified as priority in the planning phase. All the information necessary to implement these actions is collected, funding is secured (either internally or from external sources) and a project management approach is adopted to implement these adaptation actions – including deadline control, financial control, planning and risk management.

iv. **Monitoring and Reporting phase** – This phase involves reviewing progress and readjusting priorities. The proposed actions are monitored to ensure that the set targets are achieved in this phase. Specific procedures and processes for each of the actions are confirmed, while maintaining constant communication with the stakeholders throughout. On a regular basis, the progress made is assessed and priorities are adjusted to fit the current situation as needed. A progress report is to be submitted every second year after the SEACAP was developed, for monitoring and evaluation.

This document constitutes the Risk and Vulnerability Assessment, the baseline assessment for the Adaptation pillar. It will be used to set climate change adaptation targets as well as guide the development of actions to reduce vulnerability to the impacts of climate change and enhance resilience in Nakuru County, Kenya.

1.4 Purpose of the Risk and Vulnerability Assessment

A Risk and Vulnerability Assessment (RVA) determines the nature and extent of a risk by analysing potential hazards and assessing the vulnerability that could pose a potential threat or harm to people, property, livelihoods and the environment on which they depend (IPCC, 2014b). This can take the form of a single assessment or various assessments undertaken per sector. RVAs are the most commonly used tools for identifying, quantifying and prioritising key risks of a system to climate change.

2. Local government overview in Nakuru

Section 2 provides an overview of the biophysical, social, organisational and economic structure of Nakuru County. This will allow for the identifications of assets and constraints of development in the social, economic, cultural and environmental fields in the context of climate change.

Nakuru County covers an area of approximately 7,498.8 km^2 and is located in the Rift Valley in the east of Kenya. The main topographical features in Nakuru County are the Mau Escarpment covering the western part of the county, the Rift Valley floor, Ol-Doinyo Eburru volcano complex, Akira Plains and Menengai Crater. The county has an elaborate drainage and relief system with various inland lakes on the floor of the Rift Valley where nearly all the permanent rivers and streams in the county drain into. These rivers include Njoro and Makalia which drain into Lake Nakuru, Malewa which drains into Lake Naivasha, and the Molo River which drains into Lake Baringo, among others. The topography in Naivasha and Gilgil sub-counties is characterised by mountain ranges and savannah vegetation that supports various species of wildlife. The Mau Escarpment has an average altitude of 2,400m above sea level and contains most of the county's forests. Nakuru County has about 680 km^2 of gazetted forests as well as three national parks: Lake Nakuru, Hell's Gate, and Longonot. The county also has a number of private wildlife conservancies with large flocks of birds (notably flamingos) endangered rhinos, Rothchild's giraffes and hippos among other wild mammalian species. Underground hot springs in Olkaria are an important source of geothermal power that serve not only the county but also provide power supply to the national grid. The county typically receives rainfall twice a year from March to May and from October to December with a distribution ranging from 550 to 1900 mm/year depending on altitude and location (Nakuru County, 2018).

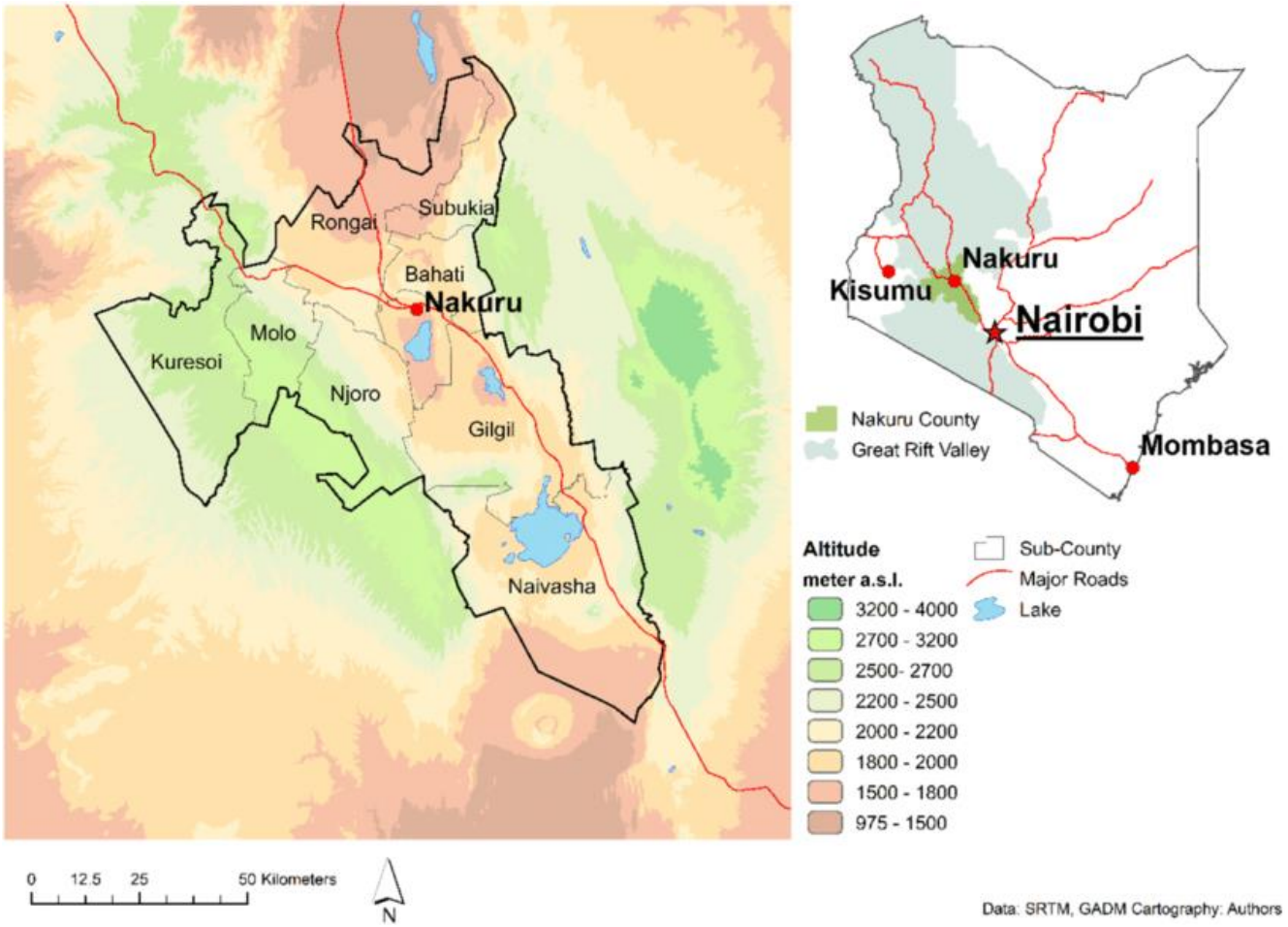


Figure 1: Location of Nakuru County in Kenya (Debonne et al., 2020)

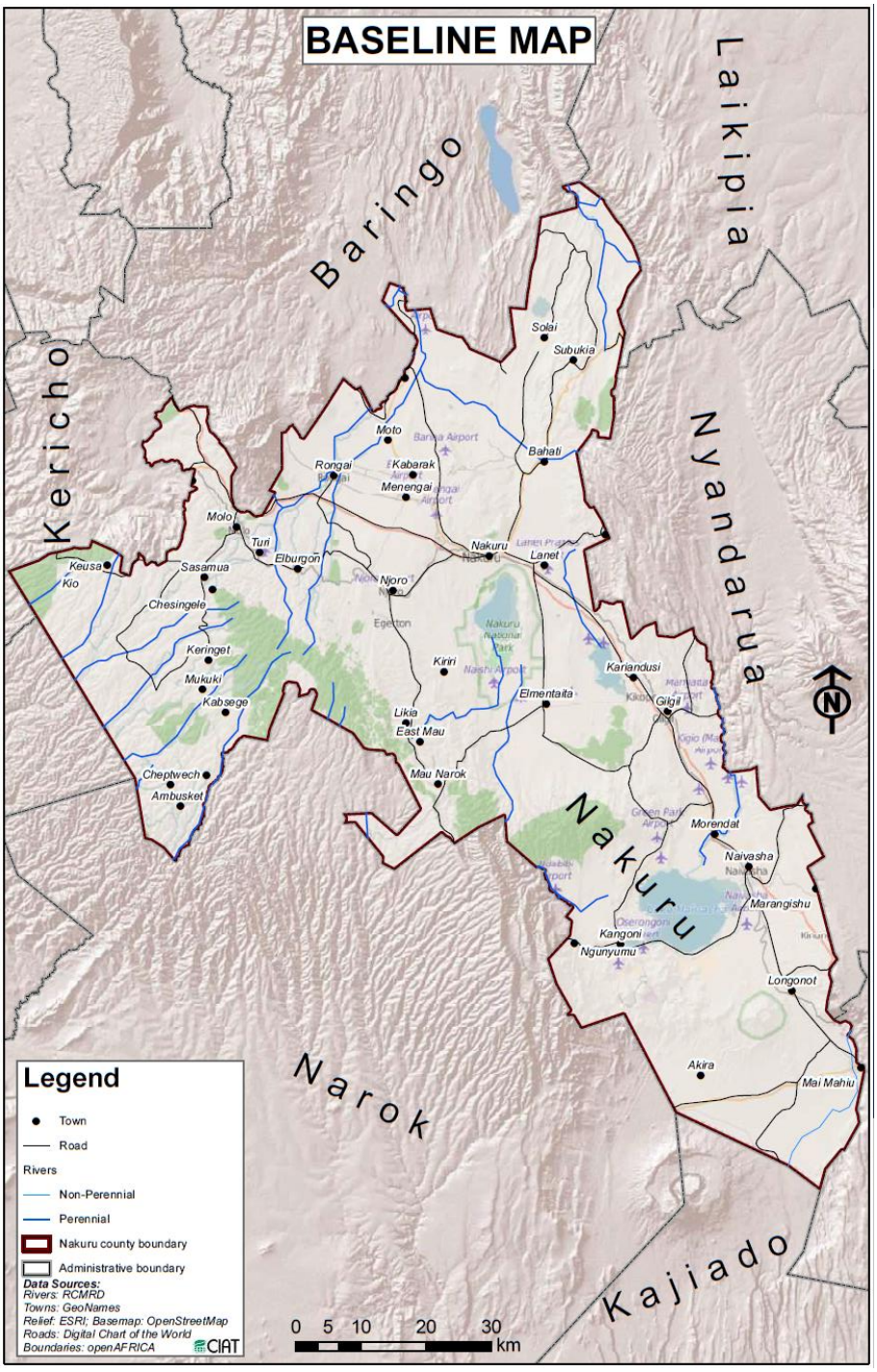


Figure 2: Nakuru County's main rivers (Government of Kenya, 2016)

Nakuru County borders seven of the 47 counties of the Republic of Kenya that came into existence with the Kenyan Constitution in 2010. The county is administratively divided into 11 subcounties and 55 wards (KNBS, 2019). Approximately 54.2% of the people in Nakuru live in rural areas, whilst 45.8% live in urban areas. The county is cosmopolitan, drawing its population from different ethnicities and nationalities (KNBS, 2019). The dominant communities include Kikuyu and Kalenjin. Other communities present in the county include Luo, Luhya, Maasai, Kamba, and Meru, among others (Nakuru County, 2018). According to the 2019 National Population and Housing Census, the county's population is approximately 2.16 million, represented by 1.077 million males, 1.084 million females, and 95 intersexes. The population growth rate is approximately 3% per year (Nakuru County, 2021). Individuals aged 18–35 represent approximately 33% of the population, which indicates that the county has a predominantly youthful population (KNBS, 2019).

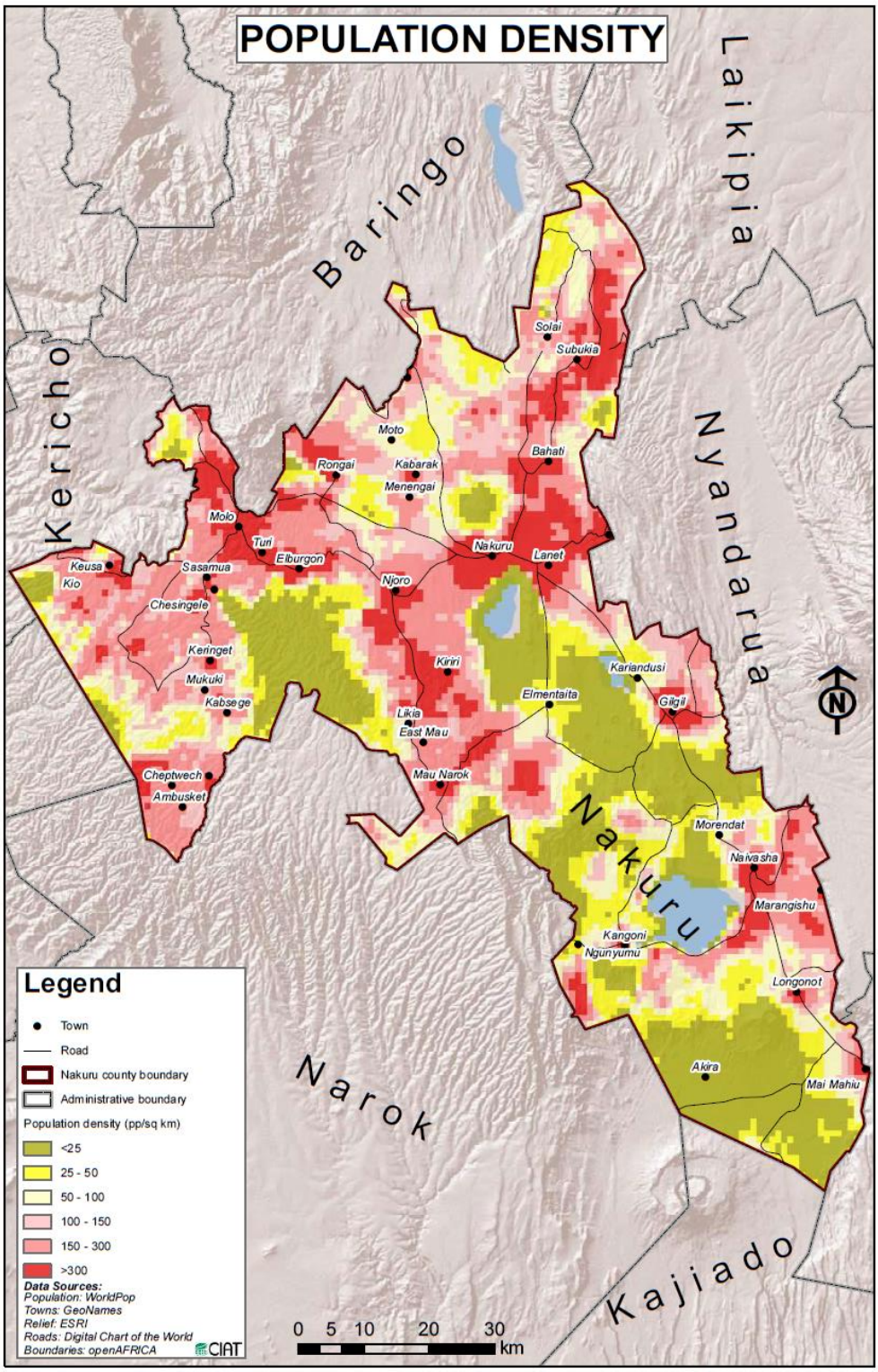


Figure 3: Population density in Nakuru County (Government of Kenya, 2016)

Nakuru County's Gross Domestic Product (GDP) for 2019 was estimated at 613 billion Kenyan shillings (KES) (approximately USD 5.7 billion), accounting for 6.9% of Kenya's GDP (KNBS, 2019, 2020c). About 29.1% of the population lives under the poverty line of USD 2 a day, which is slightly below the national poverty level of 36.1% (KIPPRA, 2019).

The main economic activities within Nakuru County are agribusiness, financial services, geothermal power generation and tourism (Nakuru County, 2018). The county's economy is mostly built around agriculture, which accounts for approximately 60% of total economic activity (Nakuru County, 2020). The agricultural sector comprises the following subsectors: livestock keeping, fish farming and food and cash-crop farming, including horticulture and floriculture. Both subsistence and large-scale commercial farming is practised with flower farms as major employers in the county. The main food crops produced in the county include maize, Irish potato, wheat, and beans, and the main livestock types are dairy cattle, local poultry and wool sheep (Government of Kenya, 2016).

Nakuru County has large natural water resources including four major lakes (Nakuru, Naivasha, Solai, and Elementaita), shallow wells, springs, dams, pans, and boreholes. However, most of these water resources, particularly the lakes, are not available for domestic, industrial or irrigation purposes. Boreholes have been sunk to boost water supply but the county is still water deficient. During the implementation of the first County Integrated Development Plan 2013–2017, water coverage within Nakuru increased from 58% to 63%. In terms of water quality, Nakuru County regularly experiences contamination of water sources due to open defecation and overflowing sewage into open water. For example, an outbreak of cholera was reported in the Kapchawea area in 2017.

Nakuru County offers some of the most significant power generation capacity both in the country and in Africa, as it is home to one of the largest geothermal plants on the continent. According to the 2015–2016 Kenya Integrated Household Budget Survey (KIHBS), electricity is the main source of energy for lighting in the county at 55%. However, most of the Nakuru County residents, especially those in rural areas and informal settlements of the rapidly expanding urban centres, rely mainly on biomass energy for cooking (firewood and charcoal).

The entire road network in Nakuru County is approximately 12,491 km, with paved roads accounting for 993.7 km, gravel roads accounting for 4,500 km, and earth roads accounting for 6,998 km. The road infrastructure can be described as 20% good, 35% fair and 45% poor (Nakuru County, 2018). Some roads, especially in agriculturally rich areas such as Kuresoi North and South, Molo, Njoro Subukia, Naivasha and Gilgil are in poor condition, leading to delays in the transport of agricultural produce to market, and causing losses for farmers for perishable goods. A railway line traverses through the county to Uganda, and is used to transport cargo mainly from the port of Mombasa to the Malaba border. The proposed Standard Gauge Railway (SGR) will pass through Mai Mahiu (Naivasha) as it joins Narok County all the way to the Malaba border.

According to the Kenya Integrated Household Budget Survey (KIHBS) 2015-2016, approximately 88% of households in the county use durable roofing materials such as corrugated iron sheets (this is the dominant roofing material used by 93% of houses); whilst 12% of the population (typically the rural population) use non-durable roofing materials for their houses. The main wall material is stone at 40%, whereas the main floor materials are cement and earth/sand at 52% and 33% respectively. The housing tenure is mostly rent/lease at 46%, however 45% of houses are occupied by their owners. Furthermore, informal settlements are increasing in the county due to rapid urbanisation and failure of the formal sector to supply adequate houses especially for the low-income segment of society (KIHBS, 2016). An estimated 82.5% of households in Nakuru County own a mobile phone. Approximately 16% have access to the internet, 57% have access to television, and 91% have access to radio (KIHBS, 2016).

2.1 Adaptation policy and regulatory framework

Table 1 provides an overview of the adaptation policy and regulatory framework at the national and county level. As mentioned above, development of the Adaptation pillar of the SEACAP (i.e. the RVA and adaptation targets and actions) is anchored in Kenya and Nakuru County's exiting climate action initiatives and ambitions. The data contained in this RVA builds on these policy documents, particularly on the 2020 updated Nationally Determined Contribution, the 2015 National Adaptation Plan, the 2018–2022 National Climate Change Action Plan and the 2018–2022 Nakuru Country Climate Change Action Plan. These particular policy documents are elaborated on in more detail (visions, targets and actions) in Section 2.3.

Table 1: National-level policy and regulatory framework

Policy documents	Mitigation and adaptation provisions
Nationally Determined Contribution (NDC) 2020	The updated NDC sets out mitigation and adaptation contributions to mainstream mitigation and adaptation into Medium Term Plans and implementing mitigation and adaptation actions. In the NDC, Kenya commits to: • Enhancing the adaptive capacity and climate resilience across all the sectors of the economy and the two levels of government – national and county governments; • Exploring innovative livelihood strategies for enhancing climate resilience of local communities through financing of locally led climate change actions; • Enhancing the risk-based approach to climate change adaptation through the development and application of comprehensive climate risk management tools that would help in addressing and adaptively managing climate risks; • Addressing residual climate change impacts, loss and damage especially in the productive sectors of the economy; • Enhancing generation, packaging and widespread uptake and use of climate information on decision-making and planning across sectors and counties with robust early warning systems (EWS); • Enhancing the uptake of adaptation technology especially by women, youth and other vulnerable groups, incorporating scientific and indigenous knowledge; • Enabling institutional strengthening of the community-driven development (CDD), the Climate Change Units and related institutions across sectors and counties as well as non-state actor institutions; and • Strengthening tools for adaptation monitoring, evaluation, and learning (MEL) at the national and county levels, including non-state actors.
National Adaptation Plan 2015–2030	• The 2016 NAP is designed to operationalise the NCCAP 2013–2017 and support adaptation strategies in the country. The NAP is the basis for the adaptation component of Kenya's first NDC.
2nd National Climate Change Action Plan (NCCAP) 2018–2022	• The plan guides Kenya on the priority adaptation and mitigation climate change actions that help define Kenya's low-carbon, climate-resilient development pathway and lead to the achievement of Kenya's NDC targets. • Counties will align their Strategic Plans and County Integrated Development Plans (CIDPs) to the Vision 2030 national development blueprint, the MTP III, and the NCCAP 2018-2022 through a consultative process.

Policy documents	Mitigation and adaptation provisions
Constitution of Kenya, 2010	• Kenya's Constitution provides the basis for action on climate change by guaranteeing citizens a clean and healthy environment, which is a fundamental right under the Bill of Rights. • Provides for the devolved system of governance (counties) which ensure participation of communities and equitable national resource distribution to address socio-economic disparities.
Vision 2030, 2008	• Under the social strategy, Kenya aims to be a nation that has a clean, secure, and sustainable environment by 2030 by harmonising environment-related laws for better environmental planning and governance. • Kenya will also enhance disaster preparedness in all disaster-prone areas and improve the capacity for adaptation to climate change.
Vision 2030, Third Medium Term Plan (MTP) 2018–2022	Thematic area: Climate Change and Disaster Risk Management (DRM). • To mitigate drought, the government will strengthen the Integrated Early Warning Systems and National Drought Emergency Fund. • The government will promote a low-carbon, climate-resilient and green growth development. • This will be achieved through strengthening climate change governance and coordination, climate change monitoring, reporting and verification, capacity building and public awareness, and formulation and implementation of the Green Economy Strategy and the National Climate Change Action Plan.
Climate Change Act, 2016	• The Act provides a framework for mainstreaming climate change across sectors. • It facilitates the formulation of a five-year National Climate Change Action Plan (NCCAP) that addresses all sectors of the economy and provides mechanisms for mainstreaming climate change into all sectors and the County Integrated Development Plans (CIDPs). • It provides mechanisms for mainstreaming climate change into the CIDPs.
Environmental Management and Co-ordination (Amendment), 2015	• Article 56 A on guidelines on climate change: The cabinet secretary shall, in consultation with relevant lead agencies, issue guidelines and prescribe measures on climate change.
National Climate Change Response Strategy, 2010	• The mission is to strengthen and focus nationwide actions towards climate change adaptation and GHG emission mitigation.
Kenya Climate-Smart Agriculture Strategy (CSA) 2017–2026	The strategy is intended to support adaptation to climate change and build the resilience of agricultural systems while minimising emissions, for enhanced food and nutritional security and improved livelihoods. • The strategy was subjected to wider stakeholder consultations that brought together all 47 counties. • Nakuru County does not have a county CSA strategy. However, the national CSA strategy has provision for the county agriculture sector ministries, departments, and agencies (MDAs) to spearhead the implementation of the identified strategies in the counties.
Draft Climate Change Policy, 2018	This policy was developed to facilitate a coordinated, coherent, and effective response to the local, national and global challenges and opportunities that climate change presents.
Sector Plan for Drought Risk Management and Ending Drought Emergencies 2013–2017	The plan sets 2030 mitigation targets defined in Kenya's NDC.

Policy documents	Mitigation and adaptation provisions
National Disaster Risk Management Policy, 2018	The policy lays down strategies for ensuring that the government commits itself to the enhancement of research in disasters and the formulation of risk reduction strategies.
Green Economy Strategy and Implementation Plan 2016–2030	• This strategy is expected to strengthen the resilience of economic, social, and environmental systems to the adverse effects of external shock. • GESIP is linked with the NCCAP 2013-2017, the NAP 2016-2030, and the National Climate Change Act, 2016. • Strategies under the thematic area of building resilience: – Promote livelihood diversification for vulnerable communities; and – Enhance disaster risk reduction measures.
National Spatial Plan 2015–2045	The National Spatial Plan supports the mainstreaming of climate change into the national and county planning processes.
The Value Added Tax (Amendment) Act, 2014	The Act offers an exemption from value-added tax (VAT) and import duties for supplies imported or bought for the construction of a power-generating plant or geothermal exploration. Kenya is expanding geothermal projects to generate clean energy and cut GHG emissions.
Public Finance Management (Climate Change Fund) Regulations, 2018	The regulations provide financing mechanisms to priority climate change actions and interventions, and empower counties to develop climate finance policy frameworks.
The Public Finance Management (National Drought Emergency Fund) Regulations, 2018	The regulations are meant to guide the operations of the National Drought Emergency Fund which is to be established to improve the effectiveness and efficiency of drought risk management systems in the country as well as to provide a common basket of emergency funds for drought risk management.
National Policy on Climate Finance (draft), 2016	The policy recognises that climate finance is an important enabling aspect of efforts to address climate change. It prepares the country to tap into external and internal climate finances to support mitigation and adaptation activities. It highlights that significant financial resources from the public and private sectors are expected to be channelled towards climate activities.
The Kenya National Green Climate Fund (GCF) Strategy, 2017	• The strategy strengthens national capacity to effectively and efficiently plan for, access, manage, deploy and monitor climate financing, through the GCF. • It recognises that the country must boost the mobilisation of adequate and predictable financial resources from domestic and international sources. Notably, county governments are critical co-financiers and can take the role of Executing Entities and/or Implementing Entities of low-carbon and climate-resilient initiatives (The National Treasury, 2017).
National Food and Nutrition Security Policy (FNSP), 2011	• The policy acknowledges that the current food crisis is fuelled by new driving forces such as climate change; and adaptation interventions that enhance farming communities' resilience to climate change induced effects are critical for the realisation of the principal objectives of FNSP. • It promotes the integration of climate change adaptation in development programmes and policies. • It improves forecasting of climate change and supports communities to respond to new opportunities and challenges. • However, it doesn't detail how to engage the counties to realize the FNSP.

Policy documents	Mitigation and adaptation provisions
Kenya Youth Agribusiness Strategy 2017–2021	• The strategy positions youth at the forefront of agricultural growth and transformation. • It has identified strategic issues which include Strategic Issue 10: Negative impacts of climate change and weak environmental governance (Ministry of Agriculture Livestock & Fisheries and the Council of Governors, 2017). • The MoEF in consultation with the county governments and development partners have developed the strategy with a view to increasing meaning and sustainable youth participation in the agricultural sector.
Climate Change Indicator Development Guidebook, 2018	• The guidebook identifies climate change indicators at national and county level.

Table 2: County-level policy and regulatory framework

Policy documents	Mitigation and adaptation provisions
Draft Nakuru County Climate Change Plan 2018–2022	Provides the following vision: *"Nakuru County has a low-carbon, climate-resilient economy that sustains the livelihoods of its citizens while contributing to the national development agenda."* • Anticipated to be achieved through eight strategic objectives, namely: – Food security – Water security – Ecosystem conservation for sustainable economic development – Green energy production and use – Climate change resilient infrastructure – Knowledge management and capacity building of community, stakeholders, and county officials – Sustainable financing for climate change action – Governance and coordination of climate change adaptation and mitigation
Second County Integrated Development Plan (CIDP) 2018–2022	• This plan provides policy advice and tools with strategic focus and programme implementation frameworks and support to tackle climate change.
Nakuru County Climate Change Fund Bill (at time of writing it was at the 2nd Reading at the County Assembly), 2020	• The Bill provides for mobilisation of local climate finance and leveraging of international climate finance for county-led climate actions.
Nakuru County Climate Change Bill, 2020	• The Nakuru Climate Change Bill aims to put in place a framework and mechanisms for the mobilisation and facilitation of county government, communities and stakeholders to respond effectively to climate change. The response mechanisms will be through appropriate adaptation and mitigation measures and action.

Policy documents	Mitigation and adaptation provisions
The Nakuru County Charcoal Bill, 2014	• This Bill promotes mitigation by supporting energy-efficient technologies, a gradual exit from the use of charcoal, and the control of tree harvesting for charcoal production. • Establishes the County Environmental Committee.
Nakuru County Waste Management Bill, 2019	• This Bill promotes mitigation by facilitating appropriate waste management and utilisation to generate clean energy.
The Nakuru County Agricultural Training and Mechanisation Service Bill, 2019	• The Bill establishes the Agricultural Development Fund. • It promotes mitigation and aims to reduce inappropriate land preparation technologies such as burning.
The Nakuru County Urban Agriculture Promotion and Regulation Bill, 2015	• This Bill promotes mitigation by including urban agriculture in the county as a way of maximising space, introducing green spaces, and using organic waste.

2.2 Key stakeholders, their roles and responsibilities

At the national level, the key stakeholder for adaptation planning and implementation is the National Climate Change Secretariat (NCCS) as detailed in **Table 3**.

Table 3: National-level stakeholders

Institution	Coordination units	Role	Adaptation commitments
National Climate Change Secretariat (NCCS)	Ministry of Environment and Natural Resources	National Focal Point for the UNFCCC	Kenya National Adaptation Plan 2015–2030 Mainstreaming the National Climate Change Act, 2016 Implementation of the Climate Change Action Plan 2018–2022
	Ministry of Devolution and Planning	Ensure the integration of climate change in the MTPs	
	National Environmental Management Authority (NEMA)	National Implementing Entity (NIE) for the Adaptation Fund and the GCF	
	National Treasury	National Designated Authority for the GCF	
	National Drought Management Authority (NDMA)	• Exercises overall coordination over all matters relating to drought management in Kenya; • Oversees adaptation and resilience-building in the arid and semi-arid areas (ASALs); • The secretariat of the Common Programme Framework in Ending Drought Emergencies in Kenya.	

County-based adaptation stakeholders are mainly departments within the Nakuru County Government in charge of County Integrated Development Plans (CIDPs), climate change, and adaptation planning such as the Department of Water, Environment, Energy and Natural Resources and the Department of Agriculture, Livestock, and Fisheries. The county Executive Committee including subcounty administration and chiefs are also relevant in adaptation action planning.

Community-based initiatives include several CBOs such as the Sustainable Community Development Services (SCODE) working with local communities (e.g. distribution of solar home systems and clean cooking equipment, access to water, forestry programmes, etc.). Relevant associations for adaptation efforts include the Nakuru County Water Resource User Associations (WRUAs) and Community Forest Associations (CFAs). There are also private sector players such as the M-KOPA and Water & Sanitation Services Co. Ltd. (NAWASCO).

2.3 Current adaptation targets and commitments in Kenya and Nakuru County

Nationally Determined Contribution (NDC), updated 2020:

Kenya ratified the Paris Agreement on 26th December 2016. This binds the country to reducing greenhouse gas emissions and responding to the impacts of climate change. The Paris Agreement is domesticated in Kenya through the Nationally Determined Contribution (NDC) that sets out the country's actions towards achieving the global goals set out in the Paris Agreement. As noted above, in the updated version of Kenya's First NDC (2020), Kenya committed to:

- Enhancing the adaptive capacity and climate resilience across all sectors of the economy and the two levels of government – national and county governments;
- Exploring innovative livelihood strategies for enhancing climate resilience of local communities through financing of locally led climate change actions;
- Enhancing the risk-based approach to climate change adaptation through the development and application of comprehensive climate risk management tools that would help in addressing and adaptively managing climate risks;
- Addressing residual climate change impacts, loss and damage especially in the productive sectors of the economy;
- Enhancing generation, packaging and widespread uptake and use of climate information on decision-making and planning across sectors and counties with robust early warning systems (EWS);
- Enhancing uptake of adaptation technology especially by women, youth and other vulnerable groups, incorporating scientific and indigenous knowledge;
- Enabling institutional strengthening of the Climate Change Units and related institutions across sectors and counties as well as non-state actor institutions; and
- Strengthening tools for adaptation monitoring, evaluation and learning (MEL) at the national and county levels, including non-state actors.

The vision outlined in the 2020 NDC is as follows: *"Kenya aims to ensure a climate-resilient society, this is to be achieved through mainstreaming climate change adaptation into the Medium-Term Plans (MTPs) and County Integrated Development Plans (CIDPs) and implementing adaptation actions. Subject to national circumstances, Kenya intends to mobilise domestic resources to cater for 10% of the adaptation cost, while 90% of the adaptation cost will require international support in form of finance, technology development and transfer, and capacity building."*

Environment sector targets include, but are not limited to:

- Greening of 14,000 ha of infrastructure (roads, railway lines, dams); and
- Strengthening early-warning and tailor-made climate information services through institutional strengthening of KMD and other information user institutions.

Agriculture sector targets include, but are not limited to:

- Mainstreaming climate-smart agriculture; and
- Building resilience of the agriculture (crops, livestock and fisheries) systems through sustainable management of land, soil, water and other natural resources as well as insurance and other safety nets.

Water and Sanitation sector targets include, but are not limited to:

- Conducting and implementing recommendations on climate and risk assessments on water, sanitation and irrigation infrastructure;
- Promoting water harvesting at county and household levels; and
- Building resilient infrastructure for the protection of dams, dykes and rivers

National Adaptation Plan, 2015:

The vision of the NAP is *"enhanced climate resilience towards the attainment of Vision 2030"*. Enhanced climate resilience includes strong economic growth, resilient ecosystems, and sustainable livelihoods for Kenyans. It will also result in: reduced climate-induced loss and damage, mainstreamed disaster risk reduction approaches in various sectors, reduced costs of humanitarian aid, and improved knowledge and learning for adaptation and the future protection of the country.

The objectives of the NAP are to:

- Highlight the importance of adaptation and resilience building actions in development;
- Integrate climate change adaptation into national and county-level development planning and budgeting processes;
- Enhance the resilience of public and private-sector investment in the national transformation, economic and social and pillars of Vision 2030 to climate shocks;
- Enhance synergies between adaptation and mitigation actions in order to attain a low-carbon, climate-resilient economy; and
- Enhance resilience of vulnerable populations to climate shocks through adaptation and disaster risk reduction strategies.

Actions under the NAP include, but are not limited to:

- Strengthen early warning and climate information services through improving the 'Climate Information Service Providers' network;
- Enhancing integration of local/indigenous knowledge into early warning systems;
- Enhance collaboration of trans-boundary water resource management;
- Enhance collaboration of trans-boundary water resource management;
- Strengthen and expand social protection and insurance mechanisms against main climate hazards; and
- Develop and up-scale specific adaptation actions – promotion and bulking of drought-tolerant traditional high-value crops; water harvesting for crop production; index-based weather insurance; conservation agriculture; agro-forestry; and Integrated soil fertility management.

National Climate Change Action Plan 2018–2022:

This plan builds on the first Action Plan 2013–2017 and provides a framework for Kenya to deliver on its NDC under the Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC). As outlined in **Table 4**, the NCCAP 2018–2022 aims to further Kenya's development goals by providing mechanisms and measures to achieve low-carbon, climate-resilient development in a manner that prioritises adaptation.

Table 4: The aim of the NCCAP, the seven priority climate action areas, their strategic objectives and main actions

Kenya's National Climate Change Action Plan 2018–2022			
Aim: To further Kenya's sustainable development by providing mechanisms and measures to achieve low carbon climate resilient development in a manner that prioritises adaptation.			
Disaster (Drought and Floods) Risk Management	**Food and Nutrition Security**	**Water and the Blue Economy**	**Forestry, Wildlife and Tourism**
Reduce risks to communities and infrastructure resulting from climate-related disasters such as droughts and floods. • Increase number of households and entities benefiting from devolved adaptive services • Improve ability of people to cope with drought • Improve ability of people to cope with floods and increase resilience of infrastructure • Improve coordination and delivery of disaster risk management activities to effectively deal with drought, floods, landslides, disease outbreaks and other disasters	**Increase food and nutrition security through enhanced productivity and resilience of the agricultural sector in as low- carbon manner as possible.** • Improve crop productivity through the implementation of climate-smart actions • Improve crop productivity by increasing the acreage under irrigation • Increase productivity in the livestock sector through implementation of priority climate-smart actions • Enhance productivity in the fisheries sector through implementation of priority climate-smart actions • Diversify livelihoods to adjust to a changing climate	**Enhance resilience of the Blue Economy and water sector by ensuring access to and efficient use of water for agriculture, manufacturing, domestic, wildlife and other uses.** • Increase annual per capita water availability through the development of water infrastructure • Climate proof water harvesting and water storage infrastructure and improve flood control • Promote water efficiency (monitor, reduce, re-use, and recycle) • Develop green infrastructure • Improve climate resilience of coastal communities	**Increase forest cover to 10% of total land area; rehabilitate degraded lands, including rangelands; increase resilience of the wildlife and tourism sector.** • Afforest and reforest degraded and deforested areas in Counties • Implement initiatives to reduce deforestation and forest degradation • Restore degraded landscapes (ASALs and rangelands) • Promote sustainable timber production on privately-owned land • Conserve land areas for wildlife

Kenya's National Climate Change Action Plan 2018–2022		
Aim: To further Kenya's sustainable development by providing mechanisms and measures to achieve low carbon climate resilient development in a manner that prioritises adaptation.		
Health, Sanitation and Human Settlements	**Manufacturing**	**Energy and Transport**
Mainstream climate change adaptation into the health sector; and increase the resilience of human settlements, including improved solid waste management in urban areas. • Reduce incidence of malaria and other vector-borne disease • Promote recycling to divert collected waste away from disposal sites. • Climate proof landfill sites • Control flooding in human settlements • Promote green buildings	**Improve energy and resource efficiency in the manufacturing sector.** • Increase energy efficiency • Improve water use and resource efficiency • Optimise industrial and manufacturing processes • Promote industrial symbiosis in industrial zones	**Climate-proof energy and transport infrastructure; encourage electricity supply based on renewable energy; encourage the transition to clean cooking; and develop sustainable transport systems.** • Promote the transition to clean cooking with alternative clean fuels such as LPG in urban areas, and clean biomass (charcoal and wood) cookstoves and alternatives in rural areas • Increase renewable energy for electricity generation • Climate proof energy and transport infrastructure • Develop an affordable, safe and efficient public transport system, including a Bus Rapid Transit System in Nairobi • Reduce fuel consumption and fuel overhead costs, including electrification of the Standard Gauge Railway • Promote low-carbon action in the aviation and maritime sectors

Nakuru County Climate Change Action Plan 2018–2022:

Aligned with these national ambitions and commitments, Nakuru County, through the Nakuru County Climate Change Action Plan 2018–2022, is guided by the vision: *"Nakuru County has a low-carbon, climate-resilient economy that sustains the livelihoods of its citizens while contributing to the national development agenda." The goal of the plan is to "mainstream climate change adaptation and mitigation strategies in the economic production and development activities to improve the living standards of Nakuru County residents"*.

The county commits to achieve this goal through eight strategic objectives namely:

1. Enhanced food security
2. Enhanced water security
3. Ecosystem conservation for sustainable economic development
4. Green energy production and use
5. Climate change resilient infrastructure
6. Knowledge management and capacity building of community, stakeholders and county officials
7. Sustainable financing for climate change action
8. Governance and coordination of climate change adaptation and mitigation

Actions for each of these objectives have been developed and prioritised in the Action Plan but are not yet quantified and measurable. Only adaptation initiatives already in place or in the pipeline such as the GCF project titled "Climate-Resilient Aggregation, Storage, Warehousing Receipts, and Trading Facility for Dry Grains in Nakuru County, Kenya" are being refined for implementation. The Nakuru SEACAP will enable additional actions from the County Climate Change Action Plan to be developed further.

The national and local commitments described in detail above will form the bedrock of the targets and actions set in Nakuru's SEACAP. The SEACAP will particularly build on the Nakuru County Climate Change Action Plan, the second CIDP 2018–2022 and current adaptation initiatives[1] in the county. In terms of budget, the second CIDP has already allocated budget for climate change actions as detailed in **Table 5**.

Table 5: Total budget allocated for climate change actions (Nakuru CIDP 2018–2022)

Subprogramme	Key output	Key performance indicators	Total budget (KSh)
Promotion of climate-smart agriculture	Increased adoption of climate change mitigation/adaptation strategies	Number of water pans constructed, greenhouses installed, soil testing kits procured, farmers trained, staff trained, soil samples	10,000,000
Climate change	Increased climate change resilience	Climate Change Action Plan in place	5,000,000
	Updated climate information	Percentage implementation of the Climate Change Action Plan	
	Climate and weather information disseminated	No. of automatic weather stations (AWS) established and operationalised	65,000,000
		RANET community radio stations established	
	1 million-plus trees grown per year, increased forest cover	No. of trees grown, % increase in forest cover, sustained water sources	500,000,000

[1] For example, the GCF agricultural project under development, the Green Belt Movement, and urban greening research currently conducted in Nakuru Town by the Stockholm Environmental Institute.

3. RVA methodology

This section describes the methodology used to develop the RVA, the first step in the Adaptation pillar of the SEACAP for Nakuru County. Data informing the development of the RVA was gathered through three separate methodologies, namely: primary data collection, secondary data collection and stakeholder consultations and multi-stakeholder workshops. The data needs and possible data sources were identified through continuous review, consultations with the Nakuru County Government, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), ICLEI Africa and various stakeholders guided by the scientifically grounded Joint Research Center (JRC) guidelines for the SEACAP development. The RVA was therefore developed in three phases outlined below.

3.1 Phase 1: Inception, situational analysis and review of secondary databases

The first step involved scanning secondary databases such as the Climate Information Platform, reviewing policy and academic documents relevant to climate change in Nakuru (as indicated in Section 2.1), and consulting key stakeholders (including the county and national government agencies) to develop a detailed situational analysis as well as build datasets. More specifically, this phase involved compiling historical and projected climate trends for Nakuru using: (i) satellite climate data retrieved from the archives of the Kenya Meteorological Department (KMD) as well as from the Nakuru meteorological station through the Climate Information Platform (CIP); (ii) the Nakuru County Climate Risk Profile for Nakuru County 2016 from the Ministry of Agriculture; (iii) key relevant documents such as the National Climate Change Action Plan 2018–2022, the Kenya National Adaptation Plan 2015–2030, the Nationally Determined Contribution 2020, and the draft Nakuru Climate Change Action Plan from the Ministry of Environment (Climate Change Unit) and from the Kenya Climate Working Group[2]. Country archives also provided useful information including reports that indicate the county's efforts towards adaptation planning. The secondary data also provided an overall indication of Nakuru county's adaptation efforts, however largely reflected climate change impacts and vulnerability at the national scale.

3.2 Phase 2: Primary data collection through household surveys

The second step involved primary data collection within Nakuru County to ground truth the secondary data as well as contextualise some of the national-level climate impacts and vulnerability data to the county context. The primary data was mainly collected through household surveys using questionnaires based on a representative household sample drawn from the eleven subcounties of Nakuru.

Before designing the sample size and household interviews, a rapid appraisal was undertaken through consultative discussions with selected key stakeholders, including: county government through the Environment Department, national government stakeholders, representatives of the Nakuru Kenya Power & Lighting Co Ltd office and the Kenya Bureau of Statistics (Nakuru office), the non-governmental organisation World Vision, and the community-based organisation Sustainable Community Development Services (SCODE) working on climate change and energy issues in the area. The rapid appraisal was aimed at identifying and characterising the subcounties and collectively designing appropriate and representative sample sizes.

Through close consultation with the county government, random stratified sampling was adopted and designed to capture the physical and socio-economic diversity of the county's situation in terms of climate change adaptation. The sampling process drew from the household population of 616,046 in the county based on recently concluded national housing and population 2019 census results (KNBS, 2019). Using Solvin's formula (Eq. 1), a sample size of 400 was arrived at against the total household population within a confidence limit of 95%, and an error margin of 0.05 only. An additional 20 households were also selected for testing/piloting the data collection alongside the survey, bringing the total sample to 420 households (i.e. the statistical sample plus the test sample).

[2] The Kenya Climate Working Group is a national network of civil society organisations.

N = Total population
N = Sample size = N ÷ (1 + Ne^2).
N = Number of households in the county = 616046 households
e = error margin (0.05)
n = Sample size
n = $1000/(1 + 1000 \times 0.05 \times 0.05)$
n = 399.74 ≈400

Equation 1: Household sample calculation

The initial appraisal noted that households' groups in Nakuru are heterogeneous, and are made up of diverse social groups experiencing climate change impacts differently, due to differentiated adaptative capacity. As such, the collective 420-sample size was differentiated through three main categories that capture this heterogeneity and defines adaptation actions:

i. Geographical contexts – where samples were distributed in each of the 11 subcounties based on subcounty households' numbers;
ii. Gender – where samples were drawn from both male and female-headed households; and
iii. Wealth ranking – where we applied income-based wealth ranking (Scoones, 1995) to differentiate households into various wealth categories and draw insights on how income defines adaptation action.

The 420 households distributed across the subcounties were contacted for telephone interviews. Of these, just 9 declined to participate in the survey.

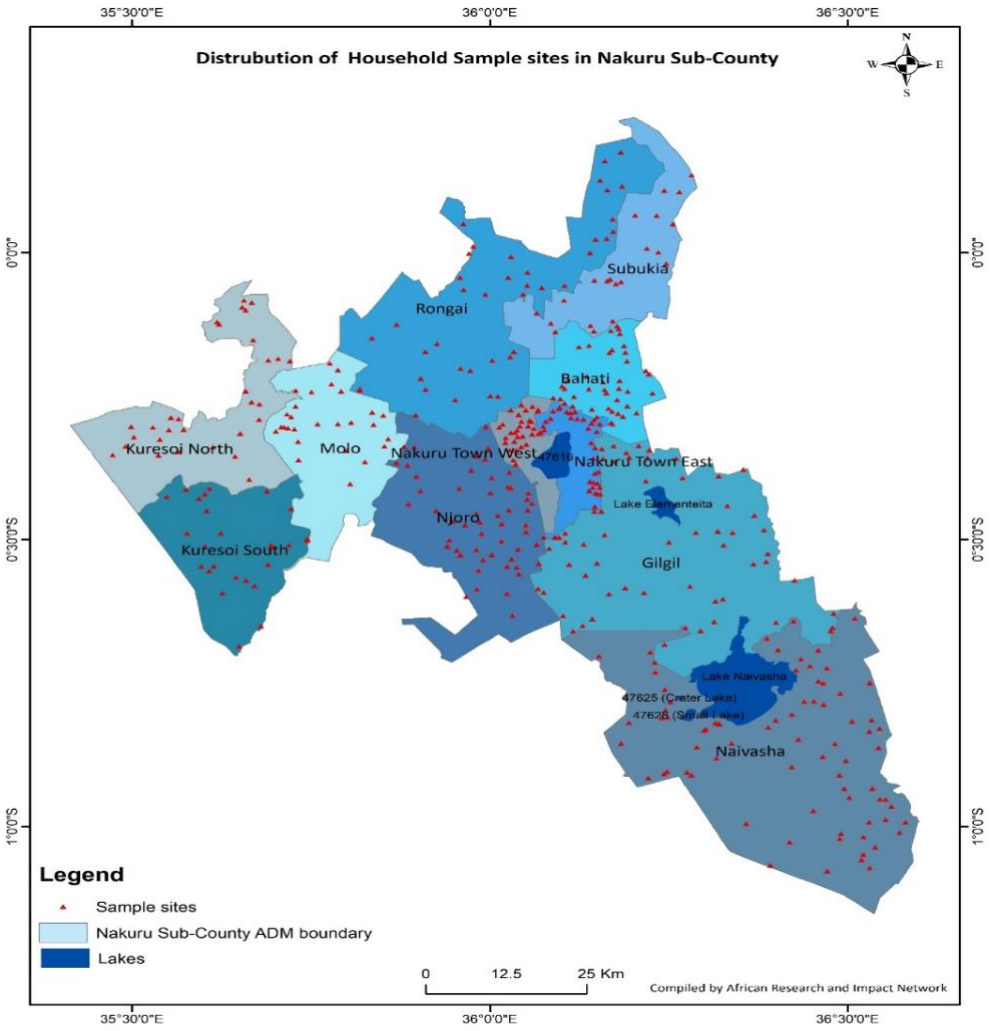


Figure 4: Household random distribution sample sites in Nakuru subcounty

During the survey, 56% of men and 44% of women, mostly between 35–44 years old, were interviewed. 67% of households headed by males. The majority of those interviewed had secondary education.

Table 6: Demographic characteristics of interviewed households

Variable	Number of interviewees	Percentage
Gender of the respondent		
Male	235	56
Female	185	44
Education level		
Pre-school	4	1
Primary	109	26
Secondary	185	44
Tertiary	122	29
Age of the respondent		
<65 Years	21	5
18–24 Years	17	4
25–34 Years	84	20
35–44 Years	126	30
45–54 Years	101	24
55–64 Years	71	17
Household main earner		
Child	25	6
Father	281	67
Mother	105	25
Don't know	4	1
Both parents	4	1

To effectively execute the interviews amidst the Covid-19 restrictions, virtual data collection was collected using the Kobo toolbox along with telephone interviews. The phone numbers of the 420 households were acquired and verified through the subcounty officers working under the County Government of Nakuru. Twelve field assistants who were tasked with undertaking the interviews were taken through a two-day face-to-face training covering the overall introduction to the SEACAP process and aims, virtual data collection process using phone interviews, the use of the Kobo toolbox, and general ethics in engaging households amidst Covid-19.

Pilot interviews were executed with a sample of twenty households during the training session, allowing for testing of the tool's effectiveness, identifying gaps, and timely remedial guidance. The actual data collection then commenced two days after the training and involved phone call interview surveys with the sampled households. The Kobo toolbox aided the monitoring of the data collection process by allowing audio recording of the interviews to verify and authenticate the information collected as well as monitor the enumerator's performance.

The interviews captured both qualitative and quantitative aspects of adaptation including asset profiles, climate impact experiences, adaptation actions preferred, and general climate data. Premised on the assumption that the respondents had not made prior contacts with study questions, all the information obtained was classified as primary raw data as they emerged from the study context without any tinkering.

Data acquired were subjected to several stages of analysis which included the use of a GIS environment to visualise the sampled households and the spatial representation of the different variables collected. Microsoft Excel and SPSS were also used to undertake qualitative and quantitative analysis. Qualitative data drawn from the interviews and stakeholder engagements were coded to draw out themes (Hopkins, 2007). The household questionnaire is included as Annexure 1.

3.3 Phase 3: Stakeholder workshops and consultations

The primary and secondary data on climate hazards and adaptation actions were complemented with two participatory workshops to provide insights on policy and technical elements of the assessments.

The first workshop held on 19th January 2021 aimed at bringing together policymakers and decision-makers to provide inputs on the county's climate change planning and to reflect on the SEACAP adaptation planning process and progress. This workshop brought together approximately 23 high-level decision-makers who acknowledged the preliminary findings and made substantive inputs, mostly in terms of barriers and opportunities to adaptation planning.

The second workshop held on 21st January 2021 focused on bringing together the technical teams from different sectors at the country and national level to review and confirm the key risks, hazards, and adaptive capacity indicators across the 11 subcounties. This second workshop brought together approximately 33 stakeholders, including the technical officers from the county government's various sectors, as well as representatives from national government agencies and ministries, civil society organisations, universities, private sector and non-governmental organisations.

In addition to supporting the RVA assessment through policy and technical outputs, the two workshops were also intended to create awareness and promote co-ownership of the climate change action planning process in Nakuru. While the policy workshop was undertaken virtually, the technical workshop was executed physically and virtually (hybrid workshop) in Nakuru with key technical teams working in groups to provide risk and vulnerability data guided by specified RVA matrices. The two detailed workshop reports are included in Annexure 2 and 3 of this report.

Figure 5: Risk and Vulnerability Assessment workshop in Nakuru on 19 January 2021

4. Historical and projected climate change

4.1 Historical climate

According to the World Bank Climate Change Knowledge Portal, Kenya's climate ranges from tropical (along the coast) to arid (in the mountain regions). The average temperature across the country is 24°C and the mean annual precipitation is 669 mm. The rainy season in Kenya usually begins in March and decreases in May to June. Since 1960, Kenya's mean annual temperature has increased by 1.0°C, at an average rate of 0.21°C per decade. The rate of increase has been most rapid in March to May (0.29°C per decade) and slowest in June to September (0.19°C per decade). Observations of rainfall over Kenya since 1960 do not show statistically significant trends, as trends in the extreme indices based on daily rainfall data are mixed.

According to the Nakuru County Climate Risk Profile (2016), Nakuru experiences a bimodal rainfall pattern, receiving heavy rainfall from March to June and low rainfall from September to November. On average, dry spells are longer around the second wet season ranging from 35 to 80 days in any given year. Around the first wet season, the dry spell ranges between 25 to 60 consecutive days every year. Extreme precipitation and flood risks are moderate in both seasons even though relatively higher in the first season.

Satellite data for rainfall (from Chirps) and temperature (from ERA-5) for the Nakuru Meteorological station analysed using the ORIGIN-Pro software also shows that the climate is shifting at the county level. Since 1981, the county has experienced a moderate (1°C) increase in mean temperature accompanied by increased heat stress, especially in the first wet season, with an associated reduction in the crop cycle; the second wet season has experienced a mild (~0.5°C) increase in temperature and no precipitation change.

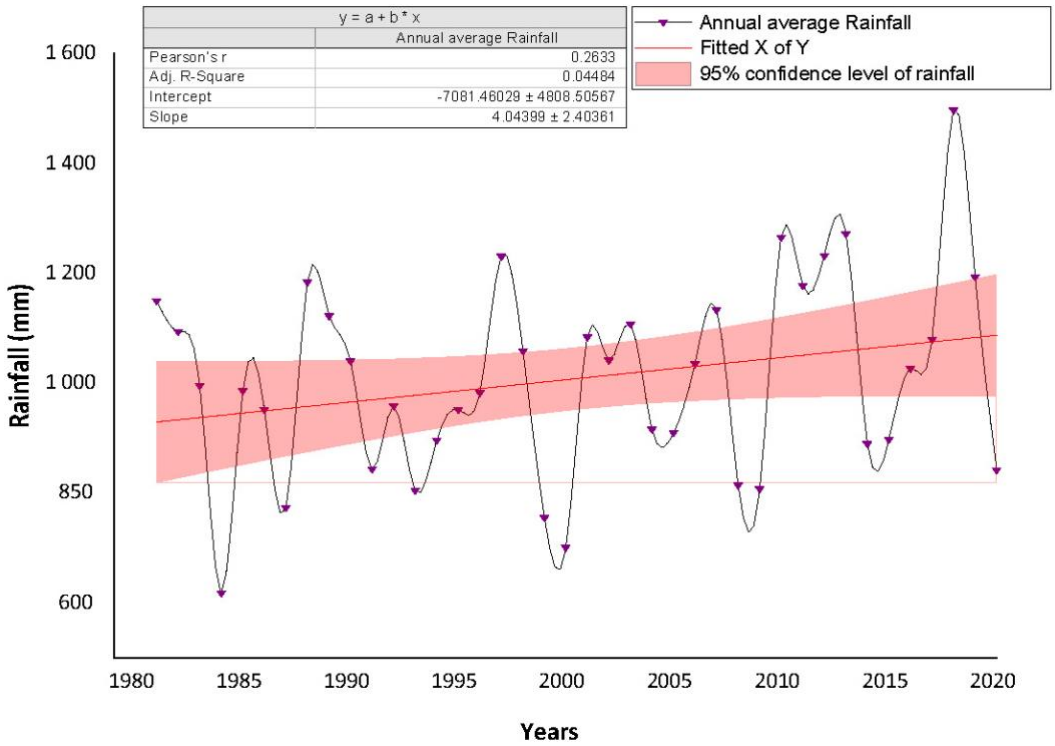


Figure 6: Historical annual rainfall for Nakuru County from 1981–2020 (Source: ACTS analysis, 2021)

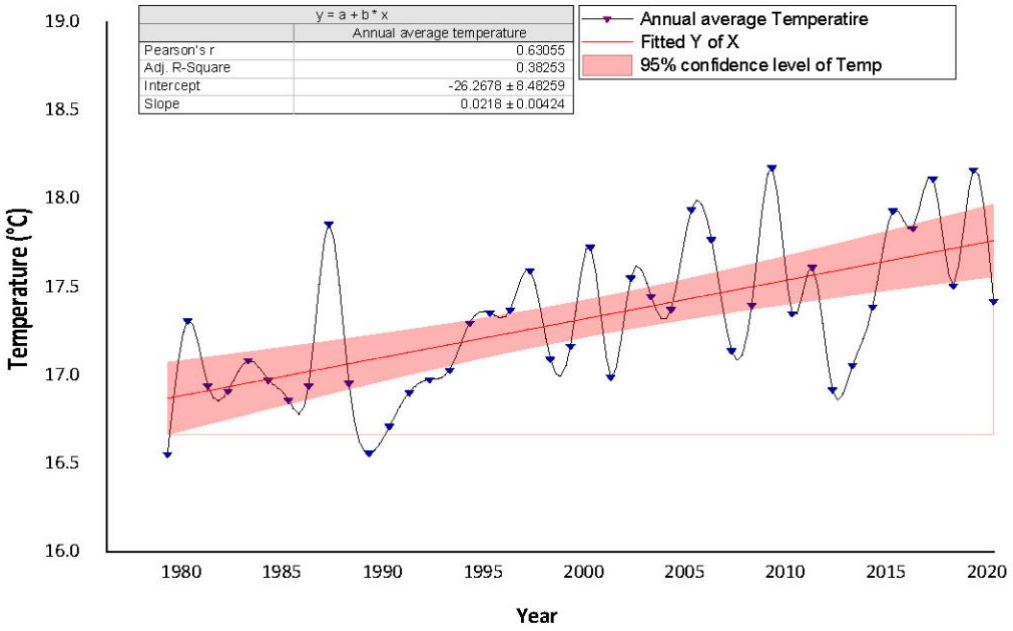


Figure 7: Historical temperature of Nakuru County from 1979–2020 (Source: ACTS analysis, 2021)

4.2 Projected climate change

The World Bank Climate Change Knowledge Portal uses the global climate model CMIP5 (RCP 8.5) to project future temperature and rainfall trends over Kenya. According to this widely used model, the mean annual temperature in Kenya is expected to increase by 1.0°C to 2.8°C by 2060 and annual rainfall is expected to increase between October and December as well as between March and May.

The Climate Systems Analysis Group (CSAG) from the University of Cape Town (UCT) has developed the Climate Information Platform (CIP) which seeks to provide climate-related information at downscaled levels. Utilising data collected from weather stations located in towns across the African continent (including the Nakuru weather station), the CIP runs a series of climate models which collectively provide a database of historical climate patterns as well as future projections for regions and districts throughout the world. Future climate projections for Nakuru are therefore taken from the CIP data based on the Nakuru weather station. It is important to note that the climate models only provide an estimated projection of potential climate shifts based on data that is currently available; the climate models do not a forecast a definite outcome.

In terms of temperature, the climate models all agree that warming within the Nakuru County will almost certainly occur and that there will be an overall increase in average monthly temperatures by between 1°C and 2.5°C by 2060. The data also indicates that there will be an increase in heat wave duration, especially in January and February.

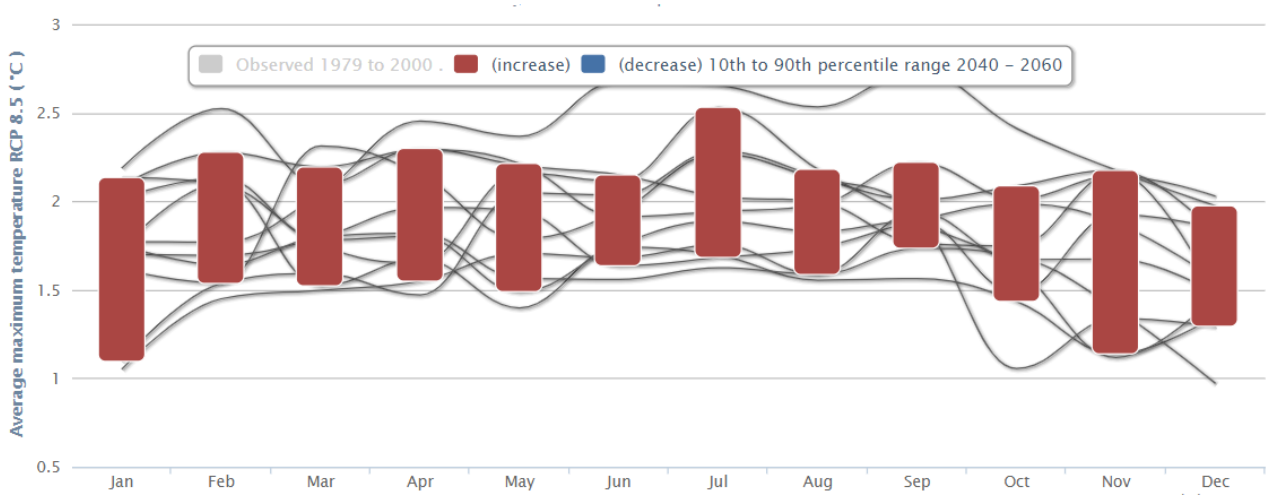


Figure 8: Average maximum monthly temperature in Nakuru for the period 2040–2060

This is calculated relative the historical period 1980–2000 under RCP 8.5. The solid wavy black lines in the graph each indicate an individual climate model run for the region (in this case, 11 separate climate models); and the solid red bars indicate the range of potential for increase in monthly temperatures for each month according to the 11 separate climate models.

In terms of rainfall, the climate models all agree that shifts in the historical rainfall patterns will also almost certainly occur. However, the models do not agree on the direction of change and as such there is uncertainty as to whether there will be an overall increase or a decrease in annual rainfall in Nakuru County.

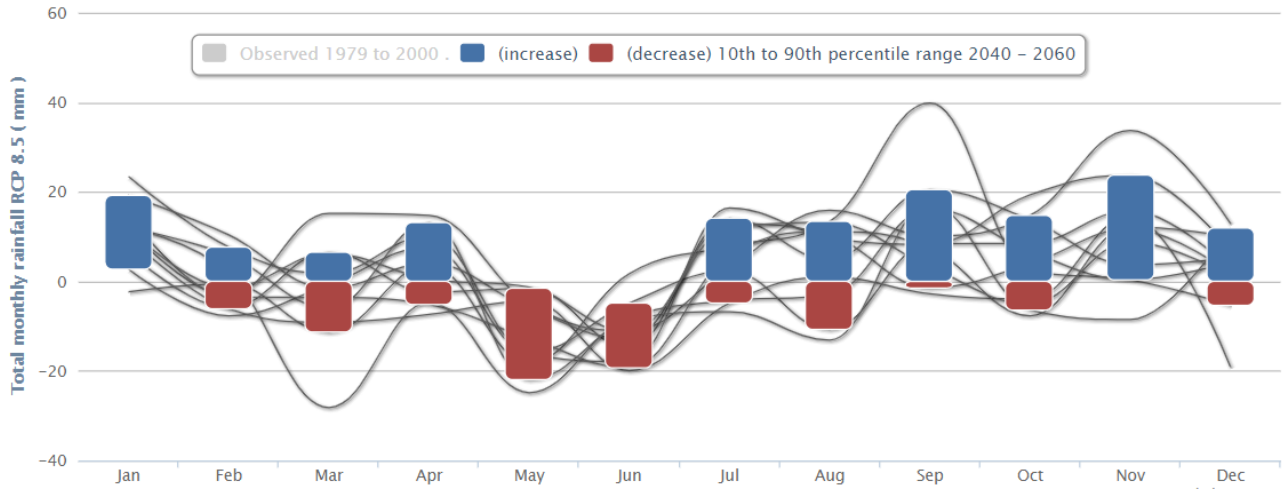


Figure 9: Total monthly rainfall in Nakuru for the period 2040–2060

This is calculated relative the historical period 1980–2000 under RCP 8.5. The solid wavy black lines in the graph each indicate an individual climate model run for the region (in this case, 11 separate climate models). The solid red bars indicate a range of potential decreases in rainfall for each month, whilst the solid blue bars indicate a range of potential increases in rainfall for each month. Where both blue and red bars are present for one month, it indicates there is uncertainty for that month and that the rainfall could either increase or decrease for that month.

5. Current and future climate hazards and their magnitude of impact

The framework of the current GCoM Common Reporting Framework (CRF) (September 2018) and the JRC Guidebook (2018) states that cities must identify the most significant climate risks facing their jurisdiction and then determine the current level of risk (probability and consequence) associated with each risk.

As noted above, to determine the most significant climate hazards experienced in Nakuru, three data sources were used: (i) the household survey; (ii) the technical workshop with key stakeholders; and (iii) secondary literature and governmental reports. The outcomes of these findings are illustrated below.

5.1 Current climate hazards

The household survey (HHS) indicates that, in the last 5 to 30 years, the county has experienced a range of climate hazards including floods, droughts, extreme hot and cold temperatures[3], rainstorms, and hailstorms. Incidences of wildfires, landslides, fog, and lightning strikes have also been identified, albeit on a lower scale. Scanning through the same period, the respondents identified floods and droughts as major climate hazards in the county. Fires are more common in Kuresoi South, while floods more common in Naivasha. The probability of hazard occurrence varies depending on the exposure of respondents. From the survey, it was depicted that floods (55.8%), droughts (49.3%), rainstorms (47.9%), lightning strikes (44.4%), and extremely cold temperatures (44.3%) had a high probability of occurrence. The majority of respondents (51.2%) reported that extremely hot temperatures have a moderate probability of occurrence. Even though fire is reported as a major hazard, its occurrence alongside hailstorms and landslides is rated low, but the damage caused by fire whenever it does occur is relatively severe.

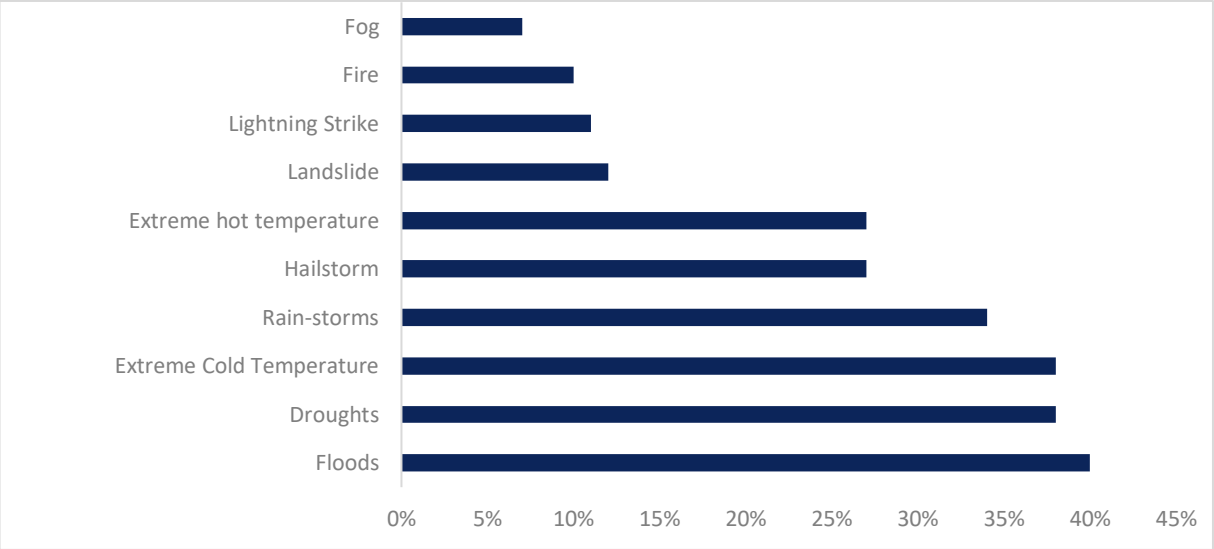


Figure 10: Climate hazards identified by the HHS

[3] These are defined as hotter or colder than usual, noting that the Nakuru County average temperature is between 17°C and 21°C.

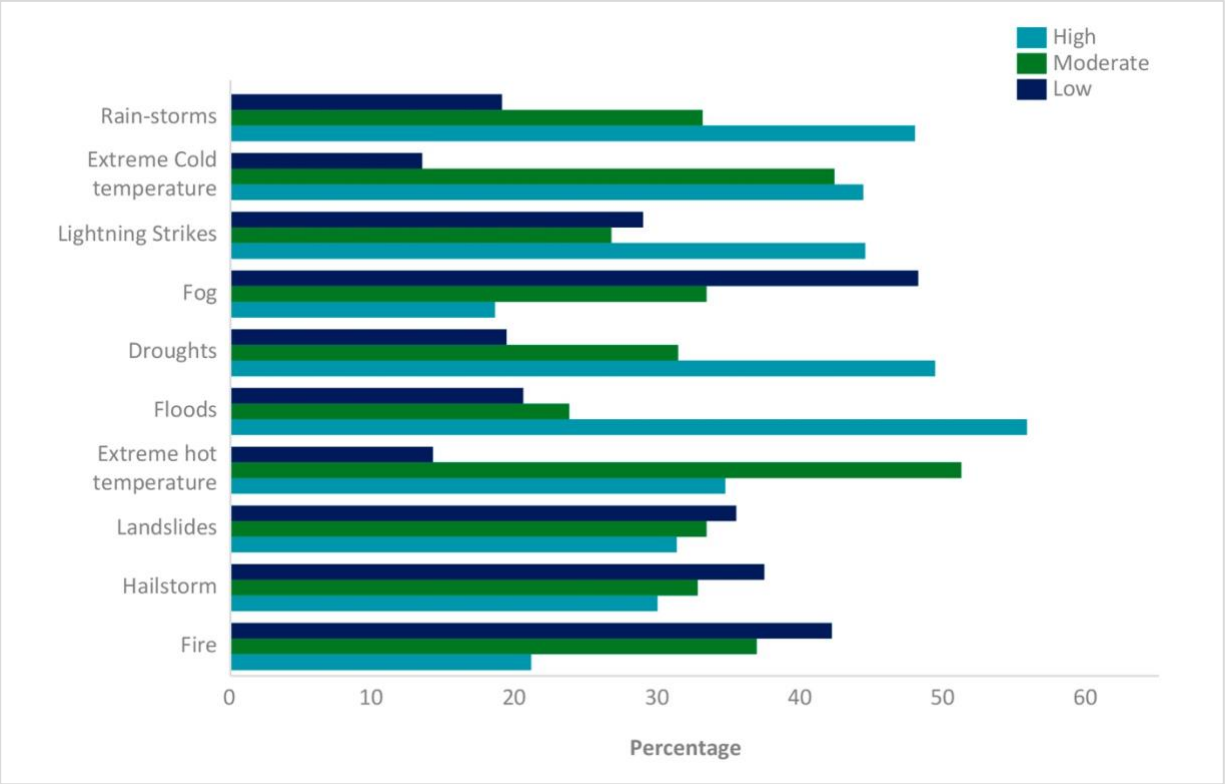


Figure 11: Probability of occurrence of climate hazards in the last 5 to 30 years, identified by the HHS

Table 7: Common climate hazards in Nakuru subcounties, identified by HHS

Climate Risks	Nakuru Sub-County										
	Bahati	Gilgil	Kuresoi North	Kuresoi South	Molo	Naivasha	Nakuru Town East	Nakuru Town West	Njoro	Rongai	Subukia
Fires	5%	3%	24%	27%	4%	9%	5%	13%	0%	15%	21%
Hailstorms	10%	27%	44%	32%	35%	20%	21%	48%	11%	42%	50%
Landslides	3%	14%	12%	0%	4%	24%	5%	20%	3%	9%	43%
Hot temperatures	44%	27%	24%	77%	27%	32%	26%	20%	29%	36%	43%
Floods	36%	35%	28%	9%	31%	64%	47%	50%	26%	42%	50%
Droughts	23%	41%	56%	73%	12%	42%	21%	40%	37%	42%	79%
Fog	3%	8%	28%	0%	0%	3%	3%	3%	11%	21%	7%
Lightning	8%	14%	40%	9%	8%	5%	0%	0%	3%	39%	36%
Cold temperatures	49%	32%	60%	59%	8%	31%	32%	23%	37%	58%	93%
Rainstorms	15%	41%	44%	36%	19%	18%	32%	43%	34%	48%	50%

The county stakeholders mobilised through the technical workshop, including the county sector representatives, were also asked to determine the most significant climate hazards experienced in Nakuru. The workshop participants generated more detailed rankings than the HHS, as shown in **Table 8** below. The stakeholders identified a range of hazards, however these were mostly aligned with the HHS results. The stakeholders identified floods, droughts, rainstorms, waterborne diseases, vector-borne diseases, airborne diseases, and insect infestation as the climate hazards most experienced across all the subcounties.

Table 8: Common climate hazards in Nakuru subcounties ranked by workshop participants on a scale of 0 to 5

Climate hazard	Nakuru subcounties										
	Rongai	Molo	K. North	K. South	Nakuru T W	Nakuru T E	Bahati	Gilgil	Naivasha	Njoro	Subukia
Rainstorms	3	3	5	5	3	3	4	2	4	3	1
Hail	1	4	2	3	1	0	4	0	2	2	1
Severe wind	2	1	1	1	2	1	2	1	3	0	0
Tropical storms	0	0	0	0	0	0	0	0	0	0	0
Thunderstorms/ Lightning	4	4	4	5	3	3	4	3	2	4	1
Extreme winter conditions	1	1	2	2	0	0	1	0	1	0	0
Cold waves	2	2	2	2	1	1	2	1	2	2	0
Extreme cold days	1	5	5	5	1	1	3	2	2	2	0
Heat waves	2	0	0	0	1	1	0	3	3	1	0
Extreme hot days	4	0	0	0	3	4	2	5	4	1	0
Droughts	5	4	3	4	5	5	4	5	5	3	1
Forest fires	2	2	1	1	2	2	4	2	2	2	0
Land fires	3	0	0	0	2	2	2	2	4	1	0
Flood/Surface floods	4	3	2	2	4	3	4	3	4	3	1
River floods	2	3	0	0	3	1	1	5	4	4	0
Groundwater floods	2	1	0	0	2	2	0	1	3	1	0
Permanent inundation	0	1	0	0	3	1	0	1	3	2	0
Landslides	2	1	2	1	2	0	2	0	2	0	1
Rock falls	1	1	1	1	1	0	2	0	0	1	1
Subsidence	2	1	1	1	2	1	1	1	2	1	0
Waterborne diseases	4	3	2	2	5	5	4	3	5	3	1
Vector-borne diseases	3	2	1	1	4	4	2	2	3	2	1
Airborne diseases	2	3	3	3	4	4	2	4	4	4	1
Insect infestation	4	3	3	3	2	2	3	2	2	3	1

These climate hazards are aligned with the hazards identified in the County Climate Change Action Plan 2018–2022 as well as the National Climate Change Action Plan 2018–2022. Rising temperatures, uncertain changes in rainfall patterns, stronger storm surges and greater risk of extreme weather events (droughts, floods and landslides) are major climate hazards affecting the country, according to these two governmental documents. The current climate hazards affecting Nakuru according to the household survey, the technical workshop and the secondary literature are summarised in **Table 9**.

Table 9: Current climate hazards experienced in Nakuru

Hazards	Relevant to Nakuru
Extreme precipitation	
Rainstorms	**YES**
Monsoons	NO
Heavy Snows	NO
Fog	**YES**
Hail	**YES**
Storm and wind	
Severe wind	**YES**
Tornados	NO
Cyclones (Hurricanes/Typhoons)	NO
Extra tropical storms	NO
Tropical storms	NO
Storm surges	NO
Lightning/Thunderstorms	**YES**
Extreme cold temperatures	
Extreme winter conditions	**YES**
Cold waves	**YES**
Extreme cold days	**YES**
Extreme hot temperatures	
Heat waves	**YES**
Extreme hot days	**YES**
Water scarcity	
Droughts	**YES**
Wildfires	
Forest fires	**YES**
Land fires	**YES**
Floods and sea level rise	
Flash/Surface floods	**YES**
River floods	**YES**
Coastal floods	NO
Groundwater floods	**YES**
Permanent inundation	**YES**

Hazards	Relevant to Nakuru
Chemical change	
Saltwater intrusions	NO
Ocean acidification	NO
Atmospheric CO_2 concentrations	NO
Mass movement	
Landslides	**YES**
Avalanches	NO
Rock falls	**YES**
Subsidence	**YES**
Biological hazards	
Waterborne diseases	**YES**
Vector-borne diseases	**YES**
Airborne diseases	**YES**
Insect infestation	**YES**

Participants identified 21 climate hazards currently affecting Nakuru County: rainstorms, fog, hail, severe wind, lightning/thunderstorms, extreme winter conditions, cold waves, extreme cold days, heat waves, extreme hot days, droughts, forest fires, land fires, flash/surface floods, river floods, groundwater floods, permanent inundation, landslides, rock falls, subsistence, waterborne diseases and Vector-borne diseases.

5.2 Magnitude of impact

The risks associated with the various hazards identified in Nakuru were further mapped based on a risk matrix scaled 1–5, with 1 = low, 2 = low-medium, 3 = medium, 4 = medium-high and 5=high, conducted during the participatory workshops. The ranking was based on the probability of each hazard occurring as well as the consequence of the hazard should it occur. The probability/frequency of hazard occurrence are estimates based on the county stakeholders' lived experiences.

The overall hazard risk was generated by multiplying the probability of occurrence and the level of consequence. The risk mapping shows that droughts, flash/surface floods, rainstorms, river floods, and waterborne diseases pose a greater risk in Nakuru County overall. Based on this exercise's outcomes, following extensive discussion, **the stakeholders agreed that the five hazards deemed as having the most significant impact on Nakuru County are droughts, waterborne diseases, flash/surface floods, rainstorms, and river floods**. These results align with the HHS results which ranks floods and droughts as the most common hazards.

According to the households interviewed, the top five hazards are flooding (55.8%), droughts (49.3%), rainstorms (47.9%), lightning strikes (44.4%), and extremely cold temperatures (44.3%), which had a high probability of occurrence, while extreme hot temperatures had a moderate probability of occurrence (51.2%). However, the technical workshop participants ranked drought as the top climate hazard with a high probability of occurrence.

The secondary literature, especially the Climate Risk Profile for Nakuru (2016) and the National Adaptation Plan (2015–2030) and Kenya's updated Nationally Determined Contribution (2020) also ranked drought and flood as the most common climate hazards that challenge productivity, incomes, and food security in Kenya and in the county, and are expected to pose even greater challenges in the future. Overall, the risk mapping shows that Nakuru County is vulnerable to several climate hazards. The vulnerability builds from the household level and accumulates through to the community and county level. Additionally, several hazards do not occur frequently but have very high risks due to the consequences associated with such hazards when they do occur.

Table 10: Magnitude of impact of climate hazards affecting Nakuru

Hazards affecting Nakuru	Current probability of hazard (rate 1 to 5)	Current consequence of hazard (rate 1 to 5)	Total (probability x consequence)
Droughts	4	4	16
Flash/Surface floods	4	4	16
Rainstorms	4	4	16
River floods	4	4	16
Waterborne diseases	4	4	14
Airborne diseases	3	3	9
Thunderstorms/ Lightning	2	3	6
Groundwater floods	2	3	6
Landslides	2	3	6
Extreme hot days	2	3	6
Severe wind	2	2	4
Forest fires	2	2	4
Extreme cold days	2	2	4
Cold waves	2	2	4
Vector-borne diseases	2	2	4
Rock falls	2	2	4
Subsidence	2	2	4
Insect infestation	2	2	3
Hail	1	2	2
Permanent inundation	1	2	2
Land fires	2	1	2
Heat waves	1	1	1
Extreme winter cond.	0	1	0

5.3 Anticipated future climate hazard intensity, frequency and timescale for Nakuru

The workshop stakeholders were asked to evaluate how the current climate hazards are expected to alter in terms of intensity, frequency and timescale. **Table 11** below indicates the expected change in frequency and intensity measured on a scale of 'Increase', 'Decrease', 'No change' and 'Not known'. The timescale for the expected changes is measured as 'Immediately', 'Short term' (by 2025), 'Medium term' (2026–2050), 'Long term' (after 2050) and 'Not known'. The current hazard intensity is rated on a scale of 1 – 5 with 1 = low, 2 = medium-low, 3 = medium, 4 = medium-high, and 5 = high.

Table 11: Anticipated future shifts in climate hazard frequency, intensity and timescale in Nakuru

Hazards	Current frequency of hazard occurrence	Future change in frequency	Current intensity of hazard	Future change in intensity	Timescale
Droughts	Low	Increase	Moderate	Increase	Long term
Flash/Surface floods	High	Increase	High	Increase	Not known
Rainstorms	High	Increase	High	Increase	Long term
River floods	High	Increase	High	Increase	Not known
Thunderstorms/ Lightning	High	Not known	Moderate	Not known	Not known
Groundwater floods	Low	Not known	Moderate	Not known	Not known
Landslides	Low	Increase	Moderate	Increase	Long term
Forest fires	Low	Increase	Low	Not known	Not known
Extreme cold days	High	Increase	Low	Not known	Not known
Extreme hot days	Low	Increase	Moderate	Increase	Long term
Rock falls	Low	Not known	Not known	Not known	Not known
Hail	Low	Not known	Low	Increase	Not known
Permanent inundation	Low	Not known	Low	Not known	Not known
Land fires	Low	Increase	Low	Not known	Not known

The table indicates that most hazards already affecting Nakuru are expected to increase in frequency and intensity with climate change. The secondary literature also indicates an increased intensity of extreme flood and drought events in Nakuru under RCP2.6 and RCP8.5 in the period 2021–2065 compared to 1981–2015.

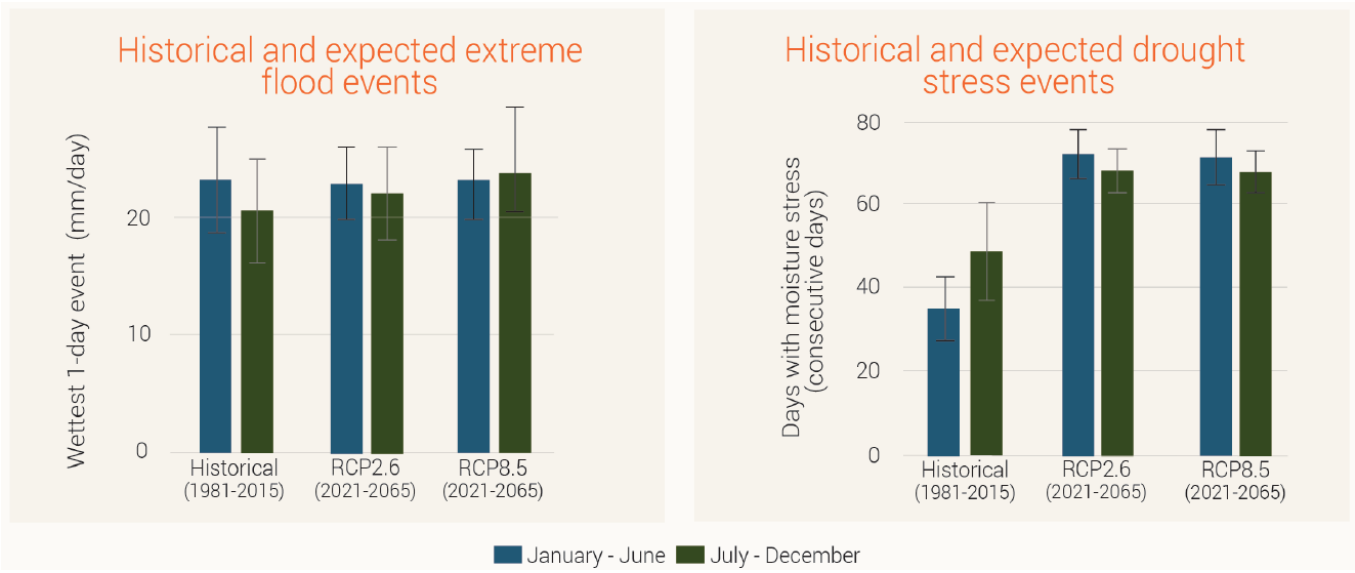


Figure 12: Historical and expected extreme flood and drought events in Nakuru (Source: Climate Risk Profile 2016)

6. Impact of climate hazards on sectors and population groups

6.1 Magnitude of impact of current climate hazards on sectors

The National Climate Change Action Plan 2018–2022 has identified some key sectors as relevant for the Mount Kenya and Aberdares Counties Trade and Investment Block, of which Nakuru County is a part. These include industry, infrastructure, information and communications technology (ICT), agribusiness, tourism, health, and forestry. The National Adaptation Plan (2015) lists agriculture, livestock, water, environment, infrastructure, sustainable livelihoods, energy and tourism as priority sectors.

Building on the national sectoral priorities, Nakuru County Government has made further steps towards identifying county-specific sectors that are key to promoting low-carbon and climate-resilient economy and livelihoods in the Nakuru County Climate Action Plan (2018–2022): agriculture, livestock and fisheries, water, wildlife and tourism, forestry, transport and infrastructure, health, energy, mining, manufacturing and trade. An analysis of the primary data generated a unified presentation indicating the impacts of climate change on these sectors.

Table 12: Sectors and services at risk of climate-related events (Source: Stakeholder engagement)

Sectors	Climate hazards	Impacts
Agriculture, livestock, and fisheries	Prolonged dry spells, frost, intense precipitation, flooding, heat stress, and increase in temperatures	• Crop failure becomes common • Increase in disease and pest incidence • Loss of crops and livelihoods
Water	Frequent, prolonged droughts	• Over-abstraction of water • Depletion of aquifers • Fluctuating water levels in the lakes and rivers, e.g. Lake Nakuru and Lake Naivasha • Soil erosion and degradation • Flooding and stormwater • Water pollution, e.g. due to discharge of agricultural effluents
Wildlife and tourism	Flooding, prolonged dry spells	• Fluctuating water levels in the lakes and rivers • Disease prevalence and wildlife deaths due to diseases and water scarcity • The spread of invasive species
Forestry	Prolonged dry spells, fires	• Loss of biodiversity and habitats • Forest fires • Increased incidence of disease and pest infestation in forests • Spread of invasive species
Transport and infrastructure	Flash floods, fog, and mist	• Hampered visibility • Destruction of transport and other infrastructure • Human and animal deaths and injuries

Sectors	Climate hazards	Impacts
Health	Floods, fires	• Increased deaths from malnutrition and human diseases • Breakdown of health infrastructure, including houses
Energy	Unreliable rain, floods	• High cost of electricity • Over-reliance by the poor on biomass energy (firewood and charcoal) leading to increased carbon footprint and respiratory complications
Mining	Flooding	• Unsustainable harvesting of sand and stones causing injuries, death, and sinking of houses; habitat destruction
Manufacturing and trade	Prolonged dry spells, frost, intense precipitation, flooding, heat stress, and increase in temperatures	• Disruption of access to raw materials • Unreliable water and power supply • Air, water, and soil pollution • Increased incidence of respiratory diseases • Ecosystem contamination

During the technical workshop, sectors which were thought to be affected by climate hazards in Nakuru were selected by the participants from the list of sectors included in Annex D of the GCoM Reporting Framework (September 2018) and updated with the county priority sectors outlined in the County Climate Action Plan 2018–2022 and listed above. The workshop participants selected: **water supply and sanitation, transport, food and agriculture, waste management, information and communication technology, environment, biodiversity and forestry, industrial, commercial, residential, education, public health, community and culture, law and order, emergency management, land use planning** and **tourism** which, with the exception of mining, manufacturing and trade, are in line with the sectors included in the National Climate Change Action Plan as sectors most impacted by climate hazards in the county.

Based on group discussions (i.e., participants were divided into five groups of six stakeholders – each having a mix of country and national government and non-state actors), stakeholders reflected on the impact of the hazard risks on these sectors. The stakeholders indicated the degree/magnitude to which each climate hazard impacts these sectors. Stakeholders ranked **water supply and sanitation, public health, education, industry, food and agriculture, waste management and tourism as some of the sectors most significantly affected by climate hazards**.

Table 13: Magnitude of impact of current climate hazards on sectors and services in Nakuru (3 = High/Extremely serious, 2 = Moderate/Serious, 1 = Low/Less serious. 0 = Not relevant)

	Lightning	Cold waves	Extreme cold days	Heat waves	Extreme hot days	Droughts	Forest fires	Land fires	Flash/Surface floods	River floods	Rainstorms	Fog	Hail	Severe Wind	Groundwater flood	Permanent inundation	Landslides	Rock falls	Subsidence	Waterborne Diseases	Vector-borne diseases	Airborne diseases	Insect infestation	Total
Water supply & sanitation	2	1	2	1	1	2	2	2	2	2	3	1	1	1	2	1	2	1	1	1	1	1	1	34
Transport	1	1	1	1	2	3	1	1	3	3	3	1	1	1	3	1	3	1	2	3	2	2	2	42
Food & agriculture	2	1	1	1	1	1	1	1	3	3	2	2	2	1	2	2	3	3	2	1	1	1	1	38
Waste management	1	1	3	2	3	3	2	3	3	3	3	1	3	2	2	2	3	2	2	2	2	2	3	53
ICT	1	1	1	1	1	1	1	1	2	2	2	1	1	2	2	1	2	1	1	2	2	2	2	33
Environment biodiversity & forestry	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	26
Industrial	2	1	2	1	2	3	3	3	3	3	2	1	1	2	2	2	2	2	2	2	2	2	2	47
Commercial	2	1	1	1	2	2	2	2	2	2	2	1	1	1	1	1	2	2	2	2	2	2	2	38
Residential	2	1	1	1	2	2	2	2	2	2	2	1	1	1	1	2	2	1	1	2	2	2	2	37
Education	2	1	2	1	2	2	2	2	3	2	2	1	1	2	2	2	2	2	2	2	2	3	3	45
Public health	2	1	2	1	2	3	2	2	3	3	2	1	1	2	2	2	2	2	2	2	2	3	3	47
Community & culture	2	1	2	1	2	3	1	2	3	3	2	1	1	1	2	2	2	2	2	3	2	3	2	43
Law & order	2	1	2	1	2	3	3	2	3	3	2	1	1	1	0	1	2	1	2	3	2	3	3	44
Emergency management	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	24
Land use planning	2	1	2	1	2	2	2	2	3	3	3	2	2	2	2	2	3	2	2	3	2	3	2	49
Tourism	2	1	2	1	2	2	2	2	2	2	2	1	1	2	2	2	3	2	2	1	1	1	2	40
Total	**28**	**16**	**26**	**17**	**28**	**34**	**28**	**29**	**39**	**38**	**36**	**18**	**20**	**23**	**27**	**25**	**36**	**26**	**27**	**31**	**27**	**32**	**32**	

During the technical workshop, stakeholders then assessed sectors to determine which would be priority for developing adaptation actions. The choice was based on the magnitude of impact of current climate hazards on the sectors, and is in line with the local and national climate change action plans. The sectors chosen as priority are: **food and agriculture; water supply and sanitation; environment, biodiversity and forestry; and land use planning**.

The stakeholders provided a rationale for their selection by describing how climate hazards which already affect Nakuru County could further impact these particular sectors in the future if no action is taken (see **Table 14**).

Table 14: Analysis of priority sectors from the technical workshop

Priority sector for adaptation actions	Sector description	Impact of climate hazards on the sector	Projected impact of climate hazards under BAU scenario
Food and agriculture	• The food and agriculture sector entails agriculture, livestock, and fisheries in the context of Nakuru County. • The agricultural sector is the backbone of the county's economy and is important to address food security. • Most of the land in the county is agricultural.	• The effects of climate change in Nakuru County have led to increasing forest fires, decreasing agricultural productivity, increasing urban sprawl, surging of lakes and increasing migration and conflict as a result of porous borders and the fight for resources. • The temperature increase has been a key cause of the decreased productivity of most agricultural products. Some crops such as wheat have been negatively affected due to meteorological droughts and the associated increase in crop pathogens. • In addition to droughts, flooding also leads to loss of crops and livestock as well as incidence of pests and diseases, locusts, fall armyworm, livestock diseases and East Coast fever.	• Increasing vector-borne, waterborne, and airborne diseases will affect farming in the future. It is anticipated that it will be difficult to continue with farming practices due to various diseases. • Increasing extreme precipitation is likely to cause soil saturation and affect crop productivity generally. • Increasing frequency of drought is likely to lower wheat production and other key crops in the country.

Priority sector for adaptation actions	Sector description	Impact of climate hazards on the sector	Projected impact of climate hazards under BAU scenario
Water supply and sanitation	• Water for agriculture and food production contributes substantially to the county's economy and is highly vulnerable to climate change impacts. Water contributes to producing food, employment (directly and indirectly), foreign exchange (revenue), and provides raw materials for industries.	• Changing rainfall patterns impacts water supplies negatively due to erratic and unpredictable patterns. This leads to post-harvest losses and affects the cropping calendar -the majority of crops are rain fed.	• If unchecked, the sector could be adversely affected, leading to conflict, rural-urban migration, and crop-livestock farmer conflicts in the search for pasture.
Environment, biodiversity and forestry	• The environment, biodiversity and forestry sector entails both the forestry, wildlife and tourism sectors in the context of Nakuru County.	• Changing rainfall patterns negatively impacts water levels in the lakes and rivers. This affects the biodiversity of the county relying on these water sources, and therefore the tourism sector. • Droughts, water scarcity and heat waves increase the prevalence of disease and wildlife deaths. • Forest fires lead to loss of biodiversity and habitats.	• It is expected that rainfall will become more erratic and temperature will rise under a BAU scenario, leading to increased negative impacts on forest, river and lake health, and biodiversity levels. • Losses in biodiversity could negatively impact tourism.
Land use planning	• The land sector guides resource use and management in the entire county. Properly planned and integrated land-use plans are very key to community adaptive capacity. This might entail the development of spatial plans to guide resource utilisation and management. In this case, the county and its citizens need to be proactive in planning rather than reactive.	• The effects of climate change in Nakuru County include an increase in forest fires, flooding areas, decreased soil productivity, urban sprawl, surging of lakes, increased migration and conflict as a result of porous borders and fights over resources. Consequently, the sector has increasingly lost its value and resulted in community incapacitation to adapt to the impacts of climate change.	• If no action is taken, increasing challenges such as sinking grounds and even the loss of lives could be seen shortly in Nakuru County.

Combining the results of the technical workshop (based on the JRC list of sectors) and the Nakuru County Climate Change Action Plan (based on existing sectors in Nakuru County), the sectors considered to be a focus priority are:

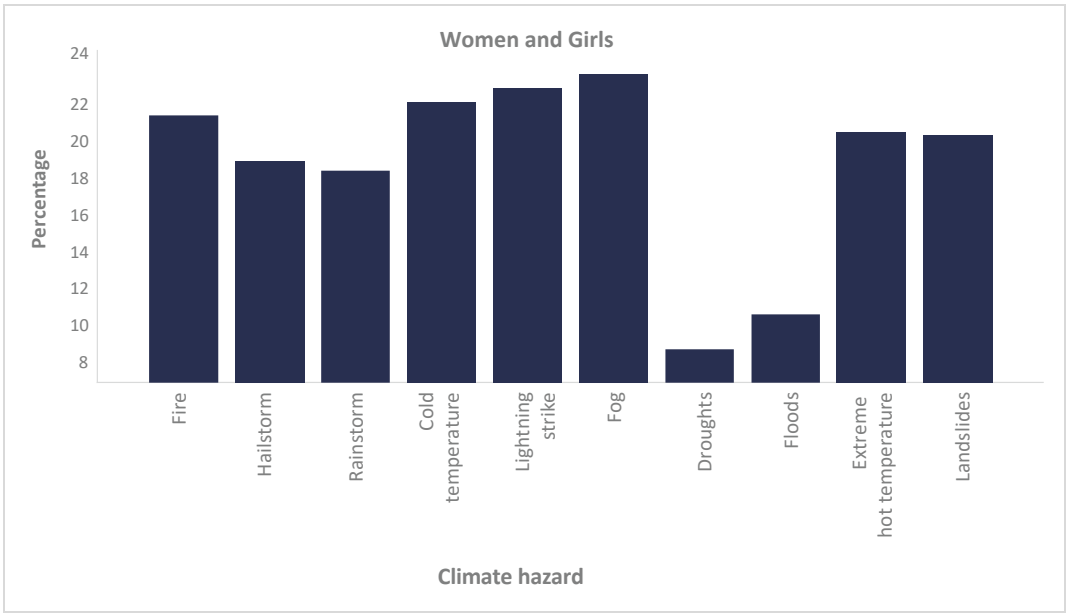
- **Agriculture, livestock and fisheries**
- **Water**
- **Forestry**
- **Tourism**

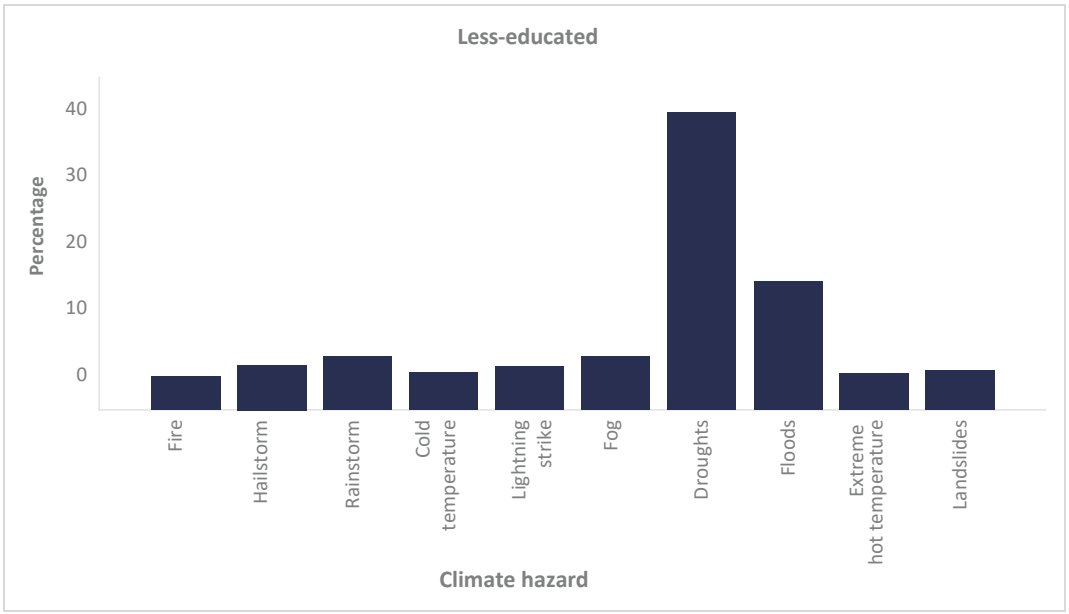
6.2 Magnitude of impact of current climate hazards on population groups

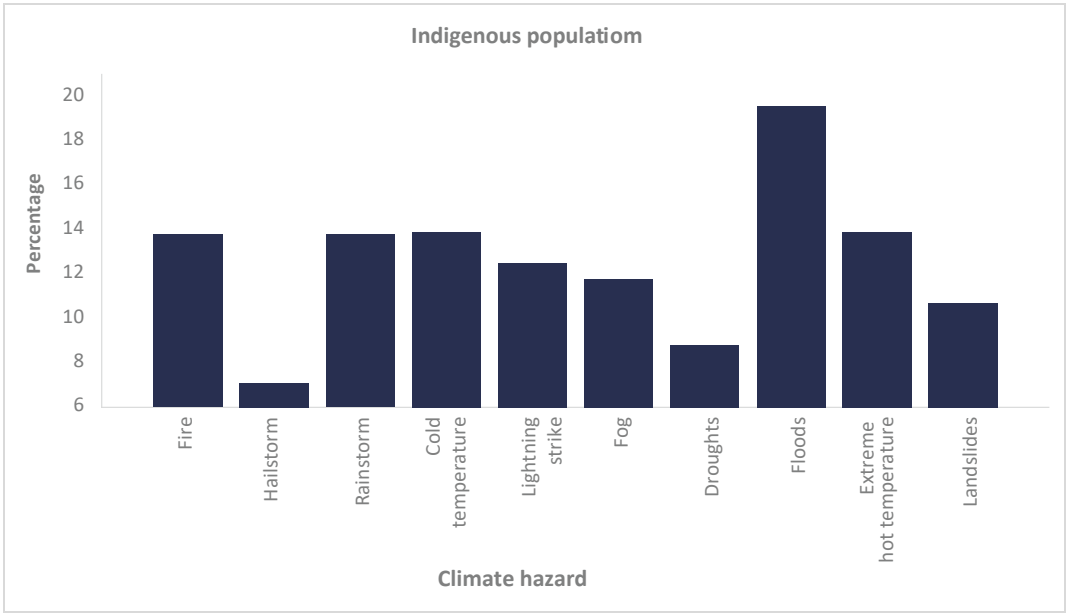
Households and communities in Nakuru are impacted differently by climate hazards depending on the magnitude of the climate hazard, and their adaptive capacity. The HHS covered the following vulnerable population groups: women and girls, the less educated, indigenous populations, marginalised groups, persons with disabilities, persons with chronic diseases, low-income households, persons living in sub-standard housing, and unemployed persons. The HHS assessed the level at which the identified climate hazards impact the nine population groups.

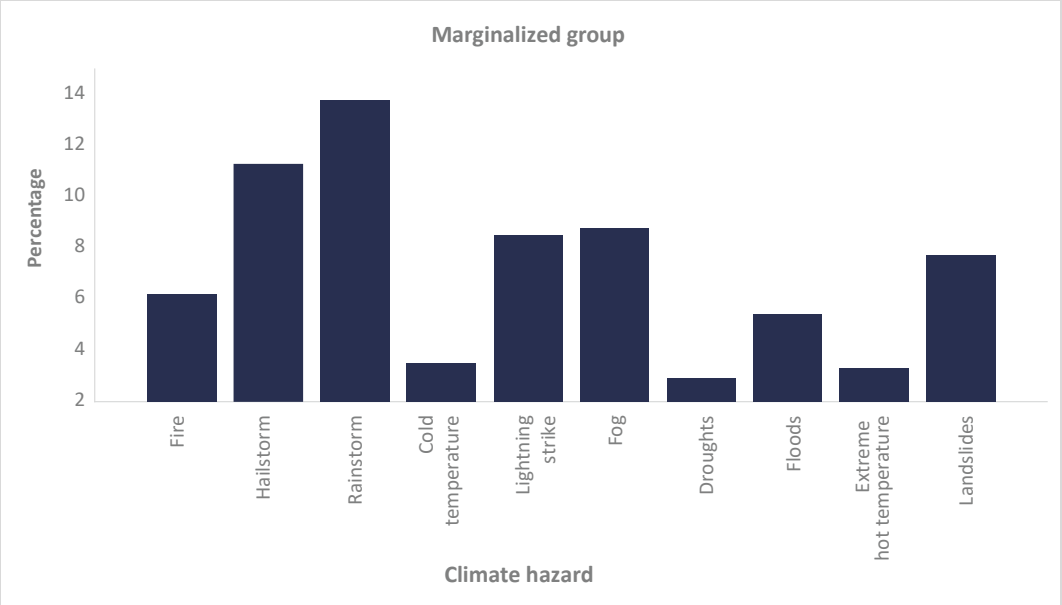
The findings indicate that **women and girls** are more vulnerable to most disasters such as fire (21.5%), extreme hot temperatures (22.2%), floods (23%), droughts (23.7%), and rainstorms (20.4%). Rainstorms (22%), landslides (24.6%) and floods (21%) affect **low-income households** while those with an existing chronic condition (e.g. asthma, cancer) are severely affected by cold temperatures.

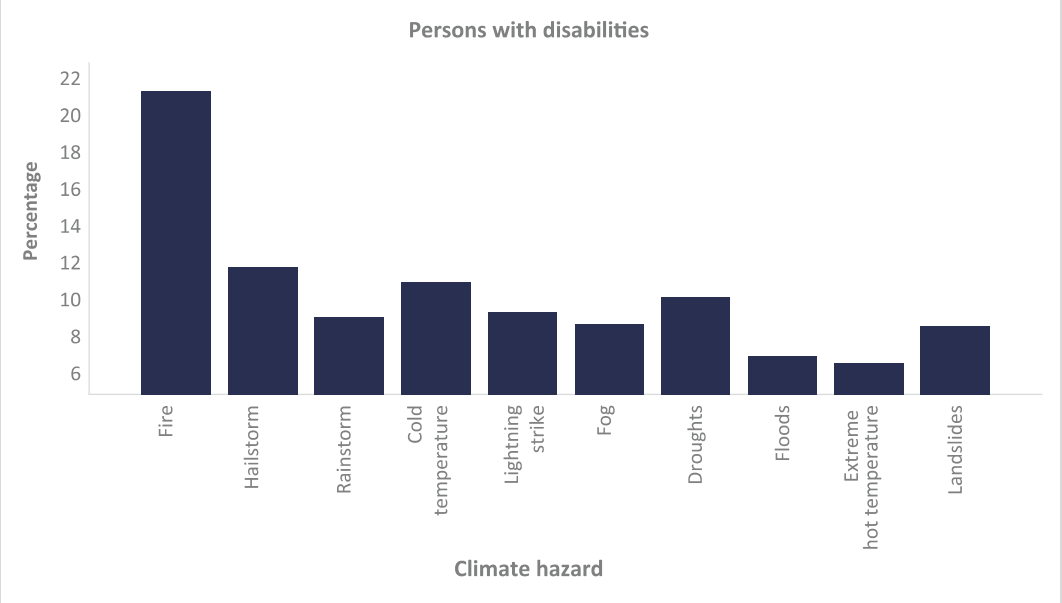
Evidence shows that in most African settings such as Nakuru County, women spend long hours on farms, hence are most susceptible to heat stress. Similarly, as the primary caregivers, women are widely responsible for daily household livelihoods and spend more time at home with children thus are more exposed to risks such as floods and hunger (Atela et al., 2019). Low-income households are less endowed with assets that could build their long-term adaptive capacity and thus can only cope with daily (relatively moderate) climate risks, and become highly vulnerable to severe events such as floods and landslides. Overall, the differentiated impacts could help in tailoring adaptation actions towards these vulnerable social groups.

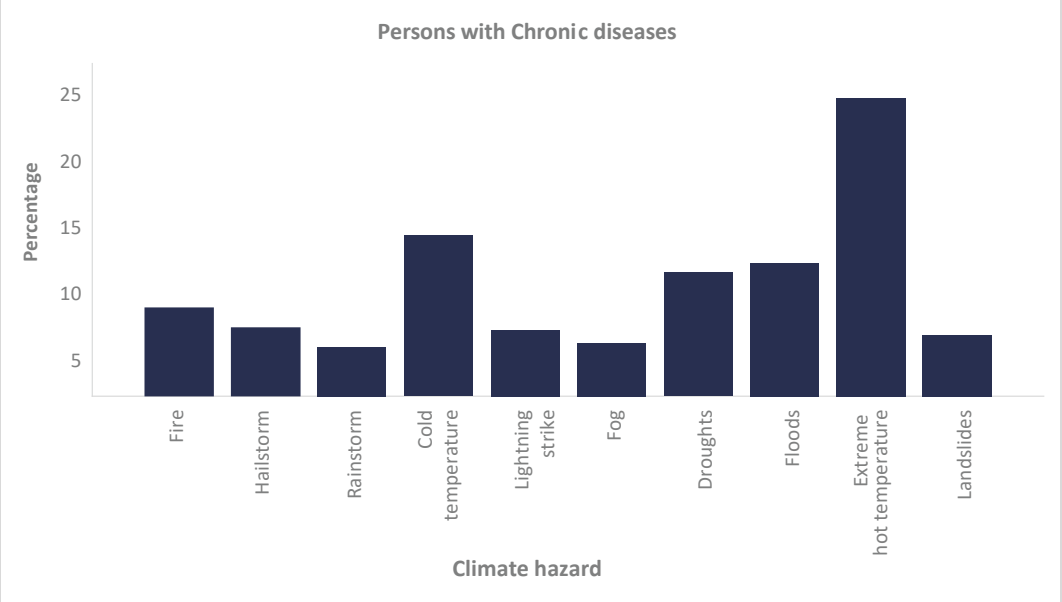

Women and Girls
Percentage
24
22
20
18
16
14
12
10
8
Fire
Hailstorm
Rainstorm
Cold temperature
Lightning strike
Fog
Droughts
Floods
Extreme hot temperature
Landslides
Climate hazard

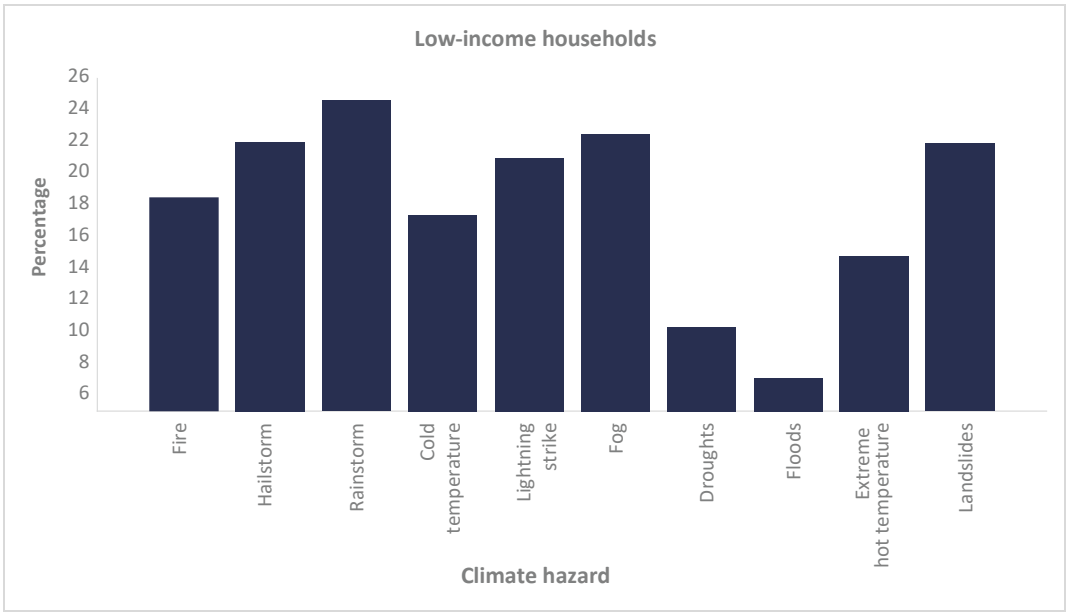

Less-educated
Percentage
40
30
20
10
0
Fire
Hailstorm
Rainstorm
Cold temperature
Lightning strike
Fog
Droughts
Floods
Extreme hot temperature
Landslides
Climate hazard

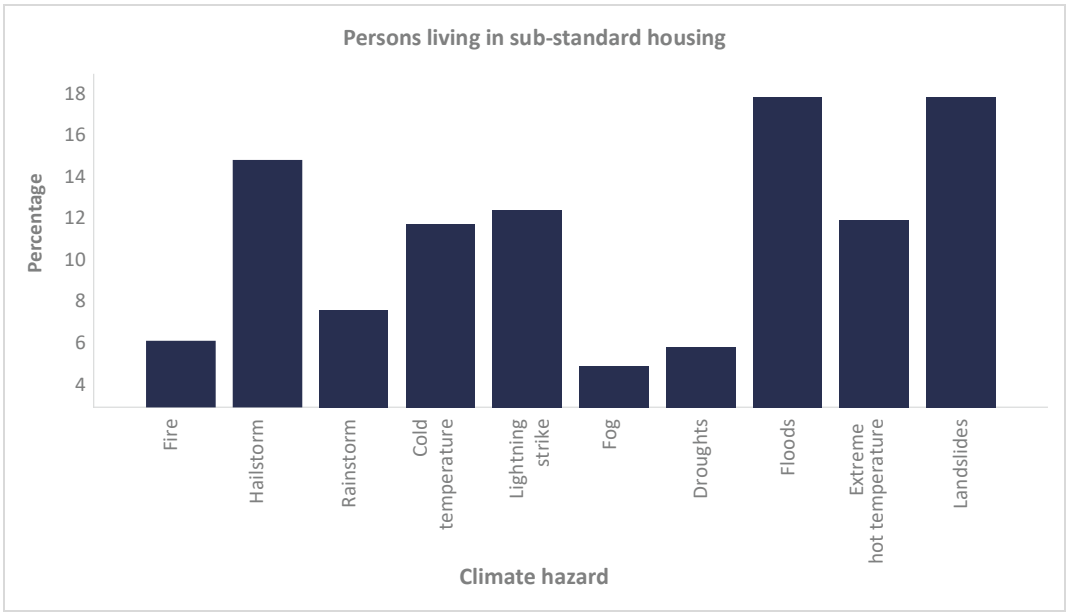

Indigenous populatiom
Percentage
20
18
16
14
12
10
8
6
Fire
Hailstorm
Rainstorm
Cold temperature
Lightning strike
Fog
Droughts
Floods
Extreme hot temperature
Landslides
Climate hazard


Marginalized group
Percentage
14
12
10
8
6
4
2
Fire
Hailstorm
Rainstorm
Cold temperature
Lightning strike
Fog
Droughts
Floods
Extreme hot temperature
Landslides
Climate hazard


Persons with disabilities
Percentage
22
20
18
16
14
12
10
8
6
Fire
Hailstorm
Rainstorm
Cold temperature
Lightning strike
Fog
Droughts
Floods
Extreme hot temperature
Landslides
Climate hazard


Persons with Chronic diseases
Percentage
25
20
15
10
5
Fire
Hailstorm
Rainstorm
Cold temperature
Lightning strike
Fog
Droughts
Floods
Extreme hot temperature
Landslides
Climate hazard





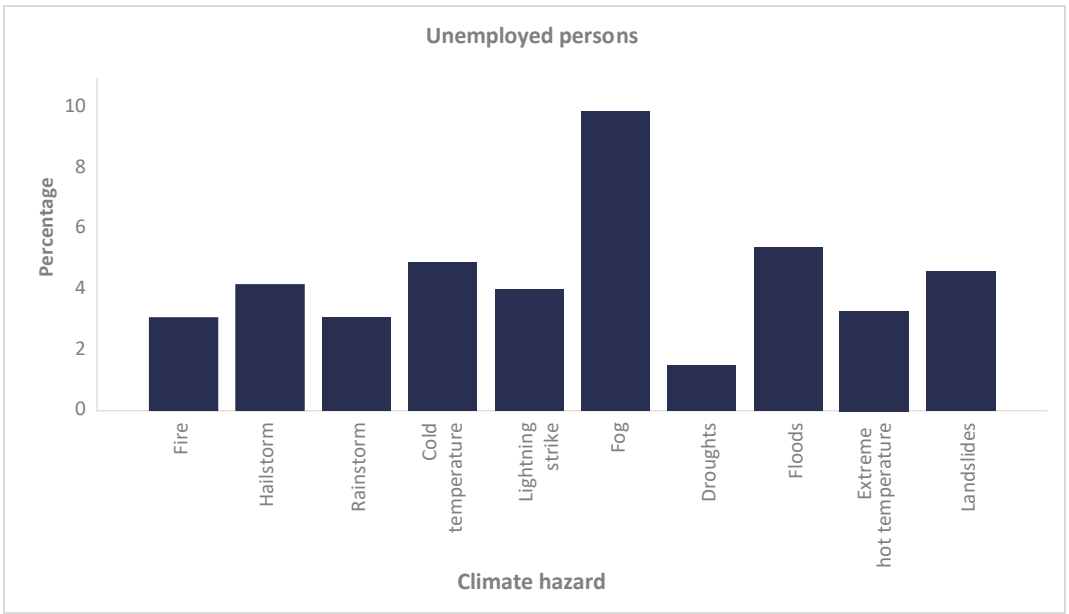


Figure 13: Population groups at risk of climate-related hazards (%) from the HHS

Table 15: Magnitude of impact of main hazards on population groups within Nakuru (3 = high, 2 = moderate, and 1 = low) from the HHS

Population group	Climate hazards				Total
	Droughts	Floods	Rainstorms	Extreme hot temperatures	
Women and girls	3	3	3	3	12
Less educated	1	1	1	1	4
Indigenous populations	2	2	2	2	8
Persons with disabilities	2	2	2	2	8
Marginalised groups	2	2	2	1	7
Persons with chronic diseases	1	1	1	2	5
Persons living in sub-standard housing	1	2	3	2	8
Low-income households	3	3	3	2	11
Unemployed persons	3	2	2	2	9

The Nakuru County Climate Change Action Plan 2018–2022 highlights the need to focus adaptation actions towards indigenous communities, women, children, the elderly, youth and the disabled among other groups, as these are already — and likely to be in the future — the most vulnerable groups to climate hazards such as droughts and floods in Nakuru County.

7. Factors that affect adaptive capacity

The risk mapping shows that Nakuru County residents are most vulnerable to the impacts of drought, waterborne diseases, flash/surface floods, rainstorms, and river floods. Depending on the nature of the risk, residents have developed strategies to cope with and adapt to these adverse impacts. This section uses results from the HHS, the technical workshop, as well as the scientific literature to give an overview of these strategies to better inform the next steps of the SEACAP: target setting and action planning.

Coping strategies are actions that households/communities undertake to respond to the impacts of climate hazards. The majority of residents (35%) tend to rely more on government assistance (such as food and insurance aid) to cushion them from the negative impacts of climate hazards. Community work social capital such as food for work is also a common coping strategy for several residents (25%). This helps residents to cope in the short term with immediate impacts such as lack of food. Inter-household transfers and village saving and lending mechanisms such as table backing were prevalent ways residents cope with both drought and flood. Reducing consumption e.g., reducing the number of meals per day is additionally deployed by 18% of respondents during droughts. Approximately 10% of the HHS interviewed indicated having sold their household assets in response to climate impacts. Property ownership is seemingly an integral part of a household's ability to adapt, a key adaptive capacity indicator for residents.

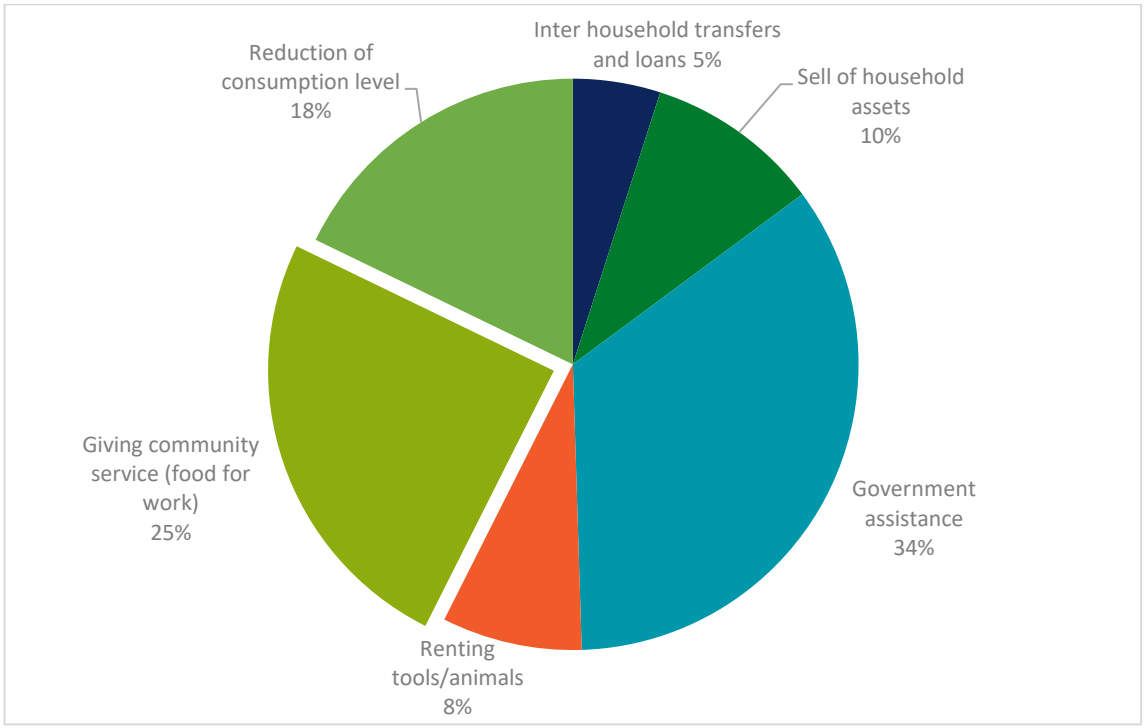


Figure 14: Percentage use of different coping strategies from HHS

Climate hazards responded to through government assistance are fires (42.1%), landslides (30.6%), floods (22.5%), droughts (21.2%), lightning strikes (20%), rainstorms, hailstorms, extreme hot and cold temperatures. **Figure 14** shows that households' coping strategies differ in scale when responding to each climate hazard. Overall, strategies identified largely show that residents of Nakuru County undertake actions that only enable them to cope with the prevailing impacts of climate change in the short-term but do not necessarily build long-term adaptive capacity. This keeps residents at high risk, especially to hazards which are infrequent but have serious consequences.

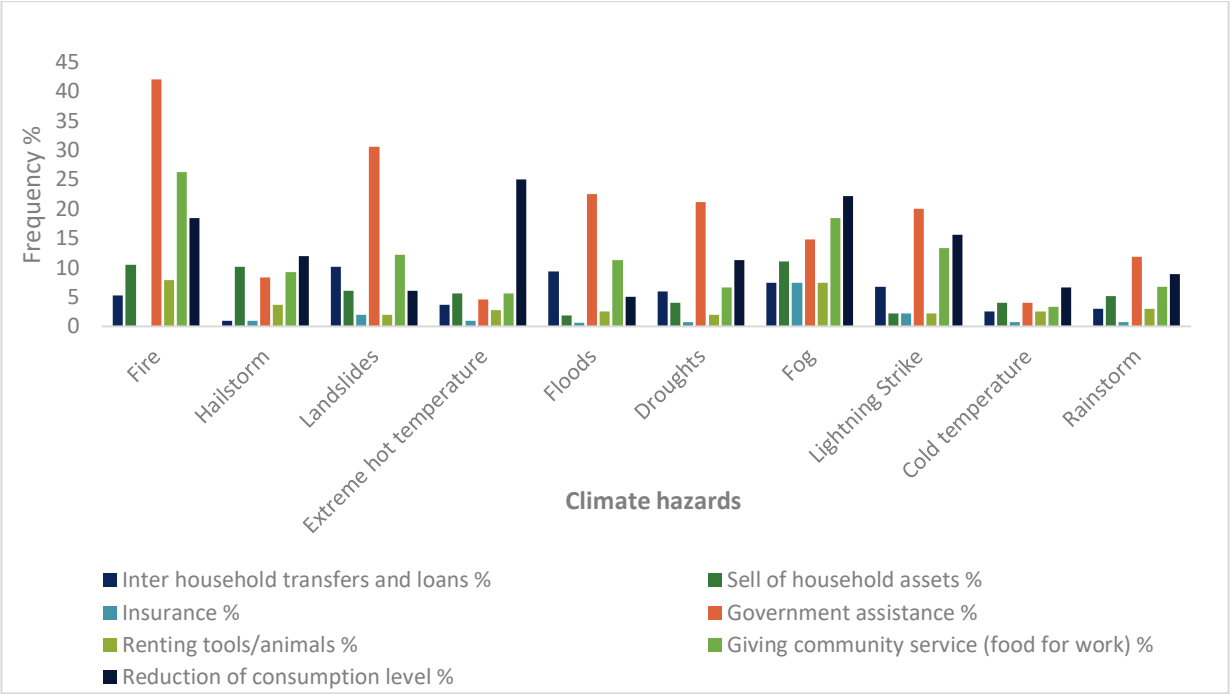


Figure 15: Summary of coping strategies for different climate hazards

Adaptation strategies are actions that households or communities undertake to prepare for the impacts of climate hazards. The household survey shows that key strategies include water harvesting techniques, which are currently being adopted by 80% of the residents (respondents), followed by diversification of crops (69%), shifting of planting dates (59%), and implementation of soil management techniques (57%). Rural-to-urban migration, irrigation practices, greenhouse farming, change of animal breeds, and aquaculture were the least adopted strategies by Nakuru residents.

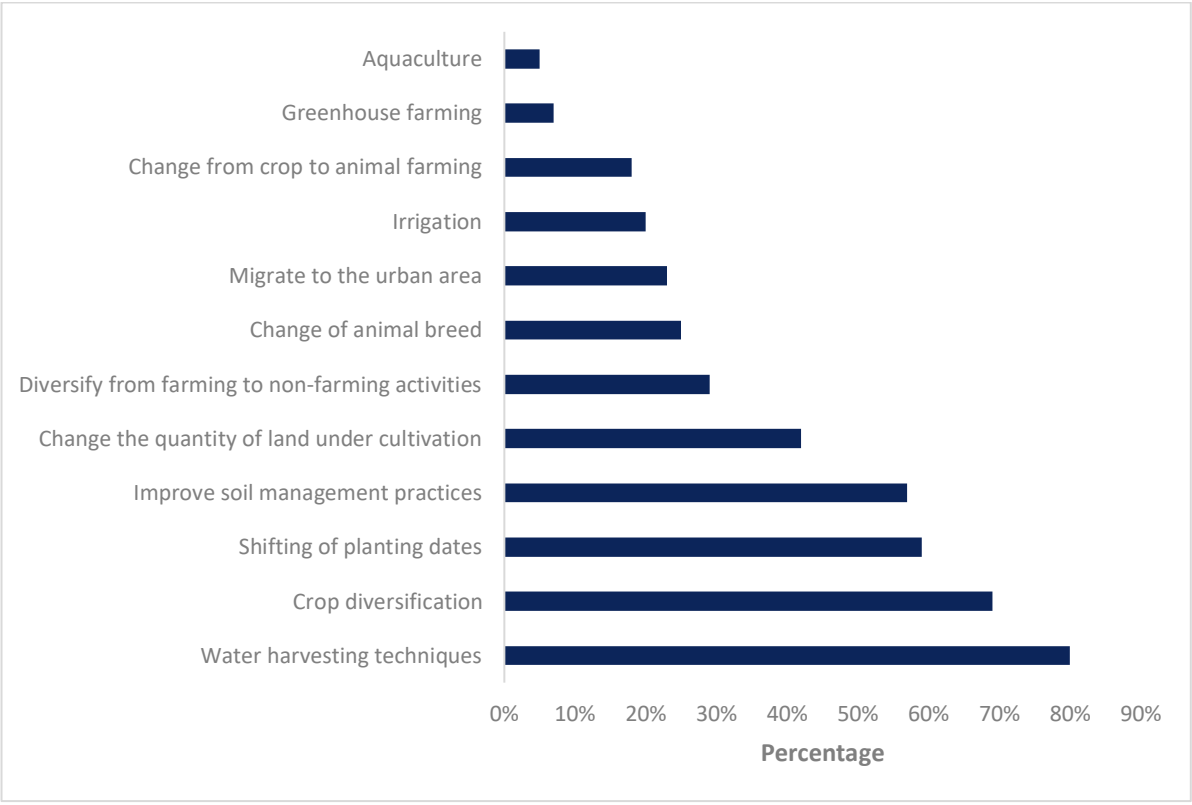


Figure 16: Adaptation hierarchy for Nakuru residents

A recent study (Koimbori et al. 2019) assesses the impacts of climate variability on maize yields in Bahati-Sub-County, Nakuru County, for the period 1985 to 2015. Annual rainfall amounts decreased over these years in the Sub-County with a shift in the onset and cessation of rainfall, while maximum and minimum temperatures have gradually been increasing on this period (Koimbori et al. 2018). The authors conclude that more effective adaptation and coping strategies to climate variability should be introduced to the Bahati-Sub-County farmers so as to cushion them from the impacts of climate variability. The study suggests that the County government in Nakuru should educate the farmers on the impacts of climate variability and on the importance of monitoring the maize-climate relationship in the area, since any variation in climatic variables negatively affects stability and supply in agricultural production. The farmers should also be encouraged to enhance crop diversification to help cushion them from climate variability. In view of the high correlation between annual rainfall, maximum temperature and maize yields, adoption of maize varieties resistant to heat stress and drought could be effective adaptation strategies. The study also advises to policy makers and stakeholders that they should ensure that they provide climate related information to the farmers that is timely, reliable and proven so as to ensure that the farmers are in a better position to cope with climate variability. Finally, Nakuru meteorological station should provide forecast prediction to the farmers on the onset and cessation of the growing season so as help maize farmers plant and harvest on time and thus increase food security in the county (Koimbori et al., 2019).

Several factors constrain the ability of local communities to implement adaptation actions. Findings from the HHS show that the lack of adequate capital (money) (61%) is the most significant adaptation constraint, followed by an information barrier at 43%. Poor market access, the absence of extension services, and poverty also pose major challenges to households' ability to adapt to climate change.

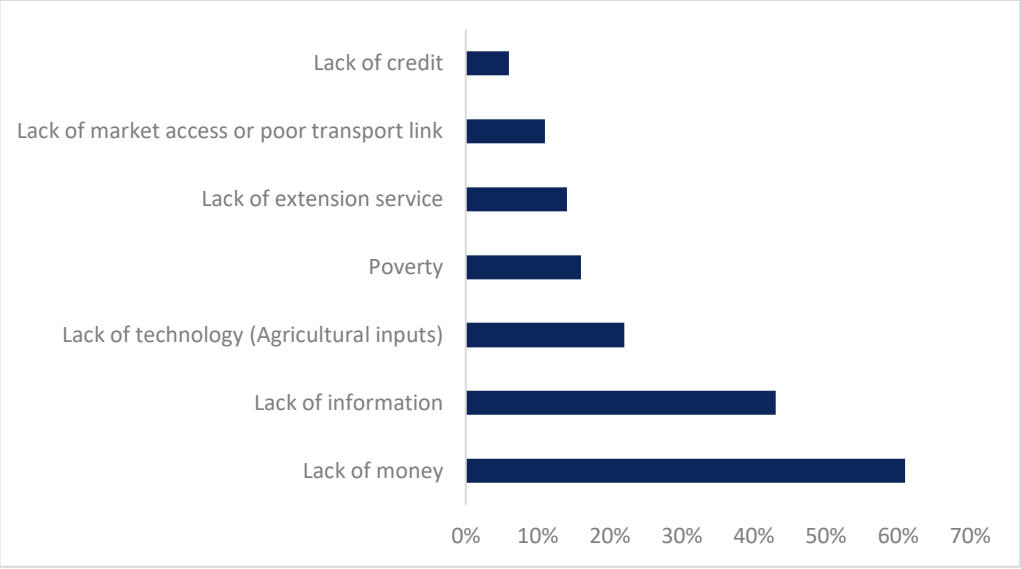


Figure 17: Major constraints that hinder ability to adapt to climate change

Respondents also shared factors that support or challenge their adaptive capacity in different sectors based on the county's socio-economic contexts (**Table 16**). Factors that enable adaptive capacity can represent opportunities for prioritisation. The list of factors in **Table 16** is aligned with findings from the strategic documents reviewed and captures the components of the county's Climate Change Action Plan 2018–2022.

Table 16: Factors that support and challenge adaptive capacity

Sectors	Factors that support adaptive capacity	Factors that challenge adaptive capacity
Food and agriculture	• Agricultural and livestock insurance and safety net schemes • Improved technology to handle post-harvest losses • Mainstreaming and promotion of climate-smart agriculture and livestock development • Improved communication systems on CSA extension and agroecological issues • Sustainable management of land, soil, water, and other natural resources	• Unpredictable and unreliable rainfall • Disruption of planting and harvesting time for crops leading to losses • Over-reliance on agriculture by the population which increases vulnerability • Slow uptake of technology that would improve crop and animal varieties • Conflict over land-use policies in the agriculture and livestock sectors • Consumption patterns by the population that increase post-harvest losses
Water supply and sanitation	• Domestication of the National Water Master Plan to ensure dams, dykes, lakes, and rivers are protected • Improved water harvesting techniques • Mainstreaming climate change into water plans and issues	• Increased demand for water in other sectors and an increasing human population • Incoherent and insensitive policies to deal with over-abstraction of water and other water management issues • Limited data on current and future water situation • Poor water governance that has seen the permeation of water cartels and vendors into the water sector
Environment, biodiversity and forestry	• Policies that reduce human-wildlife conflict through the creation of special ecological zones • Risk and vulnerability assessment for wildlife and tourism • Investment in participatory resource management • A community-based adaptation to restore degraded forests and enhance the county forest cover beyond the 10% level • Integration of forest policies into other sectors of the county economy	• Increased wildlife-human conflict • Lack of strong political will to protect tourism zones • Limited citizen mindset about local or domestic tourism • Overexploitation of wildlife habitats due to the absence of laws to support wildlife benefits to the population • Climate variability and change causing unprecedented wildlife dispersal and extinction • Excessive logging by the general public and other unauthorised entities • Inadequate public participation in forest restoration initiatives • Fragmented forest policies that do not consider sustainability practices • Loss of indigenous forest knowledge and practices that protected certain areas for community benefits

Sectors	Factors that support adaptive capacity	Factors that challenge adaptive capacity
Transport and infrastructure	• County guidelines that promote climate-proofing of the transport infrastructure • Design codes that anticipate and reduce climate risks to transport	• Irregularities in public procurement procedures that result in poor workmanship • Increased frequency and magnitude of extreme weather and singular events that continue to exceed the set infrastructure standards
Health	• Stronger integration of climate change adaptation plans into the health sector • Improvement of the level of public awareness on climate health risks • Development of health programmes to reduce the incidence of malaria and other climate-mediated diseases	• Population lifestyle that has largely ignored the ecosystem benefits to human health • Limited knowledge of the co-benefits of ecological integrity to health • Insufficient funds to support research on climate-related diseases, especially those in the tropics, hence increased endemism
Mining and extractives	• Integration of climate change adaptation strategies into the mining sector	• Poor technology development and training to deliver safe mining of natural resources • Over-extraction of natural resources has contributed to degraded landscapes, and hence more emergent vulnerabilities
Manufacturing and trade	• Creation of an enabling environment for the resilience of both the public and private industry sectors to thrive in and operationalise environmentally friendly investments • Strengthening of partnerships and linkages that would ensure resource mobilisation for the county's green projects	• Lack of policies that promote a circular economy in manufacturing and trade • Lack of government commitment to increase funding for the green economy • Stranded assets in the fossil fuel industry have delayed the transition to green manufacturing and trade

Stakeholders at the technical workshop further indicated the degree to which the various factors impede adaptive capacity and obstruct climate resilience, drawing on a long list of factors outlined in one of the guiding matrices. The stakeholders – working in groups of six – discussed how each of the factors could challenge or support Nakuru County's adaptive capacity. Once the factors had been selected, the stakeholders were asked to discuss and rate the degree to which a particular factor challenges or supports adaptive capacity. The rating was based on a scale of 'High,' 'Moderate,' or 'Low'. The workshop stakeholders found the factors relevant because they all were endorsed as factors affecting Nakuru's adaptive capacity. The findings show that several factors including access to healthcare, access to education, and resource availability, among others, highly support adaptive capacity, while poverty, unemployment, and inequalities strongly impede adaptive capacity (**Table 17**).

Table 17: Factors that support or challenge Nakuru County's adaptive capacity (Source: Technical and policy workshops)

Factors	Is this a factor that affects your adaptive capacity? YES-Y/NO-N	Does it support (S) or challenge (C) your adaptive capacity?	To what extent does it affect your adaptive capacity? 3 = High 2 = Medium 1 = Low	Comments
Access to basic services	Y	S	3	Empowers and gives the ability to put in place adaptation actions to co-exist with living conditions created by impacts of climate change
Access to healthcare	Y	S	3	
Access to education	Y	S	3	
Cost of living	Y	C	3	
Housing	Y	C	2	
Poverty	Y	C	3	The poor tend not to adopt the adaptation methods, and they engage in deforestation activities that challenge adaptive capacities
Inequality	Y	C	3	
Underemployment	Y	C	3	
Unemployment	Y	C	2	
Public health	Y	S	3	
Political stability	Y	S	3	
Political engagement/transparency	Y	S	2	
Government capacity	Y	S	3	
Budgetary capacity	Y	S	3	
Migration	Y	C	2	
Safety & security	Y	C	3	
Economic health	Y	S	3	
Economic diversity	Y	S	2	
Rapid urbanisation	Y	C	2	

Factors	Is this a factor that affects your adaptive capacity? YES-Y/NO-N	Does it support (S) or challenge (C) your adaptive capacity?	To what extent does it affect your adaptive capacity? 3 = High 2 = Medium 1 = Low	Comments
Resource availability	Y	S	3	Availability supports adaptive capacity; resources contribute to development; proper resource planning and mobilisation; good utilisation of resources
Environmental conditions	Y	S	2	
Infrastructure conditions/maintenance	Y	C	3	
Infrastructure capacity	Y	S	3	
Land use planning	Y	S	3	
Community engagement	Y	S	3	Supports adaptive capacity; however, community engagement has to be holistic and adequately planned and executed
Access to quality/relevant data	Y	S	2	

8. Conclusion

The objective of the Nakuru County RVA was to identify the most important **climate hazards** currently affecting the county and to assess the extent of their impacts on **key sectors** and **population groups** in the county. The RVA also aimed to assess how these hazards are likely to change in intensity, frequency and time scale in the future as a result of climate change.

Based on data from the participatory workshops, a household survey, interviews, and a literature review, it appears that Nakuru County is already facing climate hazards, the worst being **droughts**, **rainstorms**, **flash/surface floods**, **river floods**, and **waterborne diseases**. These results are aligned with the hazards described in the Nakuru County Climate Change Action Plan (2018) which highlights increasing frequencies of droughts, heavy rains, flooding and waterborne diseases. These hazards are likely to intensify with climate change as temperatures are projected to rise in the county and rainfall is likely to become more erratic (CIP: Nakuru Meteorological Station). Current and future impacts of these hazards on the population of Nakuru County include: increase in crop failure, malnutrition, fluctuation in the water levels of rivers and lakes, depletion of aquifers, soil erosion and degradation, water pollution, loss of biodiversity, and destruction of infrastructure such as roads.

Combining the results of the technical workshop (based on the JRC list of sectors) and the Nakuru County Climate Change Action Plan (based on existing sectors in Nakuru County), the RVA priority sectors are: **agriculture**, **livestock** and **fisheries**; **water**; **forestry**; and **tourism**. The Nakuru County Climate Change Action Plan (2018) similarly states that agriculture, livestock and fisheries; water; wildlife and tourism; forestry; transport and infrastructure; health; energy; mining; manufacturing and trade; and tourism are considered key sectors to prioritise when promoting a low-carbon, climate-resilient economy and livelihoods.

The RVA indicated that the most vulnerable groups to climate hazards in Nakuru are **women and girls** and **low-income households**. This is partly aligned with the Nakuru County Climate Change Action Plan (2018) which highlights the need to focus adaptation actions on indigenous communities, women, children, the elderly, youth and the disabled, among other groups, as these are already — and likely to be in the future — the most vulnerable groups to climate hazards such as droughts and floods in Nakuru County.

Factors that could support the adaptive capacity of Nakuru include:

- Agricultural and livestock insurance and safety net schemes;
- Improved technology to handle post-harvest losses;
- Mainstreaming and promoting climate-smart agriculture and livestock development;
- Improved communication systems on Climate-Smart-Agriculture extension and agroecological issues;
- Domestication of the National Water Master Plan to ensure dams, dykes, lakes, and rivers are protected; and
- Improvement of the level of public awareness on climate health risks.

Factors that could challenge the adaptive capacity of Nakuru include:

- Conflict over land-use policies in the agriculture-livestock sectors;
- Increased demand for water in other sectors and an increasing human population;
- Incoherent and insensitive policies to deal with over-abstraction of water and other water management issues;
- Limited data on the current and future water situation;
- Overexploitation of wildlife habitats due to the absence of laws to support wildlife benefits to the population;
- Loss of indigenous forest knowledge and practices that protected certain areas for community benefits; and
- Insufficient funds to support research on climate-related diseases, especially those in the tropics, hence increased endemism.

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Annexure 1: Household questionnaire

Greetings. My names are () calling you from Africa Research and Impact Network. We are supporting your County to better plan and improve its Sustainable energy access and climate actions. We would like to ask you some questions regarding access to electricity, clean cooking, climate change adaptation and mitigation in your community. Your responses and participation will inform the County planning and actions. The interview will take 45 minutes. Your participation is completely voluntary. All your responses will be treated as confidential and will only be used for this research purpose. We count on your cooperation to make this possible.

Name of the respondent	
Phone Number	
Name of the enumerator	
Would you like to participate in this survey and help plan sustainable energy access in Nakuru County?	
Sub-County	
Village	
How long have you stayed in the area?	
Education level?	
Gender of the respondent	
Age of the respondent	
Main house – type of walls	Mud & Wattle | Wood Panel | Bricks | Stone | Other
If Other please specify	
Which of the following appliances do you use in your household?	Television | Radio | Laptop/desktop computer | Electric kettle | Fan | Microwave | Iron | Heater | Washing machine | Smart phone/tablet | Other
If Other please specify	
How many Television do you have in your household?	
How many Radio do you have your household?	
How many laptops/desktop computers do you have in your household?	
How many electric kettle do you have in your household?	
How many fan do you have in your household?	
How many microwave computers do you have in your household?	
How many iron do you have in your household?	
How many heater do you have in your household?	
How many washing machine do you have in your household?	
How many dishwasher do you have in your household?	
How many smartphone/tablet do you have in your household?	

What means of transport does the household use?	Own bicycle | Own motor cycle | Own car | Public transport | Other
If Other please specify	
How long does it take you to reach the nearest vehicle station?	
How long does it take you to reach the nearest health centre from your house (One way)?	
Please select all relevant sources of income for your household	Formal employment | Casual employment | Own business | Farming | Other
If Other please specify	
How many people do earn in your household?	
How much is your household income per month (KShs)?	
Who is the main earner in the household?	
Please specify	
What is the Primary cooking method used by the household?	
Please specify	
What is the secondary type cooking method do you use in the household?	Electric stove | Gas stove | Paraffin stove | Energy saving jiko | Jiko (Traditional jiko) | 3-stone fireside | Briqutte | Biogas | Other
If Other please specify	
If you had a choice, what will be your preferred method of cooking?	
If Other please specify	
Are you willing to transition to the use of cleaner cooking stoves for cooking?	
Which clean cooking options are you willing to transition to?	Solar stoves | Biogas stoves | LPG stoves | Electric stoves | Other
If Other please specify	
How much are you willing to pay to transition to a cleaner means of cooking (operation costs)?	
Does your household collect firewood for cooking (or making fire)	
How often do you collect firewood?	
If Other please specify	
Does your household buy firewood for cooking (or making fire)	
How far do you travel to get your firewood (km)	
How much do you spend in buying firewood per month	
How long does it take you when you got out to fetch firewood	

How often do you buy firewood (wood to be used for cooking)	
Is electricity universally available in your area?	
Do you use electricity in your house?	
Why are you not connected?	
If Other please specify	
Are you willing to use electricity	
Do you use electricity for cooking?	
How often do you use electricity for cooking?	
Why do you use electricity for cooking?	
If Other please specify	
Do you use electricity for lighting?	
How often do you use electricity for lighting?	
Why do you use electricity for lighting?	
If Other please specify	
Do you use electricity for heating?	
How often do you use electricity for heating?	
Why do you use electricity for heating?	
If Other please specify	
Do you use electricity for cooling?	
How often do you use electricity for cooling?	
Why do you use electricity for cooling?	
If Other please specify	
Where do you get your electricity supply?	
If Other please specify	
How is your household connected to electricity?	
How do you pay for electricity?	
Please specify	

Have you ever stayed without electricity due to load shedding or technical faults from your electricity supplier?	
What amount of electricity do you get in a month for free (amount in units or kWhs)?	
How often do you buy electricity? Is it the same amount every time?	
How much electricity do you buy each time (units or kWhs)?	
Have you ever been without electricity because you did not buy enough?	
What determines how much electricity you buy?	
If Other please specify	
Has the electricity supply ever been suspended because the household did not pay the bill?	
On average, how much money do you spend on electricity in a month (amount in local currency)?	
Is gas (LPG) energy for cooking universally available in your area?	
Do you use gas (LPG) in your household?	
Which other type of gas do you use?	Biogas | Biogas | Other
If Other please specify	
Why don't you use gas? Please specify	
Are you willing to use gas?	
What do you use gas for?	Cooking | Lighting | Heating | Cooling | Other
If Other please specify	
Why do you prefer to use gas? If other please specify	
How often do you use gas?	
Where do you usually buy your gas?	Petrol station | Local vendor shop | Other
If Other please specify	
How often do you buy gas	
On average how much money do you spend in a month on gas?	
Is paraffin available in your area?	
Do you use paraffin in your household?	

Why don't you use paraffin?	Too expensive | It smells | It's dangerous | I don't have paraffin appliances | It's not available in my area | I don't know what it is | Other
If Other please specify	
Are you willing to use paraffin in your household?	
What do you use paraffin for?	Cooking | Heating | Lighting | Other
If Other please specify	
How much do you buy each time (Amount in litres)?	
What determines how much paraffin you buy	How much I can afford | How much I need | Size of the container | Other
If Other please specify	
How often do you buy paraffin? Please specify	
Have you ever been without paraffin because you did not buy enough?	
Besides money issues, have you ever not had paraffin in the household?	
On average, how much money does the household spend a month on buying paraffin (Kshs)?	
1) What support do you receive from other agencies towards electricity/cooking energy access?	
2) What are the main challenges you face in accessing energy for lighting (electricity) and for cooking?	
Which other source of energy do you use?	Solar Panel | Wind | Other
If Other please specify	
Are there natural resources (forests, bush lands, wetlands, water bodies) within your community? (Kuna mali asili (misitu, ardhi za kichaka, ardhi ya misitu, miili ya maji) ndani ya jamii yako?)	
What product do you collect from these resources? (Unakusanya bidhaa gani kutoka kwa rasilimali hizi?)	Herbs | Firewood | Food (fish, honey, fruits, etc.) | Aesthetic value | Cultural practices | Other
If Other please specify	
What other activities do you conduct in forest/bush lands/wetlands for your livelihoods? (Unafanya shughuli gani nyingine katika ardhi za misitu/kichaka/ardhi kwa ajili ya maisha yako?)	Livestock grazing | Tourism-based income | Other
If Other please specify	
Is there any plant or wildlife that has disappeared within your areas over the last 20 years? (Je, kuna mmea wowote au wanyamapori ambao wametoweka ndani ya maeneo yako katika kipindi cha miaka 20 iliyopita?)	
If yes what is the cause of disappearance? (Kama ndiyo sababu ya kutoweka ni nini)	Lack of water in the area | Lack of food | Weather variability | Other
If Other please specify	

Do you have any water sources within the community?	
If yes do you feel the changes in quality and quantity of water (Kama ndiyo unahisi mabadiliko katika ubora na wingi wa maji)	
If yes what may be the cause of the change? (Nini imesababisha iyo mabadiliko)	Increased temperatures | Drought | Increased surface run-off | Other
If Other please specify	
Where do you collect water for domestic use? If other please specify	
Is this water available every day?	
How long does it take to get to your water source?	
Have you heard of the word “climate change” before? (Je, umewahi kusikia neno “mabadiliko ya hali ya hewa”?)	
Do you receive information on climate change? (Je, unapokea taarifa juu ya mabadiliko ya hali ya hewa?)	
Source of information on climate change? (Unapokea wapi habari ya mabadiliko ya hewa?)	Radio | Local newspaper | Television | Local bazaars | Other
If Other please specify	
Over the last 5 – 30 years have you noticed any changes in the weather? (Zaidi ya miaka 5–30 iliyopita umegundua mabadiliko yoyote katika hali ya anga?)	
Which are the major climate related risks you have experienced in the last 5 – 30 years? (Ni hatari gani kuu zinazohusiana na hali ya hewa ulizozipata katika miaka 5– 30 iliyopita?)	Fire (bushfire/forest fire) (Moto vichaka/misitu) | Hailstorm (mvua ya mawe) | Landslides (maporomoko ya ardhi) | Extreme hot temperature | Floods (mafuriko) | Droughts (ukame) | Fog (ukungu) | Extreme cold temperature | Rain-storms (dhoruba ya mvua) | Other
If Other please explain	
What is the probability of Fire (bushfire/forest fire) occurring? (Je, wanaonaje uwezekano wa moto kutokea haswa?)	
What is the probability of Hailstorm occurring? (Je, wanaonaje uwezekano mvua ya mawe kutokea haswa?)	
What is the probability of Landslides occurring? (Je, wanaonaje uwezekano wa mapromoko ya ardhi kutokea haswa ?)	
What is the probability of Extreme hot temperature occurring?	
What is the probability of Floods occurring? (Je, wanaonaje uwezekano wa mafuriko kutokea haswa?)	
What is the probability of Droughts occurring? (Je, wanaonaje uwezekano wa kiangazi/ukame kutokea haswa?)	

What is the probability of Fog occurring? (Je, wanaonaje uwezekano wa Ukungu kutokea haswa?)	
What is the probability of Lightning Strikes occurring? (Je, wanaonaje uwezekano wa Radhi kutokea haswa?)	
What is the probability of Extreme Cold temperature occurring?	
What is the probability of Rain-storms occurring? (Je, wanaonaje uwezekano wa dhoruba ya mvua kutokea haswa?)	
What is the probability of Other hazard occurring?	
How would you rate the severity of Fire (bushfire/forest fire)? (unaweza kadiria ukali wa moto?)	
How would you rate the severity of Hailstorm? (unaweza kadiria ukali wa mvua ya mawe)	
How would you rate the severity of Landslides? (unaweza kadiria ukali wa maporomo ya ardhi)	
How would you rate the severity of Extreme hot temperature?	
How would you rate the severity of Floods? (unaweza kadiria ukali wa mafuriko)	
How would you rate the severity of Droughts? (unaweza kadiria ukali wa kiangazi/ukame)	
How would you rate the severity of fog? (unaweza kadiria ukali wa ukungu)	
How would you rate the severity of Lightning Strikes? (unaweza kadiria ukali wa radhi)	
How would you rate the severity of Extreme Cold temperature?	
How would you rate the severity of Rain-storms? (unaweza kadiria ukali wa dhoruba ya mvua)	
How would you rate the severity of Other risks?	
What did you do to cope with Fire risks? (Ulifanya nini ili kukabiliana na hatari za Moto?)	Inter household transfers and loans | Sell of household assets | Insurance | Government assistance | Renting tools/animals | Giving community service (food for Work) | Reduction of consumption level | Other
If Other please explain	
What did you do to cope with Hailstorm risks? (Ulifanya nini ili kukabiliana na hatari za mvua ya mawe?)	Inter household transfers and loans | Sell of household assets | Insurance | Government assistance | Renting tools/animals | Giving community service (food for Work) | Reduction of consumption level | Other
If Other please explain	
What did you do to cope with Landslides risks? (Ulifanya nini ili kukabiliana na hatari za Mapromoko ya ardhi?)	Inter household transfers and loans | Sell of household assets | Insurance | Government assistance | Renting tools/animals | Giving community service (food for Work) | Reduction of consumption level | Other
If Other please explain	

What did you do to cope with Extreme hot temperature risks?	Inter household transfers and loans | Sell of household assets | Insurance | Government assistance | Renting tools/animals | Giving community service (food for Work) | Reduction of consumption level | Other
If Other please explain	
What did you do to cope with Floods risks? (Ulifanya nini ili kukabiliana na hatari za Mafuriko?)	Inter household transfers and loans | Sell of household assets | Insurance | Government assistance | Renting tools/animals | Giving community service (food for Work) | Reduction of consumption level | Other
If Other please explain	
What did you do to cope with Droughts risks? (Ulifanya nini ili kukabiliana na hatari za Ukame/kiangazi?)	Inter household transfers and loans | Sell of household assets | Insurance | Government assistance | Renting tools/animals | Giving community service (food for Work) | Reduction of consumption level | Other
If Other please explain	
What did you do to cope with Fog risks? (Ulifanya nini ili kukabiliana na hatari za ukungu?)	Inter household transfers and loans | Sell of household assets | Insurance | Government assistance | Renting tools/animals | Giving community service (food for Work) | Reduction of consumption level | Other
If Other please explain	
What did you do to cope with Lightning Strikes risks? (Ulifanya nini ili kukabiliana na hatari za mapromoko ya radhi?)	Inter household transfers and loans | Sell of household assets | Insurance | Government assistance | Renting tools/animals | Giving community service (food for Work) | Reduction of consumption level | Other
If Other please explain	
What did you do to cope with Extreme Cold temperature risks?	Inter household transfers and loans | Sell of household assets | Insurance | Government assistance | Renting tools/animals | Giving community service (food for Work) | Reduction of consumption level | Other
If Other please explain	
What did you do to cope with Rain-storms risks? (Ulifanya nini ili kukabiliana na hatari za dhoruba ya mvua?)	Inter household transfers and loans | Sell of household assets | Insurance | Government assistance | Renting tools/animals | Giving community service (food for Work) | Reduction of consumption level | Other
If Other please explain	
What did you do to cope with Other risks?	Inter household transfers and loans | Sell of household assets | Insurance | Government assistance | Renting tools/animals | Giving community service (food for Work) | Reduction of consumption level | Other
If Other please explain	
Who do you consider to be most vulnerable to the impacts of fire? (Unadhani kina nani huathiriwa sana na moto?)	Women and girls | Less educated | Indigenous population | Marginalized groups | Persons with disabilities | Persons with chronic diseases | Low-income households | Persons living in sub-standard housing | Unemployed persons | Other
If Other please explain	

Who do you consider to be most vulnerable to the impacts of Hailstorm Risks? (Unadhani kina nani huathiriwa sana na dhoruba ya mvua?)	Women and girls | Less educated | Indigenous population | Marginalized groups | Persons with disabilities | Persons with chronic diseases | Low-income households | Persons living in sub-standard housing | Unemployed persons | Other
If Other please explain	
Who do you consider to be most vulnerable to the impacts of Landslides? (Unadhani kina nani huathiriwa sana na maporomoko ya ardhi?)	Women and girls | Less educated | Indigenous population | Marginalized groups | Persons with disabilities | Persons with chronic diseases | Low-income households | Persons living in sub-standard housing | Unemployed persons | Other
If Other please explain	
Who do you consider to be most vulnerable to the impacts of Extreme hot temperature?	Women and girls | Less educated | Indigenous population | Marginalized groups | Persons with disabilities | Persons with chronic diseases | Low-income households | Persons living in sub-standard housing | Unemployed persons | Other
If Other please explain	
Who do you consider to be most vulnerable to the impacts of Floods? (Unadhani kina nani huathiriwa sana na mafuriko?)	Women and girls | Less educated | Indigenous population | Marginalized groups | Persons with disabilities | Persons with chronic diseases | Low-income households | Persons living in sub-standard housing | Unemployed persons | Other
If Other please explain	
Who do you consider to be most vulnerable to the impacts of Droughts? (Unadhani kina nani huathiriwa sana na ukame/kiangazi?)	Women and girls | Less educated | Indigenous population | Marginalized groups | Persons with disabilities | Persons with chronic diseases | Low-income households | Persons living in sub-standard housing | Unemployed persons | Other
If Other please explain	
Who do you consider to be most vulnerable to the impacts of Fog? (Unadhani kina nani huathiriwa sana na ukungu?)	Women and girls | Less educated | Indigenous population | Marginalized groups | Persons with disabilities | Persons with chronic diseases | Low-income households | Persons living in sub-standard housing | Unemployed persons | Other
If Other please explain	
Who do you consider to be most vulnerable to the impacts of Lightning Strikes? (Unadhani kina nani huathiriwa sana na radhi?)	Women and girls | Less educated | Indigenous population | Marginalized groups | Persons with disabilities | Persons with chronic diseases | Low-income households | Persons living in sub-standard housing | Unemployed persons | Other
If Other please explain	
Who do you consider to be most vulnerable to the impacts of Extreme Cold temperature?	Women and girls | Less educated | Indigenous population | Marginalized groups | Persons with disabilities | Persons with chronic diseases | Low-income households | Persons living in sub-standard housing | Unemployed persons | Other
If Other please explain	

Who do you consider to be most vulnerable to the impacts of Rain-storms? (Unadhani kina nani huathiriwa sana na dhoruba ya mvua?)	Women and girls | Less educated | Indigenous population | Marginalized groups | Persons with disabilities | Persons with chronic diseases | Low-income households | Persons living in sub-standard housing | Unemployed persons | Other
If Other please explain	
Who do you consider to be most vulnerable to the impacts of other risk?	Women and girls | Less educated | Indigenous population | Marginalized groups | Persons with disabilities | Persons with chronic diseases | Low-income households | Persons living in sub-standard housing | Unemployed persons | Other
If Other please explain	
Crop farming	
Livestock farming	
Fishing	
Water resources	
Land resources	
Which of these strategies have you used to reduce the effects of climate change?	
If Other please specify	
Do you think the adaptive mechanism(s) you employed is the best and viable one in current and future climate change and variability?	
What other adaptation mechanism(s) do you think is appropriate?	
What are the major constraints you have that hinders your ability to adapt?	Lack of money | Lack of information | Poverty | Lack of credit | Lack of technology (agricultural inputs) | Lack of extension service | Lack of market access or poor transport link | Other
If Other please specify	
Rainfall on-set	
Rainfall amounts (kiwango cha mvua)	
Rainfall seasonal distribution Cessation (end of rainy season)	
Temperature	
In your opinion which of these are a priority concern about waste in the area?	Littering, which looks bad | Effects on human health | Effects on the environment | None | Other
If Other please specify	
In what do you store your household rubbish (solid waste) before disposing? If other please specify	
What is the approximate size of the dust bin (trash can) used in your household (in litres)?	

Can you roughly estimate the percentage composition of your generated waste (in percentages)?	
Kitchen waste	
Plastics	
Metals	
Glass	
Papers	
Others	
Where do you dispose your generated waste? Please specify	
How often do you empty your trash? Please specify	
Do you sort your waste before disposing?	
What type of waste sorting do you do with your household waste?	Recyclables from non-recyclables | Perishables from non-perishables | No sorting | Other
If Other please specify	
Does your household use the services of any of the garbage collectors?	
Which garbage collection service provider do you use? Please specify	
How much money do you pay the waste collectors per month in KShs?	
Are you satisfied with your current waste collection service?	
What makes you satisfied with the current waste collection service?	It is affordable | They are regular and almost always on time | They are friendly | Other
If Other please specify	
Is a sewage system or waste water collection system available in your area?	
What is the main mode of liquid waste management in your household? Please specify	
What is the main type of toilet used by household members? Please specify	
Does your household practice any form of agriculture?	
Farming methods used by household	Arable: Crops Pastoral: Animals Mixed: Crops and animals Subsistence: Grown just for the farmer and his family Commercial: Grown to sell Intensive: High inputs of labour or capital usually small Extensive: Low-inputs of labour or capital Sedentary: Permanently in one place

Do you use fertilizers for crop cultivation?	
What is the main type of fertilizer used?	
What is the total surface area of your field(s)?	
Has your household performed any form of land use conversions in the past 5 years?	
Which of the following land use conversions has your family done in the past 5 years	Forest land to cropland | Grassland to cropland | Forest land to settlements | Grassland to settlements | Wetland to settlements | Cropland to forest land | Cropland to settlements
Why do you choose not respond to the survey?	I do not know much about the household | I do not trust the purpose of the survey | For personal reasons | Other
If Other please specify	

Thank you for completing our survey!

Thank you for taking part in this survey.

The data obtained from this survey, as well as the data from other respondents will be used to develop a Sustainable Energy Access and Climate Action Plan for the Nakuru City

Annexure 2: Policy workshop report

Report of the Risk and Vulnerability Assessment (RVA) Virtual Workshop for High-Level Decision-makers

Held on: Date: 19th January 2021

Time: 10:00hrs – 13:00hrs

Submitted on: **26th January 2021**

By: **Dr Joanes Atela and Team**

About this Report

This report summarizes high-level decision-makers' contribution to the RVA assessment and development of the adaptation pillar under the SEACAP project. GIZ, ICLEI Africa jointly organized this event, and ACTS/ARIN and the focus was on presenting the preliminary findings for input by the high-level decision-makers from Nakuru County and National Government and Key Stakeholders.

Acronyms and abbreviation

RVA	Risk Vulnerability Assessment
SEACAP	Sustainable Energy Access and Climate Action Plan
CoM SSA	The Covenant of Mayors in Sub-Saharan Africa

Table of Contents

Introduction

The timely decision-makers workshop comes when there is a dire need to address climate change and its impacts at the County level. The decision-makers' worskshop was convened primarily to create awareness among decion makers on the preliminarily on the RVA process for Nakuru and seek their input for futher scruitiny by the technical workshop be convened by 21st of January 2021. This workshop brought together approximately 23 high-level decision-makers who acknowledged the findings and made substantive inputs. In this regard, the workshop aimed at bringing together all the stakeholders to build a consensus in developing an RVA framework for Nakuru County.

The workshop sought to get the high-level inputs into the adaptation planning building on Nakuru County's strategic climate action initiatives such as the country climate change action plan, the county climate change bill 2020; the anticipate county climate change policy, strategy, and county climate change adaptation planning framework, amongst other related climate change planning framework.

Some of the highlights captured in this report include identifying the common climatic hazards in the County, the key sectors affected, and the level, existing vulnerabilities, and county households' adaptive capacity and systems. The workshop's output will inform the development of the adaptation pillar, which entails reviewing the existing climate change action plan to identify the areas of strengthening and sharpening in terms of climate change adaptation targets and informing the county's climate change adaptation actions.

RVA workshop Objectives

From the primary and secondary data gathered, analysed, and reviewed, climate change impacts are felt in Nakuru County at various scales and levels, with crucial sectors and vulnerable groups in the society much affected. Among the many stakeholders in the County and beyond, the decision-makers play a critical role in shaping the strategic policy and technical support systems needed in the adaptation implementation and intervention formulation. Therefore, the workshop aimed to bring the various decision-makers to input in the county's integrated climate adaptation planning. More specifically, the workshop aims include:

- Get strategic inputs from the high-level stakeholders in the climate action planning for Nakuru County
- Raise awareness on the progress and the status of climate change planning for the County
- Promote co-ownership of the climate change action planning process in Nakuru
- Get the stakeholders' to support the planning and the subsequent implementation of the climate change adaptation plans for Nakuru County.

Workshop Proceedings

Opening remarks

Mr. Kiogora Murithi – Chief Officer, Natural Resources Nakuru County Government

From his welcoming remarks, the Chief officer Reiterated the significance of the climate action plan for the County of Nakuru and reaffirmed their commitment to a sustainable low carbon development of Nakuru County. He affirmed that Climate change adaptation requires evidence-based action planning to support resource mobilization and substantive implementation of the planned adaptation actions. Mr. Mureith further confirmed Climate change impacts most threaten the agricultural sector, which is the pillar of the County's economy. Besides, the sector is heavily dependent on the water sector, and thus, adaptation must consider other supporting sectors. He reiterated that the County would work towards building stronger resilience in the face of climate change. Mr. Kiogora further reiterated Nakuru County is committed to the SEACAP development process and insisted on the need to focus on the communities and their livelihoods, which are often affected by climate change.

Eng. Festus Ng'eno – County Executive member, Minister, Environment and Natural Resources Nakuru County Government

The CEC acknowledged the timely support from the SEACAP team (GIZ, ICLEI Africa, and ARIN/ACTS) toward building resilience for Nakuru County. While reaffirming the importance of the SEACAP development for the County, the minister was keen on the threats posed by climate change impacts and outlined some of the critical steps the County is taking from the decision-maker's level, informed by research evidence to address the threats. The climate change impacts are continuous, and the more we wait, the more the people and their livelihoods, the critical socio-economic sectors are negatively impacted. The CEC shared that, Climate Change Bill is at the second reading at the county assembly and other relevant policy and regulation such Energy Bill at the draft level, and the Waste Management bill is currently ongoing towards finalization. The CEC emphasized the need to partner and collaborate and called upon the workshop participant to support the process. Some of the county government's milestones include; the urgency to develop Climate Change finance regulation framework for the county, e.g., lobbying for at least 1% from the exchequer to finance Climate Change actions in the 17 sub-counties in Nakuru County. The CEC also reiterated the need to strengthen the draft County climate change action plan 2018–2022 backed with policy evidence interventions for adequate resource allocations and mobilization for implementation.

Peter Ketyenya – CEC Finance.

Resource mobilization and financial allocations are critical to the realization of the planned climate actions. The County develops a financial budget, and the specific action needs to be translated into actionable projects and programs that the County can implement, monitor, and evaluate progressively. The minister reiterated the need to anchor the climate action through specific financial plans and options such as establishing the county climate change fund to strengthen the actions' implementation. He further reiterated the Ministry and the County's commitment to actualize the climate change adaptation plans to be developed by translating them into actionable or executable projects and programs supported by County legal policies.

Remarks by Kruti Munot – GIZ About CoM SSA

On behalf of GIZ, Kruti gave a general overview of the SEACAP process under the CoM SSA and why the Covenant of mayors is keen to support local governments' energy climate Changes and climate action planning. In this regard, GIZ specifically supports the SEACAP process development and enables climate-related developments at the sub-national government levels, among other development agendas. There is an MoU with the Ministry of devolution in Kenya for the CoM SSA project implemented in Nairobi, Nakuru, and Kisumu Counties with Embu, Mombasa Makueni keen to join the CoM SSA. The SEACAP development allows the Counties to learn from the global stage and interact with broader planning process expertise. The audience was reminded of the three pillars of the SEACAP development and the planning stage in which Nakuru SEACAP development is. In the planning stage, the assessment and research activities are done, comprehensive consultations and validation are conducted before setting the targets and drawing up the action plans. The plans' implementation then takes the process to another level of monitoring and evaluation, which comes with periodic reporting.

Preliminary Findings on the SEACAP development for Nakuru County

Overview by Dr. Joanes Atela

Dr. Atela, who is the director of climate change programs at the African Centre for Technology Studies and the Convenor of the Africa Research and Impact Network, acknowledged the central role the County plays in connecting the climate action, efforts from the global and national level to the communities and households. The Counties are very significant units to mediate Climate Change actions because of their proximity to the people. The Counties are the local level government units that can best associate with the climate change impacts at the local level, and thus the intervention targeted to the local level is best mediated and structured by the county governments' involvement. Policies are shifting from the global level to places where actions happen, in this case, the Counties. The Paris Agreement and NDCs in place further target the local solution s and locally-led actions. The development of the SEACAP for Nakuru comes at the opportune time when the Paris agreement's renegotiations are forthcoming and new targets are set. This allows the county to scale up and link its climate change ambitions to the national and global goals and climate change action agenda.

Furthermore, Dr. Atela reiterated the critical role the SEACAP plays in giving the County a specific roadmap in climate action and positioning Nakuru County to pitch fundable intervention programs and projects locally and internationally. Most climate action and development donors are keen to direct local governments' resources and funding with some evidence-based action plans and strategic policies in place. Therefore, Nakuru County is a champion county in this space, and the SEACAP development process will scale up this effort. The Risk and vulnerability assessment through the SEACAP process also gives the County to borrow from research and consultation of various sectors. This allows harnessing a lot of opportunities, including funding for Climate Change actions. Therefore, the SEACAP process contributes to the Multi-sectoral and inclusive climate action plans that are much needed at the County levels. The county government's commitment is impressive, and the Africa research and Impact Network, in collaboration with ICLEI Africa and GIZ, will support this endeavor.

Key Findings:

They were presented by Charles Tonui, a research fellow at the Africa Research and Impact Network, key findings from the primary data collected and analyzed for Nakuru, the climate change adaptation review, and the consultation did so far SEACAP development for Nakuru County. The key challenges faced in the County in its effort to achieve the desired climatic change action and development ambitions. More specifically. The overarching issues summarize the preliminary findings in the County's path towards a low carbon emission development. The key findings include:

The Manifestations of hazard are mostly in floods and drought as they represent the county's most significant risks. How does the County prepare for such hazard risks and enhance disaster risk preparedness?

The severity, frequency, and magnitude of impacts will increase by 2100 in increased precipitations and prolonged moisture stress. The County thus need to specify more profound the sector-specific potential impacts and action plans as interventions.

Increase in lake water levels; displacement of populations by extreme weather events. This is currently evident in most lakes in the Rift Valley of Kenya, most of which are within Nakuru County borders. The permanent inundation has got adverse impacts and also presents opportunities. What opportunities are there for the County, and how is the County prepared for such impacts that may persist for the rest of the century?

Policy Responses at the National and county levels need to be scaled up, be informed by evidence, and conducted at the multistakeholder level. Most of the county's policies are sector independent and need to integrate the climate action policies conscious of the sector-specific vulnerabilities and impacts.

Challenges Identified

i. Inadequate infrastructure and technical skills for effective planning and developing a climate-proof economy.
ii. Lack of risk-informed plans at the County. Most plans are sector-specific and not integrated.
iii. Gender imbalance and insensitive responses.
iv. Most interventions in the County are reactive and thus reveals the lack of preparedness.
v. Inadequate funding for the Integrated climate change action planning and strategic development. This is due to the inadequate policies and fulfilling the prerequisite requirements for most of the global and national funding.
vi. Limited knowledge and capacity to climate Change the globally available funding and resources for climate action).

Overarching issues

i. Multi-sectoral planning and collaboration in climate action are improving, but much more still needs to be done.
ii. Reactive community responses instead of such responses being proactive.
iii. County policy agenda evolving well but need to link adequately with the national agenda.
iv. Data downscaling for sub-counties should be a key priority.

General Reflections and Inputs

- Cross-sectoral planning, as seen by Nakuru County, is timely.
- Learning from the case study of wheat and meteorological factors – there is a need to diversify livelihoods. Interdependence factor on the trans-boundary risk analysis. This underscores the need to build on cohesion for proper resilience building.
- Community engagements need to be reinvigorated – Payment for Ecosystem Services encourages the communities to get involved actively.
- Productive use of modern energy – County to come up with models that will be sensitive to drive Low-carbon economy and improve on the household livelihoods.
- The climate change impacts are felt on the natural ecosystems, household and livelihood systems and specifically on the key sectors driving the County and national economy. Some barriers and opportunities have been or will be encountered or identified. How is the County's experience on this, and how is the plan to address and overcome these barriers and tap the opportunities moving forward?

Progress made by Nakuru by Mr. Kiogora Murithi

- Align County SEACAP to improve Nakuru County Climate Change Action Plan 2018–2022, whose goal is to mainstream CLIMATE CHANGE strategies into County plans to improve county residents' living standards. The plan focuses on food security, green energy production, and use, climate change resilient infrastructures, sustainable financing, governance, and coordination.
- It is cascading national programs and actions to the County. Even as the County continues planning and addressing local climate change impacts, the national government also has specific priority areas of action, and the county's need to link its planning efforts and priorities to the national agenda.
- The bottom-up model has been the cornerstone of the county programs. In this regard, the development of the SEACAP has embraced the local model by using the assessments and multistakeholder to facilitate consultation of various stakeholders in the planning process.

Note: It was noted that Nakuru County is considering the models that would ensure the private sector is actively involved in the planning process and tap into the Multilateral corporations. The county is interested is to know its contributes to the recently updated NDC (2020). The county anticipates that the SEACAP process and the Climate change action planning can tap into the NDC national reporting.

Nakuru County is also working with the Kenya Association of Manufacturers to develop energy plans and energy policies. The county is engaging the Geothermal Development Corporation on energy consumption, which is the critical input for a comprehensive county energy plan. The county government fosters a circular economy at the expected industrial parks' significant operation to address sustainability issues. Therefore, SEACAP's role is instrumental in building the capacity necessary for the great take-off towards building resilience for the county.

RVA Process by Dr. Joanes Atela & Mr. Tom Randa

The indicator approach relies on conducting the Risk and Vulnerability Assessment under the SEACAP development process in Nakuru. It was reiterated that the assessment is critical since the impacts of climate change are usually localized and unique to communities, sectors, livelihood systems, and thus, the response and planning must be localized. In Nakuru County, the agriculture sector remains the County's economic background and is the most vulnerable to climate change. The RVA is expected to interrogate the hazards, vulnerabilities, and capacity of the local systems in Nakuru through an indicator-based approach. The technical workshop scheduled for Thursday, January 21, 2021, will offer a landscape to interrogate Nakuru County's RVA.

Recommendation to improve the RVA process.

- Gender perspective would be critical in giving the RVA more impetus. Climate change impacts are gender-sensitive, and thus, the interventions and responses should be gender inclusive.
- The water sector's strategic actions are required urgently since all other sectors and livelihood systems rely on water resources.
- There's a need to implement the plans—building synergy to tackle the various risks and vulnerabilities and tap into the opportunities of climate change. Local partnerships are recommended, primarily to involve the local stakeholders to own the climate change action planning and its implementation.
- The role of the regional economic blocs in augmenting climate change action.
- Counties to leverage on the Climate Change Fund by building the necessary capacity to strengthen this.

Opportunities and Barriers.

Opportunities

- Climate financing:
  - An ongoing initiative by the treasury, Financing Locally-Led Climate Change Program, where the counties could tap into its opportunities by having adequate legislation to support it.
  - On the climate change Fund, a push from the civil society caucuses to help operationalize the fund
- Capacity development opportunities; The Ministry of Energy at the national level intends to provide technical support to counties.

Barriers

- Institutional barrier; for example, the Climate Change action plan 2018–2022, which was scheduled to operate from 2018–2022, was just approved the last year 2020 – hugely derailing the actions to deal with the impacts.
- The bureaucracies within the public financing framework
- Weak public financing framework for emergencies such as multiple and non-climatic hazard risks, e.g., The government had to divert public finance for development to respond to an unpredicted pandemic like Covid-19 response denying sufficient finance not only for development but also climate action.
- Lack of motivation from the higher relevant bodies. Disconnect on the various levels of the planning process.

Closing Remarks

The County Assembly is considering scaling up the climate change finance allocation from the current proposed 1% to 2%. There's a need to bring on board, all stakeholders particularly the local communities. More emphasis is placed on the fact that climate change affects all the county economy sectors, hence calling for multi-sectoral and community-based responses.

Annexure 3: Workshop Agenda

County Government of Nakuru (Technical staff)
Risk and Vulnerability Assessment (RVA) Workshop

Date & Time: 21 January 2021, 09:00 – 13:00 (EAT)
Join Zoom Meeting:

Time	Item	Key content of the session	Description	Responsible
19 January 2021				
Introduction Session				
10:00 – 10:05 5 mins	Workshop Opening	• Setting the scene	• Importance of decision-makers' participation in the workshop	Eng. Ng'eno / Mr. Kiogora
10:05 – 10:20 15 minutes	Introductions	• Round of introductions	• Participants to introduce themselves	Ministries NM
10:20 – 10:25 5 mins	Overview of the workshop	• Provide an overview of the workshop objectives, content, and structure	Objectives of the workshop: • Raise awareness about climate change and impacts on the County • Provide an update on (1) what has been done to address climate change to date, (2) what has been done since the adoption of the climate change action plan, and (3) what still needs to be done. • Solicit strategic inputs into the development of the RVA and get a deeper understanding of the barriers & enablers for climate action in Nakuru County • Get buy-in from high-level decision-makers into the RVA and SEACAP development process	NM
10:25 – 10:35 10 minutes	About CoM SSA	• Introduce CoM SSA supporting local governments address the impacts of climate change	Presentation: • What is CoM SSA? • What is a SEACAP (brief) with a focus on adaptation pillar • CoM SSA in Nakuru County	GIZ

Time	Item	Key content of the session	Description	Responsible
Contextualization: What is climate change, and why does it matter?				
10:35 – 10:45 10 minutes	Impact of climate change in Nakuru County	• Overview of climate in Nakuru • Impact of climate change in Nakuru County • Making a case for why local governments have a responsibility to respond to climate change	Presentation (use images, graphics, not too much text) • Impacts of climate change national (brief) and County level • Findings from secondary data & literature • Status, gaps	Dr. Atela and the team
10:45 – 11:10 25 minutes	Discussion on impacts of climate change in Nakuru County – lived experiences	• Sharing of stories from Nakuru County, specifically • Solicit information for the content required for the RVA	Facilitated Discussion • What are your experiences with the impacts of climate change in the County?	NM
Climate change adaption and developing an R&VA				
11:10– 11:15 5 minutes	What is climate change adaptation & what are the benefits?	• ICLEI Africa Video: Benefits of climate change adaptation	• Video • What is climate change adaptation? • Benefits of climate change adaptation (making a case for why we should be adapting to climate change	KG
11:15 – 11:20 5 mins	Principles of climate change adaptation planning	• ICLEI Africa Video Key: steps to include in climate change adaptation planning	• Video • Critical information to include in Risk and Vulnerability Assessments, Adaptation Goal and Climate Change Adaptation Action Plans	KG
11:20 – 11:35 15 minutes	What has Nakuru done so far towards developing their SEACAP?	• Overview of Nakuru's Climate Change Action Plan and SEACAP development process	• Presentation • Grace to provide an overview of the County's action plan & link to the SEACAP development process • Reference & links to the national commitments and plans, value add & link of SEACAP and RVA to the county policies and plans. Highlight the gaps (e.g., no data sector selection should be based on the RVA). • How the SEACAP will fit into the policy processes & budgeting.	A representative from Nakuru County *Check with Grace the relevant person for the presentation, **Dr. Atela & team & ICLEI to assist with the presentation development

Time	Item	Key content of the session	Description	Responsible
11:35 – 11:50 15 minutes	Q & A	• Open Q & A	• Response to Videos (if required) • Response to County's presentation and progress	NM
11:50 – 12:00 10 minutes	What is still to be done to develop the SEACAP?	• Take everyone though the next steps of what still needs to be done	• Short statement • Reiterate the three steps of climate action planning • Highlight what has been done so far (target and climate action plan) • Provide an overview of the way forward: develop and RVA + develop recommendations to update the target and adaptation plan • Reiterate the need for the RVA as part of the existing action plan as would have been presented by the Nakuru representative	KG
12:00 – 12:20 20 minutes	Taking things forward	• RVA Data collection and findings	• Presentation • Dr. Atela & the team to provide an overview of the process for developing the RVA • Provide an overview of the data collection & findings so far • Provide detail on the next steps (technical workshop)	Dr. Atela & the team
12:20 -12.45 25 minutes	Discussion on barriers and enablers to climate change adaptation	• Factors that challenge or support the implementation of climate change adaptation actions	• Facilitated discussion • What can challenge adaptation actions and what can support adaptation actions	NM
12:45 – 12:50 5 mins	Wrap up and next steps	• Summarise what has been covered in the day • Group to share their feedback • Provide an overview of the target setting and action planning workshops	• Presentation • Discussion on lessons learned with the group and time for questions needing clarification	NM
12:50 – 13:00	Closure	• Thank participants		Eng. Ng'eno / Mr. Kiogora

Annexure 3: RVA Technical Workshop report

Risk and Vulnerability Assessment (RVA) Technical Workshop Held at Waterbuck Hotel in Nakuru City, Nakuru County

Date: 21st January 2021

Workshop Report: Technical Stakeholders

Submitted on: **26th January 2021**
By: **Dr Joanes Atela and Team**

About this Report

This report summarizes the hybrid workshop on Risk Vulnerability assessment and its feeds to the adaptation pillar under the SEACAP project. GIZ, ICLEI Africa jointly organized this event, and ACTS/ARIN and the focus was on the technical stakeholder to input into the SEACAP process in Nakuru County.

Acronyms and abbreviation

RVA	Risk Vulnerability Assessment
SEACAP	Sustainable Energy Access and Climate Action Plan
CoM SSA	The Covenant of Mayors in Sub-Saharan Africa

Table of Contents

Introduction

The development of the SEACAP under the Adaptation pillar could not be complete without conducting a comprehensive Risk and Vulnerability Assessment within the area of interest. Nakuru County is faced with multiple risks and vulnerabilities to climate change defined by the exposure of the critical livelihood sectors and County systems to various climatic shocks. Understanding the current and existing risks and vulnerabilities coupled with the possible climatic risks and vulnerabilities allows adequate planning and resource mobilization to enhance the adaptation to address such risks. The Risk and Vulnerability Assessment plays a critical role in informing the target setting and developing the county action plans in climate adaptation. In as much as the County population at the household, levels are affected by the various climatic shocks, the county's strategic stakeholders in the different sectors play a central role in shaping the adaptive strategies and options. In this regard, the RVA workshop held on 21st January 2021 comes in to supplement the high-level climate change policy workshop held virtually on 19th January 2021, county sector (climate change) consultations both physically and virtually (zoom and phone calls), secondary information analysis, and the household primary data and information gathered through the Primary data collection. The technical RVA brought together approximately 33 stakeholders. The stakeholders present included the technical officers from the county government's various sectors and representatives from Nakuru County Government's partners and stakeholders, including national government agencies and ministries, civil society organizations, universities, and private sectors non-governmental organizations. The outputs generated from the above methods will be harmonized to inform RVA for Nakuru County. The RVA, therefore, formed the basis of better understanding the County's adaptation status, the underlying climate risks, and prevailing vulnerabilities through a livelihood and ecosystem-based approach.

RVA workshop Objectives

The RVA workshop was a strategic data collection exercise that brought key informants to discuss various RVA findings, gaps, and opportunities to share more regarding the RVA methodology and fill the identified gaps in Nakuru County with regards to climate change impact. The workshop aim was to create awareness of the SEACAP and the preliminary outputs as well as provide technical staff from various organizations to make substantive input into RVA for Nakuru County through, e.g., identifying the key sectors affected by climate change, current and potential climatic risks, understand the vulnerabilities and the adaptive capacities status of Nakuru County and make necessary recommendations that will also feed into the JRC template as well as feed into the county adaptation plan. The workshop also brought the voices of climate adaptation stakeholders in the SEACAP development and facilitated ownership and buy-in of the SEACAP outputs for future incorporation and implementation towards building a resilient county.

More specifically, this workshop aim was to facilitate:

1. Understanding of the climatic risks facing various strategic sectors in Nakuru County;
2. Understanding of the Vulnerabilities to climate change of the critical sectors in Nakuru;
3. Exploration of the adaptive options and plans in Nakuru County
4. Interaction among various voices of stakeholders in understanding the risks and vulnerabilities to climate change in Nakuru.
5. It gathered data and information to inform the target setting and action plan development in climate change adaptation for Nakuru County.

Workshop program

The workshop was a hybrid workshop format that combines the virtual and physical interaction of the participants. The technical RVA workshop was held from 9:30 to 4:30 pm, and it was conducted in English, but the participants had the opportunity to use other languages in group discussions, especially Kiswahili and local dialect. To ensure okay representation and participation, the workshop was organized in 3 sections. Different stakeholders were drawn from public and private institutions, civil society organizations, the national and the county government, academia, and other sectors. The first section was the introduction, and the presentation was based on the host (ARIN/ACTS, ICLEI, GIZ, and County Government) findings and relevance of the SEACAP process, followed by group discussions and closed with an hour plenary discussions/presentation from the participant. The workshop agenda was designed to enable participants to engage in a detailed discussion: the group discussion longer time, approximately 2 hours, due to the series of technical templates. The participants had time for field questions and get responses from the SEACAP technical team.

Workshop Proceedings

Opening remarks

Dr. Artela and Ms. Nachi did a brief description of CoM SSA, ACTS, ICLEI, and GIZ. Emphasis was laid on the members' full participation to compile Nakuru County SEACAP that is modeled to be a comprehensive document on Energy and Climate Change issues during planning within the County. CoM SSA supports climate change-oriented development and its working with Sub Saharan African countries to help them have adaptive and mitigation measures to impacts related to climate change.

Dr. Atela outlined the impacts of climate change within Nakuru based on a household survey carried out by ACTS within the 11 Sub Counties of Nakuru County. Tom Randa interpreted the findings, and it was clear that impacts of Climate change is locally felt; thus, it must be locally dealt with.

The most significant impacts that stood out include but not limited to:

- The decrease in yields for most staple food
- Food insecurity will result
- The availability of water in the future is uncertain.

Through CoM SSA, Nakuru County is developing a rapid strategy known as Sustainable Energy Access & Climate Action Plan (SEACAP) to give a concerted effort all across the county departments to deal with climate and energy issues.

Methodology

Mr. Tom Randa gave an overview of the steps that were identified to be amongst the stages in which a model adaptation plan which entails:

- Risk and Vulnerability Assessment. There must be a study to understand the risks and their probability of happening within the county. This will guide on assessing the vulnerability of the targeted population.
- Adaptation Goal. Identification of the adaptation goals that are linked to the Country's NDC should also be prioritized.
- A well outlined and coordinated Action Plan should follow.

RVA for Nakuru County

- City descriptive analysis. Analyze the city needs on a basis based on the risks and their vulnerabilities.
- Define climate hazards. Identify the hazards within the county and their predictability of occurrence.
- Select vulnerability indicators. Map out clear indicators depicting the hazards and their vulnerabilities.
- Data gathering & processing. Collect actual data from the residents (respondents) and analyze and interpret it.
- Assess the vulnerability score. Whether high, moderate, or low.

The data collected all along should depict the situation felt by the people in the targeted areas.

Progress of Nakuru County

Mrs. Grace Karanja gave the priority areas for the county in the period 2018-2022, which include the following areas: food security; water security; ecosystem conservation for sustainable economic development; green energy production and use; climate-resilient infrastructure; knowledge management and capacity building of community, stakeholders and county officials; sustainable financing for CC action; and governance and coordination of climate change action. The county identified entry points into the SEACAP program in capacity building, research support & monitoring; valuable inputs for the County Integrated Development Plan (CIDP).

Discussion

The workshop members' concern was that a thorough exposition of the hazard trends to be done to give out more precise information on their frequency, magnitude, and duration. These stakeholders were allowed to discuss to provide an overview of the RVA primary data collected from the household.

The key question raised during the workshop

- How has climate change affected various groups, and how will it be addressed based on the survey done.
- The aspect of climate security to be incorporated in the report because Nakuru County borders counties with historical security issues.
- How have the impacts of climate change affected access to energy?
- Waste management should also be included and determined on how they relate to climate change and its impacts.
- What were the parameters used to get them to the projections? Was it limited?
- Enrich graphical representations to address how the vulnerabilities and hazards affect planning.
- Expound on economic wise based on the hazards and vulnerabilities to rank on most impactful.
- The survey report should also include agrometeorological and socio-technological aspects in dealing with the hazards and the vulnerabilities.
- The results should be narrowed down to the specific area where the hazard occurs, either village, the ward that will be easier to get direct information and plan on adaptive measures.
- Whether the impact of climate change on the different groups in the county was considered and what ought to be done to address those impacts – participant, Pan-African Climate Justice Alliance (PACJA)
- That the issue of trans boundary resource-climate change nexus to be considered in the RVA process, e.g., climate and security, which currently manifest in terms of conflict over resources in Baring County, has resulted in the forced migration of Baringo communities into Nakuru County.

  Consider climate security and cross-border conflicts

  Nakuru County borders volatile parts of Baring County, which to date are experiencing human-human conflicts attributed to several factors, including the fight over a natural resource like pasture, water, and land. These volatile near border sections of Baring County are largely semi-arid and experience high vulnerability to climate change. The ongoing conflicts have forced many Baringo residents to migrate to Nakuru County in search of a peaceful place or livelihood. This is perceived to imply that Nakuru County responds to the spillover of conflict from Baringo County. Hence a conference delegate recommended that the SEACAP team need to assess the actual impact on the existing vulnerability of Nakuru County, especially at the border and Nakuru City.

- Whether the team addressed response to temperature fluctuation and how communities can effectively respond to their impacts, the issue of energy systems vulnerable to climate change impacts, discussed at the other SEACAP pillar, should be addressed in the RVA.

  The fluctuation of Weather Parameters at the Borders

  A delegate argued that Nakuru County's environment and climatic conditions aren't independent but depend on the neighboring counties' environment and climate conditions. The delegate affirmed that the climate maps produced by the SAECAP team could reveal more if different climate data are overlaid at the borders. The SEACAP team need to focus also on the transition points where climatic conditions fluctuate at the borders and their implication on the climate conditions inside Nakuru County

Use Severity of the Parameters

Wycliffe Amakobe, KCCWG, interrogated the use parameters in the RVA that the team needs to go a step ahead and assess and make projections based on the severity of each parameter, not only the high low or increase and decrease in temperature and rainfall. The R& VA report needs to capture the severity of the parameters (temperature and precipitation) on people's economy, cost implications, housing, etc. The RVA process needs to incorporate the econometrics expert(s) to contribute to the implication of parameters on the livelihoods from the economic perspective. The social-technical aspects, including social and land change due to the impact of the parameters (temperature and rainfall), need to be captured.

Other subsectors to be incorporated into the RVA process

E-waste, among other emerging sub-sectors, implies the county's waste produced and capacity to manage in the future. The county's ongoing RVA process can highlight how e-waste can influence pollution due to improper e-waste and the current county's ability to manage it sustainably.

- The issue of Gender lens and Climate Change where it emerged that women are usually significantly impacted, even so from the previous studies; Whether the was room to consider other variables other the ones used during the survey (room for adjustment?); Hazard mapping, i.e., flood hot spots based on location specificity; the challenge of data availability at the local level impedes the down-scaled analysis; the link between Waste generation and management & CC – Emissions majorly happen on sites where landfills are situated.

Reflections of the exercise:

The participant was provided with sheets to fill during the workshop break up groups. This was composed of six groups with at least five participants divided based on their technical background and experience to ensure the participatory discussion.

1. **Exercise 1:** *Updating and Ratifying Identified Climate Hazards & Risk identified to be affecting Nakuru: Hazard, probability of occurrence, impacts, the magnitude of impacts.*

This exercise entailed the participant identifying the common hazard in the Sub-county, their probability of occurrence, impacts, and magnitude of the impacts. This was useful since risks are identified per sub-county and thus providing the overview awareness of per sub-county. This information helps to build a picture of what the community is facing in their daily activities.

2. **Exercise 2:** *Identifying sectors and sector climate risk.*

Climate affects sectors at different levels. In this exercise, the participant was to identify sectors, not in the list provided which are impacted by climate variability. From the exercise, it was clear that climate change affects most of the sectors in the county.

3. **Exercise 3:** *Identifying factors that support or challenge adaptive capacity.*

Exercise 3 was more of an interactive exercise cutting across exercises 1 and 2 after identifying the Climatic risks in the sub-county level and sectors vulnerable to its impacts. This section was critical since it identifies factors that support and hinder the county's adaptive capacity to these climatic risks.

Conclusion

The lessons learned from this workshop will contribute to an overall synthesis of the adaptation pillar report and complement the primary data collected from the respondent.

Annexes:

1. Workshop Agenda

County Government of Nakuru (Technical staff)
Risk and Vulnerability Assessment (RVA) Workshop

Date & Time: 21 January 2021, 09:00 – 13:00 (EAT)
Join Zoom Meeting:

Time	Item	Key content of the session	Description	Responsible
Workshop Opening and Welcome				
08:30 – 09:00 30 mins	Registration	• Register signing & name tags • Pre-evaluation forms • Remote log in	N/A	Alice & Abel
09:00 – 09:05 5 min	Workshop opening and welcome	• Open workshop • Welcome attendees • Overview of the workshop objectives	Objectives: • Raise awareness about climate change and impacts on the County • Provide an update on (1) what has been done to address climate change to date, (2) what has been done since the adoption of the climate change action plan, and (3) what still needs to be done. • To co-develop the remaining content for the RVA • To get a sense of buy-in and ownership from stakeholders	CO Kiogora (with virtual assistance from NM)

Time	Item	Key content of the session	Description	Responsible
09:05 – 09:10 5 mins	About CoM SSA	• Introduce CoM SSA supporting local governments address the impacts of climate change	Presentation: • What is CoM SSA? • What is a SEACAP (brief) with a focus on adaptation pillar • CoM SSA in Nakuru County	GIZ
Contextualization: Impact of climate change in Nakuru County & Climate Change Planning in Nakuru				
09:10 – 09:30 20 minutes	Impact of climate change in Nakuru County	• Overview of climate in Nakuru • Effect of climate change in Nakuru County • Making a case for why local governments have a responsibility to respond to climate change	Presentation: • Impacts of climate change national (brief) and County level • Findings from secondary data & literature • Provide an overview of the data collection & conclusions so far • Status, gaps • (use images, graphics, not too much text)	Dr. Atela and the team
09:30 – 09:35 5 mins	Principles of climate change adaptation planning	• ICLEI Africa Video Key: steps to include in climate change adaptation planning	Video: • Key information to include in Risk and Vulnerability Assessments, Adaptation Goal and Climate Change Adaptation Action Plans	KG/ NM
09:35 – 09:40 5 minutes	Q&A	• General questions on topics covered so far	• Facilitated Q&A session	TR (with support from ICLEI Africa and GIZ virtually)

Time	Item	Key content of the session	Description	Responsible
09:45 – 09:55 10 minutes	Nakuru's steps towards developing their SEACAP?	• Overview of Nakuru's Climate Change Action Plan and SEACAP development process	Presentation • Highlight what has been done so far (target and climate action plan) to provide an overview of the County's action plan & link to the SEACAP development process • Reference & links to the national commitments and plans, value add & relation of SEACAP and RVA to the county policies and plans. Highlight the gaps (e.g., no data sector selection should be based on the RVA). • How the SEACAP will fit into the policy processes & budgeting.	A representative from Nakuru County *Check with Grace the relevant person for the presentation, **Dr. Atela & team & ICLEI to assist with the presentation development
09:55 – 10:05 10 minutes	RVA process	RVA development process for Nakuru	Presentation Dr. Atela & the team to provide an overview of the process for developing the RVA	
10:05 – 10:15 5 minutes	Q&A	• General questions on information provided so far	• Facilitated Q&A session	HA
10:15– 10:30 15 minutes	**Break**			

Time	Item	Key content of the session	Description	Responsible
Completing the content for the development of the RVA				
10:30 – 11:00 30 mins	Updating and ratifying Identified climate hazards & hazard risk identified to be affecting Nakuru	• Identifying significant climate hazards faced by each of the local governments • Ascertaining and validating climate hazard risks • Identification of most significant climate hazards and where they affect the county	Presentation: • What is considered to be a climate hazard; • Presentation of climate hazards that have been identified to date as part of the initial development of the RVA **Exercise 1:** • Each group provided an A4 sheet with 'probability', 'consequence,' and a rating of 1 – 5. • Groups to write the relevant hazards for the county in column 1. • Groups were then asked to rate their hazards in columns 2 and 3 according to the likelihood of them occurring each year (probability) and their impact (consequence). 1 – low and five is high. • The probability and consequence number should be multiplied to identify which hazards pose the most significant risk to the county • Groups to share their top climate hazards with plenary and facilitator to note synergies between groups	Dr. Atela and the team

Time	Item	Key content of the session	Description	Responsible
11:00 – 12:00 1 hour	Updating the sectors identified and vulnerable groups most affected by climate hazards	• Identification of sectors most affected by climate hazards • Identification of priority sector (based on which are most affected by climate hazards but also those that are considered to be of economic/ social/ political importance	Presentation • Introduce sectors identified as relevant for Nakuru based on the initial development of the RVA **Exercise 1:** • Each group was provided with an A3 sheet with relevant climate hazards printed along the top and relevant sectors printed down the side. Scale: 3 = High/ Extremely Serious, 2 = Moderate/ Serious, 1 = Low/ Serious. Groups then look at each (relevant) hazard and discuss how it affects each (relevant) sector placing the corresponding number underneath each sector to indicate the magnitude of impact (30 mins); • Groups to discuss which sectors are most significantly affected by climate hazards and are of the most critical importance for the county development/ economy. Groups to draft description/s for the prioritized sector/s (10 mins).	Dr. Atela and the team

Time	Item	Key content of the session	Description	Responsible
11:00 – 12:00 1 hour	Updating the sectors identified and vulnerable groups most affected by climate hazards	• Identification of sectors most affected by climate hazards • Identification of priority sector (based on which are most affected by climate hazards but also those that are considered to be of economic/ social/ political importance	**Exercise 2:** • Each group was provided with an A3 sheet with relevant climate hazards printed along the top and relevant population groups printed down the side. Scale: 3 = High/ Extremely Serious, 2 = Moderate/ Serious, 1 = Low/ Serious. Groups then look at each (relevant) hazard and discuss how it affects each (relevant) population group placing the corresponding number underneath each sector to indicate the magnitude of impact (30 mins); • Groups discuss which population groups are most significantly affected by climate hazards and how (10 mins).	

Time	Item	Key content of the session	Description	Responsible
12:00 – 12:45 45 mins	Identifying factors that support or challenge the adaptive capacity	• Introduction of the concept of adaptive capacity; • Identification of factors that can challenge or support adaptive capacity • Description of how factors challenge or support adaptive capacity and how this could be overcome.	Presentation slide: Introduce the concept of adaptive capacity; Introduce exercise (5 mins) **Exercise 1:** • Factor identification. Each city is given a sheet of paper with the JRC factors listed in column 1. The sheet also includes four additional columns titled – 'is this a factor that affects your adaptive capacity,' 'support/ challenge,' 'to what degree (low, medium and high)' and 'description.' • Groups were asked to discuss which factors are relevant vs. not relevant to the county. In column 2, county to tick the relevant factors and cross the factors that are not relevant (5 mins). In column 3, for the factors that are considered relevant, group to indicate either support or challenge adaptive capacity (5 mins); in column 4, groups to indicate the degree to which factor supports/ challenges adaptive capacity (low, medium, or high) (5 mins). Select one aspect and describe how 1 factor either challenges or supports adaptive capacity and how this could be addressed (25 mins).	Dr. Atela and the team

Time	Item	Key content of the session	Description	Responsible
12:45 – 13:00 15 minutes	Wrap up and next steps	• Summarize what has been covered in the day • Group to share their feedback • Provide an overview of the target setting and action planning workshops	Presentation • Discussion on lessons learned with the group and time for questions needing clarification	NM /KG
13:00	**Lunch**			