REPUBLIC OF KENYA

COUNTY GOVERNMENT OF KAJIADO

COUNTY ENERGY PLAN

Concept Development by Practical Action
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Inside This Document

Foreword

As the Governor of Kajiado County, I am pleased to present this County Energy Plan (CEP), a pivotal document that delineates our strategic approach towards energy development within our jurisdiction.

This foreword encapsulates the rationale behind the formulation of the CEP, the key priorities it addresses, and the concerted efforts undertaken to ensure its comprehensive and inclusive nature.

Historically, energy planning in Kenya has been centralized at the national level. However, with the advent of the Constitution of Kenya in 2010, the landscape of energy planning underwent a transformative shift.

Empowered by constitutional provisions, county governments assumed a more prominent role in energy planning and administration. The Energy Act of 2019 further solidified this decentralization by mandating the development of County Energy Plans tailored to the unique energy needs of each county.

The rationale behind the CEP's development is deeply rooted in our commitment to sustainable development and the attainment of the United Nations Agenda 2030, particularly Sustainable Development Goal 7 (SDG 7), which advocates for universal access to affordable, reliable, and modern energy services.

With a focus on promoting renewable energy sources, enhancing energy efficiency, and ensuring equitable access to energy, the CEP aligns with national priorities and global mandates.

Kajiado County has made significant strides in advancing access to modern energy services. However, the disparities in energy access across our administrative units underscore the imperative for coordinated action. Through strategic partnerships with national agencies, private sector entities, and international organizations like the United Nations Development Programme (UNDP), we aim to bridge these gaps and accelerate progress towards universal energy access by 2030.

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This CEP, developed with support from the UNDP's Accelerator Lab Climate Action initiative (ACCA) and the Government of Japan, serves as a roadmap for our energy development endeavours.
It embodies our collective vision for a sustainable energy future, one that fosters economic growth, enhances livelihoods, and safeguards the environment.

In crafting this plan, extensive consultations were held with stakeholders representing diverse interests and perspectives. Their invaluable insights have enriched the document and ensured its relevance and effectiveness. Moving forward, the County Government is fully committed to the implementation of the CEP, and we are poised to take the necessary steps to translate its goals into tangible outcomes.

In conclusion, I extend my gratitude to all those who contributed to the development of this plan and reaffirm our unwavering commitment to realizing its objectives. Together, let us embark on this journey towards a brighter, more energy-efficient future for the people of Kajiado County.

H.E Joseph Ole Lenku, EGH

Governor of Kajiado County

Preface

As the County Executive Committee Member (CEC) in charge of energy, I am delighted to present the Kajiado County Energy Plan (CEP). This comprehensive document represents a significant milestone in our ongoing efforts to harness the transformative power of sustainable energy within our county.

The genesis of this plan lies in the recognition of the critical role that energy plays in driving socio-economic development. Guided by the mandate established in the Energy Act of 2019 and the imperative outlined in the County Integrated Development Plan (CIDP), our county embarked on the journey to develop a strategic roadmap for the energy sector. This plan not only aligns with the broader objectives of the CIDP but also underscores our commitment to fostering inclusive growth, environmental sustainability, and resilience to climate change.

Crucially, the development of the CEP has been a collaborative endeavour, characterized by extensive consultation, participation, and inclusivity of all stakeholders. Through workshops, forums, and engagements, we have sought input from diverse voices, including government agencies, civil society organizations, private sector entities, and local communities. This inclusive approach ensures that the CEP reflects the aspirations and priorities of all stakeholders, laying a robust foundation for its successful implementation.

At its core, the CEP sets forth clear objectives aimed at enhancing energy access, promoting renewable energy sources, improving energy efficiency, and fostering sustainable energy practices. To achieve these objectives, the plan delineates comprehensive strategies encompassing key focus areas such as energy sources, bio-energy, electricity access, and energy conservation.

Moreover, it outlines a detailed implementation matrix, comprising programmes and projects strategically designed to address the county's energy challenges.

Crucially, the development of the CEP has been a collaborative endeavour, characterized by extensive consultation, participation, and inclusivity of all stakeholders. This inclusive approach ensures that the CEP reflects the aspirations and priorities of all stakeholders, laying a robust foundation for its successful implementation.

Central to the success of the CEP is the establishment of a dedicated oversight mechanism in the form of the CEP Committee. This committee, comprised of representatives from relevant government departments, will play a pivotal role in guiding the implementation of the plan, ensuring accountability, and facilitating coordination among stakeholders.

As we embark on the implementation phase, I call upon all stakeholders to rally behind the CEP and lend their unwavering support. Together, we have the opportunity to transform Kajiado County into a beacon of sustainable energy excellence, driving prosperity and well-being for generations to come.

In conclusion, I extend my gratitude to all those who have contributed to the development of this plan, reaffirming our collective commitment to a brighter, more sustainable energy future for Kajiado County.
Sincerely,

Michael Sabore Semera

County Executive Committee Member (CEC)
Roads , Public Works, Transport & Energy

Acknowledgements

The Kajiado County Energy Plan (CEP) is the result of a collaborative effort between the County Government of Kajiado, Department of Public Works and Energy and Practical Action, made possible through the Accelerated Clean Cooking Action (ACCA) project, with funding from UNDP through the generous contribution from the Japanese Government through JICA.

This CEP, with its detailed solutions addressing the priority energy development needs of Kajiado County citizens, exemplifies an inclusive and participatory process. We extend our gratitude to all stakeholders who contributed to the development of this plan, including community members who willfully provided information through surveys and needs assessments.

Special thanks go to the Ministry of Energy and Petroleum's Renewable Energy Directorate: Dan Marangu (Director Renewable Energy) and Rukia Bakari (MoEP), for the Ministry support and guidance. We also appreciate the contributions of county government departments, Ministries, KPLC, KEFRI, KFS, civil society organizations, and the dedication of the County Energy Planning Technical Committee.

The drafting was led by Dr Evans Kituyi who worked tirelessly on this project supported by Brian Jaoko. The SETA team were a supportive partner led by JP Laude and Jechoniah Kitala, ,provided crucial technical support, with additional expertise from Etienne Jacquemet IED-Least Cost Electrification Planning and Doreen Irungu on clean cooking modelling. County mobilization and primary data collection was spearheaded by the Kajiado County team, led by Eng. Simon Sitelu (Director of Energy) under the overall leadership of Peter Ngao (Chief Officer, Public Works and Energy).

Finally, we acknowledge the Practical Action team led by George Theuri (Team Lead), Evans Omondi, and Hadson Mwashi (Intern), for their project management and technical inputs and support. Tim Mwangi (PA-Head of Programmes) and Yvonne Nyokabi (UNDP Project Manager-Climate Promise) provided overall leadership during the project's implementation.


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Executive Summary

The Energy Act of 2019 mandates each County Government to develop and submit a County Energy Plan (CEP) to the Cabinet Secretary for Energy and Petroleum, which is aligned with its respective energy needs at the local level. These plans, alongside inputs from national energy providers such as Kenya Power, Kenya Electricity Generating Company (KenGen) and Rural Electrification Authority (REREC) will then be consolidated into the Integrated National Energy Plan (INEP). Locally, the CEP implements the energy-related CIDP components across all sectors. This CEP has been developed through an elaborate participatory process which included a review of official policy documents and academic literature, baseline studies on energy access in domestic, communal institutions and enterprises, stakeholder consultations (key informant interviews, community engagement forums, focused group discussions with sector experts, and county leadership consultations).

Status of Access to Clean Energy

Among the households surveyed to inform this CEP, 40% were connected to the Kenya Power grid, 5% had individual solar home systems (SHS), and 1% were connected to solar mini-grids. Notably, 46% relied on portable solar lighting such as lanterns and flashlights for their primary lighting. The remaining 8% of households used kerosene lamps, candles, LPG lamps, or similar sources as their primary lighting methods.

The survey found a high dependency on woody resources (Firewood & Charcoal) with about 55% of Kajiado households relying on firewood as their primary fuel. LPG and Charcoal are primary fuels for 24% and 19% of the Households (HHs) respectively. However, Charcoal usage in Kajiado meets the greatest share (42%) of the cooking energy demand, making it the most used fuel, followed by firewood, which meets 38% of the cooking energy demand, particularly in the rural and peri-urban areas. The adoption of firewood and charcoal Improved Cooking Stoves (ICS) is very low, the Three Stone Open Fire (TSOF) is used by 89% of the households using firewood, leading to a very low efficiency of firewood consumption. Similarly, for households using charcoal, the majority still use metallic stoves at 67%, and only 33% use ICS stoves again translating to very low-efficiency consumption.

Compared to 2019, there was a 50% decrease in LPG usage and a complete cessation of kerosene use as a primary cooking fuel, being relegated to secondary and tertiary use by users—meanwhile, households reporting charcoal and firewood as primary cooking fuels nearly doubled compared to 2019. In 2023, 7% of households still used kerosene, but only as a secondary or tertiary fuel. These changes can be attributed to several factors, including the impact of COVID-19 leading to job losses, increased taxation on all commodities, and significant rises in fossil fuel prices since early 2023. These economic pressures likely reduced disposable incomes, prompting a return to more traditional and less expensive cooking fuel sources like charcoal and firewood. During this period, there was also a slight increase in households reporting more frequent use of bioethanol, electricity (from 1.2% to 4%), and biogas (from 0.7% to 2%) as secondary and tertiary cooking energy sources.

On cooking energy, households, educational institutions, health facilities, and SMEs are consuming a total of 1,085,753 tons/year of dry wood equivalent (charcoal and firewood combined)—with households responsible for 94% of this. Households similarly consume 97.4% of the total 12,174 ton/year of LPG consumed by all users. Communities bought 31% of firewood (117,490 tons/year) at a total KES 1.4 Billion and all the charcoal (101,184 tons/year) at KES 3.5 Billion in 2023. The fuelwood consumption could lead to clear-cutting of approximately 51,700 ha of forest annually under the worst-case scenario if all was sourced from Kajiado's standing stock on only 16,800 ha. It is reasonable to attribute the source of much of the bought charcoal and firewood consumed in Kajiado to lower quality fuel sources such as woodlands and bushlands in distant locations.

The baseline study also revealed the potential in unexploited renewable energy resources in the County, which if exploited could significantly increase the proportion of clean energy in the overall mix. Key among these were wind, hydro and bioenergy. Similarly, the study identified significant economic potential in the rehabilitation and solarisation of boreholes across locations in the county. These could innovatively support dairy and beef production as well as horticultural production by linking them to value chains and markets with potential for youth employment.

Transition Pathways to Clean Energy

Using a Least Cost Electrification model, two out of three scenarios have been identified for electrifying approximately 112,000 users, crucial for achieving clean energy access. This will entail a combination of grid extension, grid densification, grid intensification, mini-grid development, and promotion of Solar Home Systems (SHS). Similarly, employing the LEAP model for clean cooking solutions has underscored the rationale for embracing activities outlined in a Policy Scenario, emphasizing the dedicated implementation of the County Energy Plan (CEP) by the county government. This is because the discounted cost of fuel required under this scenario is, albeit higher, comparable to that under the Business as Usual Scenario.

Moreover, the considerable fuelwood consumption, with 31% of users purchasing firewood to fulfil a third of their cooking needs, coupled with the revelation that a significant portion of firewood is of inferior quality--sourced from woodlands and shrublands in distant locations within the county, underscores the urgency to address the community's unsustainable consumption patterns. Without policy intervention, these patterns pose a threat to Kajiado's forests and woodlands. Proposed interventions include regulating vendors and sources of fuelwood, promoting energy efficiency through Improved Cooking Stoves (ICS) and regulated charcoal production, and augmenting stock through tree planting programmes.

In addition, this Plan advocates for an ambitious strategy aimed at enhancing energy access and agricultural development within the region. This involves the rehabilitation and solarization of 184 boreholes, with plans to drill and solarize an additional 173 boreholes.

This initiative aligns with the expansion of commercial horticulture area from 60 hectares to 120 hectares by 2033, with the aim of boosting agricultural productivity and economic growth.

Furthermore, by increasing watering points for livestock, the plan targets a significant rise in the beef market value, aiming to elevate it from KES 1.5 billion (as of 2022) to an estimated KES 3 billion by 2033. Additionally, efforts are directed towards enhancing milk production, aiming to increase yields from the current 10.3 million litres (as of 2022) to an estimated 25 million litres by 2033.

To achieve these goals, ten programmes comprising closely interrelated energy and non-energy project activities have been proposed for implementation by a wide array of stakeholders at a cost of KES 585 million between 2024 and 2033. These programmes include a recommendation for establishing an Energy Fund to mobilize and provide funding for stakeholders to access through appropriate instruments.

Development Outcome

With support from development partners, Kajiado County has developed its County Energy Plan (CEP), which, alongside similar documents from other counties, will form the foundation for the development of the National Integrated Energy Plan (INEP) for the entire country. The effective implementation of this plan will notably enhance access to cleaner and more affordable energy for the citizens of Kajiado.

Locally, the successful execution of the proposed programmes and projects will complement ongoing efforts outlined in the County Integrated Development Plan (CIDP) 2023-2027, the County Spatial Plan (CSP) 2020-2030, and the County Climate Action Plan (CCAP) 2023. Nationally, these initiatives will contribute to the country's commitments to achieve universal access to clean cooking by 2028 and its obligations under the Paris Agreement as articulated in the Nationally Determined Contributions (NDC) 2020, implemented through the National Climate Change Action Plan (NCCAP) 2023-2027.

Overall, these endeavours will significantly enable Kajiado to make strides towards fulfilling the objectives of Sustainable Development Goal 7 (SDG 7), which advocates for universal access to affordable, reliable, sustainable, and modern energy for all.

List of Abbreviations and Acronyms

ABC	African Biodigester Component
ACCA	Accelerated Clean Cooking Action
CCAP	County Climate Change Action Plan
CEC	County Executive Committee
CEEC	Centre for Energy Efficiency and Conservation
CEP	County Energy Plan
CEPC	County Energy Planning Committee
CFL	Compact Fluorescent Lights
CIDP	County Integrated Development Plan
CSP	County Spatial Plan
ECDE	Early Childhood Development Education
EDGE	Excellence in Design and Greater Efficiency
EE	Energy Efficiency
EPC	Electric Pressure Cooker
EPRA	Energy and Petroleum Regulatory Authority
FW	Firewood
GCF	Green Climate Fund
GDC	Geothermal Development Company
GEOSIM	A GIS based software designed for quickly creating highly interactive rural electrification planning scenarios
GIS	Geographical Information Systems
GIZ	German Agency for International Cooperation

GJ	Giga Joules
GWH	Gigawatt Hour
HH	Household
ICS	Improved Cookstove
ICT	Information and Communications Technology
IFC	International Finance Cooperation
INEP	Integrated National Energy Plan
IRENA	International Renewable Energy Agency
KFS	Kenya Forest Service
KG	Kilogram
KNBS	Kenya National Bureau of Statistics
KNEECS	Kenya National Energy Efficiency & Conservation Strategy
KPLC	Kenya Power and Lighting Company
KV	Kilovolt
LCOE	Levelled Cost of Electricity
LED	Light Emitting Diode
LPG	Liquified Petroleum Gas
MCA	Member of County Assembly
MEL	Monitoring, Evaluation, and Learning
MEPs	Minimum Energy Performance Standards
MoEP	Ministry of Energy and Petroleum
MSME	Micro, Small, and Medium Establishments
MW	Megawatt
MWH	Megawatt-Hour

NCCAP	National Climate Change Action Plan
NDC	Nationally Determined Contributions
NG-CDF	National Government Constituencies Development Fund
NGO	Non-Governmental Organization
NOCK	National Oil Corporation of Kenya
ODK	Open Data Kit
PCU	Project Coordination Unit
PPP	Public Private Partnerships
PV	Photovoltaic
RE	Renewable Energy
REREC	Rural Electrification and Renewable Energy Corporation
SAGAs	Semi-Autonomous Government Agencies
SDGs	Sustainable Development Goals
SE4ALL	Sustainable Energy for All
SHS	Solar Home Systems
SME	Small and Medium Enterprises
TC	Technical Committee
TSOF	Three-Stone Open Fire
TVET	Technical and Vocational Education and Training
TWG	Technical Working Group
UNDP	United Nations Development Programme

Photo by: Gary M. Cohen
Pexels.com

Chapter One
Introduction

1.0 Overview

Historically, energy planning in Kenya was centrally managed by the Ministry of Energy at the national level. However, the promulgation of the Constitution of Kenya in 2010 provisioned for the transfer of some energy planning and administrative functions to the county governments at the sub-national level

1.1. Background and Rationale

Historically, energy planning in Kenya was centrally managed by the Ministry of Energy at the national level. However, the promulgation of the Constitution of Kenya in 2010 provisioned for the transfer of some energy planning and administrative functions to the county governments at the sub-national level. The shift was aimed at strengthening participation in energy planning at the local level and supporting targeted investments as part of the development planning processes.

The Energy Act of 2019 builds on this provision in the constitution by mandating each County Government to develop and submit a County Energy Plan (CEP) to the Cabinet Secretary for Energy and Petroleum, which is aligned with their respective energy needs at the local level.

These plans, alongside inputs from the national energy providers such as Kenya Power, Kenya Electricity Generating Company (KenGen), and Rural Electrification Authority (REREC), are consolidated into the Integrated National Energy Plan (INEP).

The development of the CEP by counties and the INEP are in line with the Government of Kenya's commitment to the United Nations Agenda 2030, whose Sustainable Development Goal 7 (SDG 7) calls for universal access to affordable, reliable, sustainable, and modern energy for all.

The goal focuses on supporting universal access to modern energy services, increasing the share of renewable energy in the energy mix, and promoting energy efficiency, which are mainstreamed in the CEP and consequently in the INEP.

Beyond the development of the CEP, it is the role of county governments to guide the exploitation and use of renewable energy resources.

This is through developing appropriate strategy and planning for efficient delivery of energy services to domestic, institutional, and commercial and industrial users within their counties and collaborate with neighbouring counties on the same.

Kajiado County government has made significant strides in promoting access to modern energy services. The 2019 Kenya National Population Census reported that 67.4% of households in Kajiado County use mainly electricity followed by solar energy for 15.5% of the households to meet their lighting energy needs.

Additionally, 47.2% and 29% of the households rely on liquefied petroleum gas (LPG) and firewood respectively to meet their cooking energy needs. Charcoal is utilized by 9.1% of households, and biogas by 0.7% (KNBS, 2019).

However, there is significant variations in levels of access to modern energy services within the 8 administrative units in Kajiado County which underscores the urgency for coordinated efforts by both national and county governments, as well as the private sector and financiers, to bridge this gap.

The shared objective is to achieve universal energy access by 2030, necessitating a clear and comprehensive energy plan like the CEP for Kajiado to guide the transition.

The Kajiado County Government through the Department of Roads, Public Works, Transport and Energy with funding support from the United Nations Development Programme's (UNDP) Accelerator Lab Climate Action initiative (ACCA) and the Government of Japan has developed this CEP to be used as a roadmap to guide energy development within the county.

1.2. CEP Development Methodology

The development of the Kajiado County Energy Plan is based on the guidelines from the Integrated National Energy Planning (INEP) Framework, which provides a step-by-step process of CEP development and outline (Part VI of the INEP).

The process commenced with the nomination of the County Energy Planning Committee (CEPC) and the formation of its supporting Technical Committee (TC), which would then validate subsequent processes led by the CEP development team.

Other components of the CEP development process included literature reviews, baseline surveys of energy access, stakeholder engagement including field visits by the team, and multi-step validation workshops for the final product. These steps are briefly described below.

1.2.1. Literature Review

Various publicly available policy reports, strategies, and plans were reviewed in this process. A sample of the key public policy and planning documents reviewed include:

National Policy Documents

- Energy Act of 2019
- Kenya National Energy & Conservation Strategy
- Bioenergy Strategy 2020-2027
- National Energy Policy 2018
- National Climate Change Action Plan 2023-2027
- Nationally Determined Contributions 2020
- Long-Term Low-Emission Development Strategy (LT-LEDS)-2050
- Kenya Energy Transition and Investment Plan 2023-2050

Kajiado County Policy Documents

- Governor's Manifesto 2023-2027
- County Integrated Development Plan 2023-2027
- County Spatial Plan 2020-2030
- Annual Development Plans for 2022, 2023
- Kajiado County Renewable Energy Atlas 2020
- County Participatory Climate Risk Assessment (PCRA) Report 2023-2027
- County Climate Change Action Plan (CCAP) 2023-2027

1.2.2. Baseline Surveys

Baseline surveys were conducted among 612 households and a total of 90 educational institutions and healthcare facilities as well as small enterprises, sampled across all sub-counties of Kajiado.

The findings from these surveys (Chapter 3) complement the data from the secondary sources and other stakeholder engagement approaches. Data collection tools developed by Sustainable Energy Technical Assistance (SETA) and adjusted to suit the Kajiado county context were used, and administered by trained enumerators using the ODK app.

1.2.3. Stakeholder Engagement

Key Informant Interviews

More than thirty (30) experts from local, county, and national governments were consulted for their strategic and expert opinions to fill gaps in data and information at various stages of the process. Some of these represented institutions included Kenya Power, KenGen, MoEP, etc., while others were individual experts in different areas of interest.

Community Engagement Forums

Community engagement forums were convened in three locations, each location being the most appropriate in the county to host community discussions around a selected theme and nexus sector recommended by the Technical Committee (TC).

Three such forums—each bringing together at least 30 participants were organized in Bissil (health), Matasia (agriculture and trade), and Isinya (education). These forums aimed to inter alia, validate the survey findings, identify primary energy and non-energy development challenges, and needs, and suggest solutions.

Focus Group Discussion with Sector Experts

Diverse experts from the Kajiado county government's nexus departments, the civil society, business community, academia, and Semi-Autonomous Government Agencies – SAGAs (EPRA, Kenya Power, KFS, etc.) were convened to interrogate the emerging findings and provide expert input and direction.

Technical Committee (TC) Meetings

Three TC meetings were convened in the course of the exercise. The first served to approve the methodology and select the target nexus sectors and community engagement sites, the second validated the baseline report while the third validated the proposed solutions clustered around programmes and projects.

CEC and MCA Consultation

County Executive Committee from the nexus departments and Members of the energy committee of the Kajiado County Assembly were also accorded a special opportunity to interact and make their input/validate the programmes and projects underpinning

1.2.4. Electrification and Clean Cooking Modelling

Energy systems modelling provides a systematic evaluation of technical, socio-economic, political, and environmental factors that could influence future energy demand and growth. This does not give a forecast of the future but provides insights to policy and decision makers on the potential impacts of key decisions and trends.

Least Cost Electrification Modelling

A combination of tools was employed to arrive at the least cost electrification solutions. First, GIS informed the clustering of the population into 16,137 clusters that were then validated against the 2019 census data. 95% of these clusters had less than 100 people while 5% had between 100 and 9000 people.

Each cluster in an electrified sub-location (with a transformer and MV lines) was assumed to be electrified, resulting in 322,000 households living in an electrified locality. Kenya Power reported 315,787 domestic clients connected to its grid by September 2023, implying over 90% connectivity rate.

GEOSIM–a geospatial electrification tool was then used to determine the investment and operating costs related to the development of the proposed electrification options to reach universal access.

These supply options include:

1) grid densification – to connect un-electrified households in already electrified cluster

2) grid extension – consisting in extending the interconnected grid to the clusters in unserved areas

3) mini-grids (both PV and hybrid) – deployed in small and medium sized clusters located far from the interconnected network

4) solar home systems (SHS) – standalone systems to reach households in very sparse areas OR in densification or intensification areas when the price of a SHS becomes lower than a grid connection for an equivalent level of consumption.

The selection of the optimal electrification strategy towards 2030 is determined based on the lowest levelized cost of electricity (LCOE). LCOE is calculated as the ratio of the lifetime costs of a project divided by its electricity production over its operational lifespan. This approach ensures that the chosen electrification method provides the most cost-effective and sustainable solution for achieving universal access to electricity in Kajiado, Kenya.

Modelling Clean Cooking Options

This CEP harnesses the power of the Low Emission Analysis Platform (LEAP), a comprehensive modelling tool crafted by the Stockholm Environment Institute (SEI), to steer decisions toward fostering clean cooking practices. The approach involves employing two scenarios: one reflecting the status quo ("business as usual"), and another representing potential policy changes proposed by the CEP ("Policy scenario").

These scenarios serve as narrative frameworks depicting potential trajectories for the cooking sector in Kajiado County. By evaluating these scenarios, the programme aims to illuminate diverse future possibilities and equip county leadership with insights to navigate extremes while charting a course toward desired outcomes.

1.2.5. Conceptual Framework

Following the above-detailed document reviews and consultations, the conceptual framework presented in Figure 1.1 emerged, which graphically describes the components of an effective CEP development process.

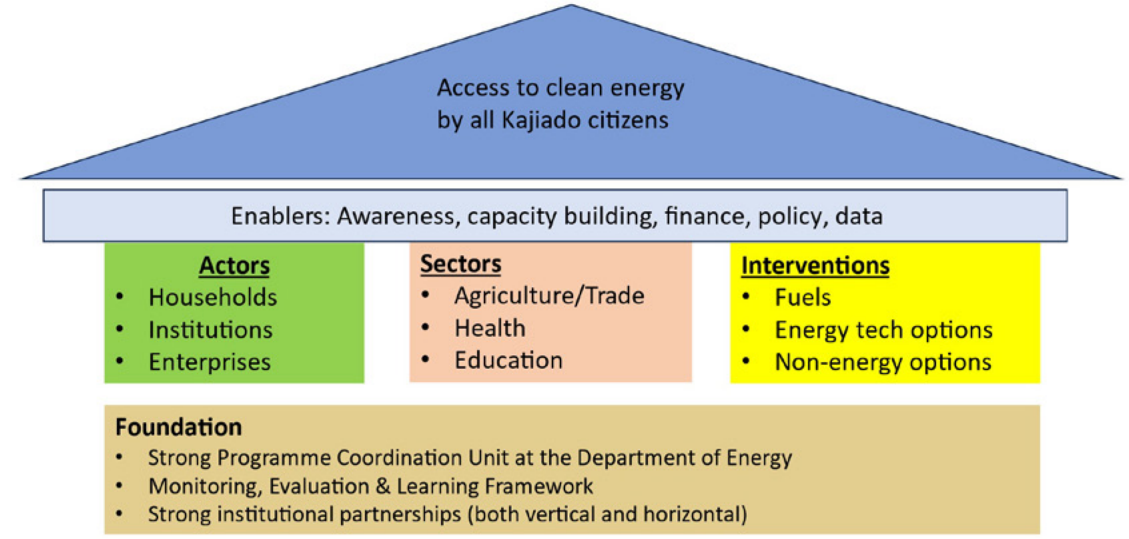


Figure 1.1.
Conceptual framework

According to this framework, developing a CEP capable of driving energy transition towards increased access to affordable clean energy by all the people of Kajiado requires engagement with key energy users (actors), consultations with priority development sectors identified through the TC for the county (nexus sector) and aim to identify fuels and other energy and non-energy interventions for implementation in the short, medium or longer terms.

The process should also identify the enabling environment (e.g. awareness, capacity building, finance, etc.) critical for the seamless implementation of the CEP. Crucially, this implementation requires a strong Project Coordination Unit (PCU) within the Department of Energy, a well-defined Monitoring, Evaluation, and Learning (MEL) framework, and institutional partnerships both within the county government of Kajiado (horizontal) and at national and community levels (vertical).

Endorsed by the TC, this framework informed the overall design and development of this CEP.

1.3. Integrating Energy Planning into the CIDP

The County Integrated Development Plan (CIDP), mandated by the 2010 Constitution of Kenya, is a cornerstone of strategic planning for counties, outlining goals, priorities, and initiatives for a specified period. Tailored to each county's unique characteristics, needs, and potential, the CIDP guides targeted interventions and investments to uplift local communities [1].

The synergy between the County Energy Plan (CEP) and the CIDP is profound, emphasizing the integration of energy considerations into the broader developmental framework. By embedding energy-related strategies and objectives into the CIDP, the county government can leverage sustainable energy resources to drive progress in key sectors like agriculture, trade, health, and education.

This integration aligns with the devolved governance model, empowering county governments to manage energy planning and administration at the sub-national level.

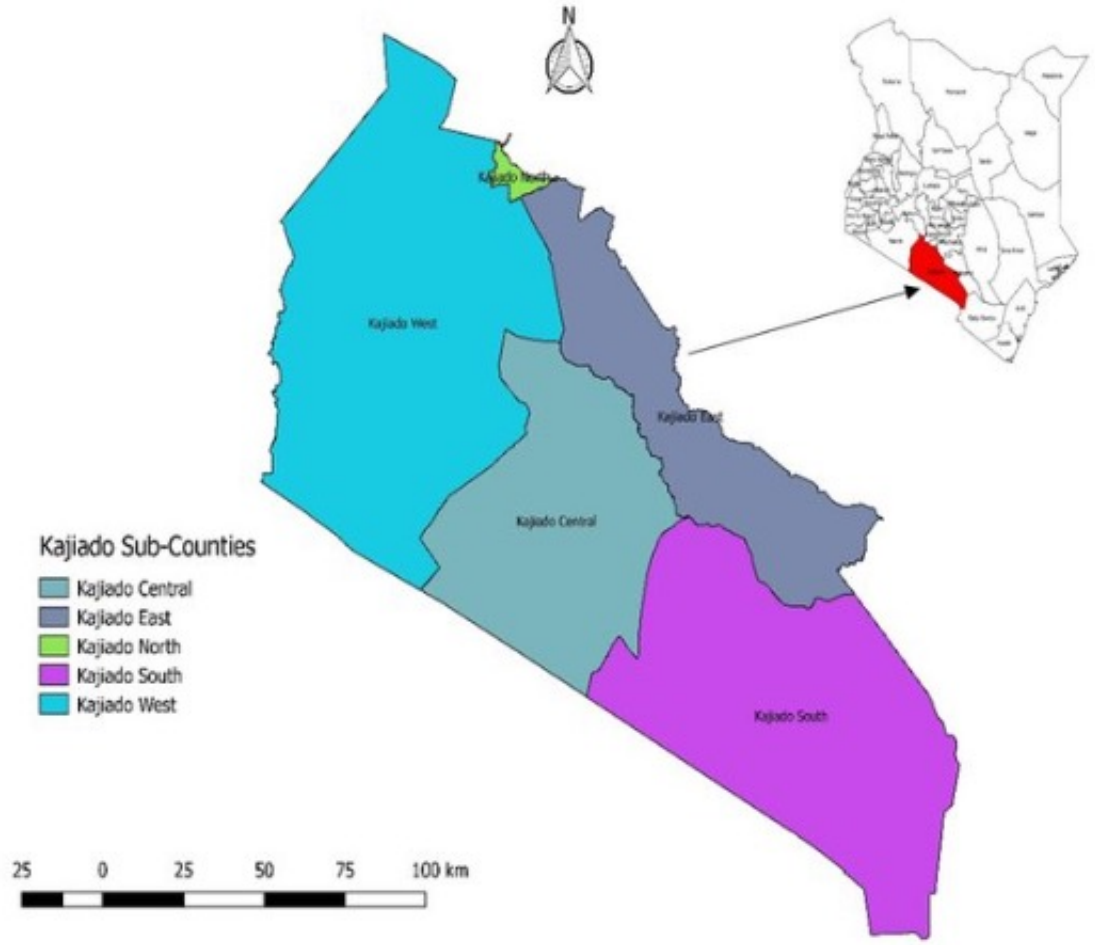
Essentially, the CEP acts as a specialized component of the CIDP, focusing exclusively on the energy sector. This ensures that the strategies, targets, and action plans outlined in the CEP seamlessly align with the broader goals of the CIDP. Consequently, energy becomes a cross-cutting theme informing decisions across multiple sectors, ensuring that development initiatives are economically viable, environmentally sustainable, and socially inclusive.

Incorporating the CEP into the CIDP requires systematic alignment of goals, strategies, and timelines. This necessitates collaboration between the Department of Environment, Natural Resources, and Climate Change, leading CEP development, and other county government bodies responsible for formulating and executing the CIDP. Through this collaborative approach, the county can capitalize on the strengths of both plans, leveraging the energy sector's potential to catalyse progress while adhering to the overall development vision outlined in the CIDP.

Currently, Kajiado County has launched its third CIDP for the period 2023-2027, with a budget of KES 133.6 billion for implementation. This CIDP recognizes the importance of formulating and implementing the CEP in identifying, planning, and implementing sustainable renewable energy, energy access, and energy efficiency and conservation projects.

1. For more information, see: https://countytoolkit.devolution.go.ke/process/planning/county-integrated-development-plan-cidp

Figure 1.2: ***Location of Kajiado County showing the 5 original administrative units***
[Source: Survey of Kenya, 2023]



1.4. County Overview

Kajiado County is located in the southern part of Kenya, covering approximately 21,872 Km2 with a population of 1,117,840 people in 2019 (KNBS, 2019).

1.4.1. Geographic Description

Kajiado County is located in the southern part of Kenya, covering approximately 21,872 Km2 with a population of 1,117,840 people in 2019 (KNBS, 2019). It is situated between Longitudes 360 5' and 370 5' East and between Latitudes 10 0' and 30 0' South (Kajiado County Government, 2018).

Kajiado County shares borders with Taita Taveta County to the Southeast, Machakos and Makueni Counties to the East, Nairobi County to the Northeast, Kiambu to the North, and Narok County to the West. Kajiado County holds geographic significance, as it borders the Tanzania regions of Arusha and Kilimanjaro to its south.

With its headquarters in Kajiado town, the county enjoys a strategic location abundant in both cultural heritage and natural attractions. Notably, the presence of diverse wildlife serves as a major tourist attraction for the region.

1.4.2. Demographic Description

The distribution of the population across sub-counties is outlined in Table 1.2 where Kajiado North sub-county has the highest population of about 304,404 persons in 2019, projected to reach 364,221 persons in 2025.

The population structure of the county presents a broad base and a slender top, maintaining a 1:1 sex ratio across all ages.

Children aged 0-4 years account for approximately 14 percent of the total county population, indicating a high birth rate.

According to KNBS, 2019 a significant segment of the population falls within the youthful age range of 15 to 29 years, comprising 34 percent of the total population, reflecting a high dependency rate and a lower count of middle-aged individuals. The population aged 65 years and above represents 2.1 percent of the total population.

Table 1.1: ***Population distribution by sub-county***
[Source: KNBS, 2019]

SUB COUNTY	POPULATION
Isinya	207,715
Kajiado Central	159,520
Kajiado North	304,404
Kajiado West	181,622
Loitokitok	190,174
Mashuuru	63,861
Total	**1,107,296**

Currently (2024), Kajiado County has 8 administrative units (CIDP, 2023-2027), 2 of which had not been established as stand-alone units when the 2019 Census was conducted. The two are: Oloililai and Elang'ata Wuas.

Table 1.2 shows the current and projected sub-county population by density and sub-county showing the mid (2025) and end (2027) projections. Kajiado North recorded the highest population representing 27 percent of the county population closely followed by Kajiado East at 25 percent with Kajiado Central being the least populated at 14 percent.

Table 1.2: ***Population distribution and population density by Sub County***
[Source: Content compiled from KNBS (2019)]

	AREA (KM^2)	(2027) PROJECTIONS	(2019) CENSUS	(2022) PROJECTIONS	(2025) PROJECTIONS
Kajiado Central	4,240	200,807 (density 47)	161,862 (density 38)	179,319 (density 42)	192,281 (density 45)
Kajiado North	111	380,361 (density 3439)	306,596 (density 2773)	339,679 (density 3071)	364,221 (density 3293)
Kajiado East	3,322	340,779 (density 103)	274,687 (density 83)	304,302 (density 92)	326,310 (density 98)
Kajiado West	7,862	226,844 (density 29)	182,849 (density 23)	202,573 (density 26)	217,214 (density 28)
Kajiado South	6,337	238,003 (density 38)	191,846 (density 30)	212,545 (density 34)	227,903 (density 36)

1.4.3. County Socio-Economics

Kajiado County is primarily agrarian, with agriculture, livestock farming, and agribusiness forming the backbone of the local economy. Pastoralism is particularly significant, with Maasai communities traditionally relying on livestock for sustenance and livelihoods.

Additionally, the county's proximity to Nairobi, Kenya's capital city, offers opportunities for trade, commerce, and employment. Furthermore, the county has experienced significant population growth, reflecting its attractiveness as a residential and commercial hub.

Rapid urbanization, land use changes, and the growth of extractive industries such as mining characterize Kajiado County.

Regarding infrastructure, Kajiado County is undergoing development, with ongoing efforts to improve road networks, access to clean water, healthcare facilities, and educational institutions.

The county's natural attractions, including abundant wildlife and cultural heritage sites, contribute to its growing tourism industry, attracting visitors from both domestic and international markets.

Overall, Kajiado County presents a mix of traditional livelihoods, emerging economic opportunities, and developmental challenges, necessitating strategic planning and investments to promote sustainable socioeconomic growth and improve the quality of life for its residents.

1.5. Policy and Regulatory Framework for the Energy Sector

The Constitution of Kenya allocates energy policy functions to the National Government, while county planning and development, including energy regulation, are assigned to County Governments.

1.5.1. National Level Policies

The Constitution of Kenya allocates energy policy functions to the National Government, while county planning and development, including energy regulation, are assigned to County Governments. Several national-level policies and legislations guide energy planning in Kenya, including the Kenya Vision 2030, the Bioenergy Strategy 2020-2027, and the Kenya National Energy Efficiency and Conservation Strategy 2020.

The Energy Act 2019, National Forest Policy 2014, Forest Conservation and Management Act 2016, National Environmental Management & Coordination Act 2015, and National Sustainable Waste Management Policy 2013 are also pertinent. Additionally, the Kenya National Electrification Strategy, the Climate Change Act, the National Climate Change Action Plan 2023-2027 (NCCAP-3), the Nationally Determined Contributions, and the SE4All strategy provide further guidance relevant to the counties.

As per the Energy Act of 2019, each of the anticipated 47 County Energy Plans (CEP) contributes to the Integrated National Energy Plan (INEP) overseen by the Ministry of Energy and Petroleum. This hierarchical integration ensures a coordinated approach to energy planning, aligning county-level strategies with national energy goals. Thus, CEPs play a crucial role in the overall energy landscape of the country, facilitating effective energy management and sustainable development.

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1.5.2. County-Level Policies

A review of recent energy policies and plans by counties shows the sole focus on climate change, with energy issues being addressed due to its contribution to climate issues. The same is the case in Kajiado, and the relevant policies include:

Governor's Manifesto

The manifesto highlights waste-to-energy projects like "Taka ni Mali," converting solid waste into biogas and thermal energy. This initiative aims to empower over 300 women's groups economically while addressing waste management and environmental concerns.

CIPD 2023-2027: Kajiado County's development blueprint

The Plan states planned investments in Energy and related sectors such as Transport, Infrastructure, Agriculture and ICT.

Kajiado County Climate Change Action Plan (CCCAP) 2023-2027

The CCCAP outlines strategies to make the county climate-resilient and sustainable, including adapting to climate change, sustainable land and water management, and adopting clean energy solutions.

Energy-related focus areas include providing environmentally friendly cooking energy to eliminate charcoal burning, establishing solar mini-grids, and endorsing alternative energy sources like LPG, biogas, solar, and wind.

County Fiscal Strategy Papers

Resource allocations by the Kajiado Government prioritize sectors like Health and Education, with slight reductions or increments from previous years. The Energy, Infrastructure, and ICT Sectors traditionally receive the fourth-highest allocation, signalling the county's commitment to prioritize energy intervention while supporting other development sectors.

Sustainable Forest Resources Management and Exploitation (Charcoal) Policy, 2018

This policy document aims to enhance forest cover to a minimum of 10% in Kajiado County, bolstering climate change adaptation and resilience efforts. It advocates for the sustainable utilization of forest resources to ensure comprehensive environmental conservation, benefiting both current and future generations of Kenyans.

Emphasizing respect for socio-cultural values, access to justice, gender equity, and inclusivity, the policy underscores the importance of community participation. Furthermore, the document prioritizes the sustainable conservation of water catchment areas by facilitating capacity building within Community Forest Associations, aiming for a 90% awareness rate of forest conservation and protection among local communities within the next year.

This approach aims to foster ownership and engagement in forest conservation efforts.

Kajiado County Renewable Energy Atlas (2020)

The Kajiado County Renewable Energy Atlas serves as a vital resource for stakeholders, including the public, policymakers, landowners, developers, and utility companies, interested in advancing energy production from diverse sources such as water, wind, biomass, geothermal, and solar.

This comprehensive tool aims to facilitate informed decision-making and collaboration to promote sustainable and diversified energy solutions in the region.

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Chapter Two
County Energy Resources

2.1. Bioenergy Resource Potential

2.1.1. Woodfuel (Charcoal and Firewood)

The total forest area in Kajiado County is 16,866 ha (CSP, 2020-2030), primarily located along the county's borders.

This includes 15,626.8 ha of gazetted as well as 1,240 ha standing on community-owned land. This forest area is an equivalent of 0.08% of the total land area of the County (21,900.9 km2 = 21,900,900 ha).

Table 2.1 presents the proportion of the land area under different types of vegetation across the county's four ecological zones.

These forests, comprising indigenous and exotic varieties, face various challenges, including excessive logging for firewood and charcoal production.

The total forest area in Kajiado County is 16,866 ha (CSP, 2020-2030), primarily located along the county's borders.

This includes 15,626.8 ha of gazetted as well as 1,240 ha standing on community-owned land.

Table 2.1: ***Percentage of land area under vegetation of different types in the four ecozones of Kajiado*** *(Source: Kajiado County Spatial Plan 2020-2030)*

WOODY COVER (%)	VEGETATION TYPE	RIFT VALLEY	ATHI-KAPITI PLAINS	CENTRAL HILLS	AMBOSELI PLAINS	TOTAL
0-2	Open grassland	9	71	14	37	**26**
2-20	Wooded and bushed grassland	74	-	10	-	**26**
20-40	Bush and woodland	16	29	75	59	**44**
>40	Forest and other types	1	-	1	4	**2**

The county faces a huge demand for firewood and charcoal (both internally and externally, from neighbouring counties), which poses a threat to the county's forest/tree cover. This is also coupled with Kajiado's predicted high population growth in the coming years, according to KNBS (2019). About 70% of Kajiado residents heavily rely on firewood for cooking services.

According to the 2019 Census data, Loitokitok leads in the use of firewood at 66.1 %, followed by Kajiado West at 57.7%, Kajiado Central at 51.6% and Mashuuru at 50.7%. The data also revealed household reliance on firewood and charcoal as the main cooking fuels in Kajiado County, accounting for 29% and 9.1%, respectively, cumulatively constituting 38%. In contrast, LPG (Gas) emerged as the predominant main cooking fuel, with a usage rate of 47%.

Kajiado serves as a major charcoal supplier to its neighbouring counties, where the demand is notably high. The high population projections (KNBS, 2019), urbanization trends within and surrounding counties of Nairobi, Kiambu, and Machakos, and relatively lower awareness levels on energy alternatives in Kajiado exacerbate the risk of future charcoal and firewood deficits.

Secondly, highly inefficient charcoal production and consumption technologies are employed by unlicensed producers and users, respectively.

Similarly, large firewood consumers such as educational institutions continue to receive their wood supplies from unregulated sources and vendors, especially from areas like Mashuuru, Kajiado West and Kajiado Central. Osinde (2022), reported a decline in the major sources of wood for charcoal production in Kajiado County, leading to concerns about the continued unsustainable harvesting of wood.

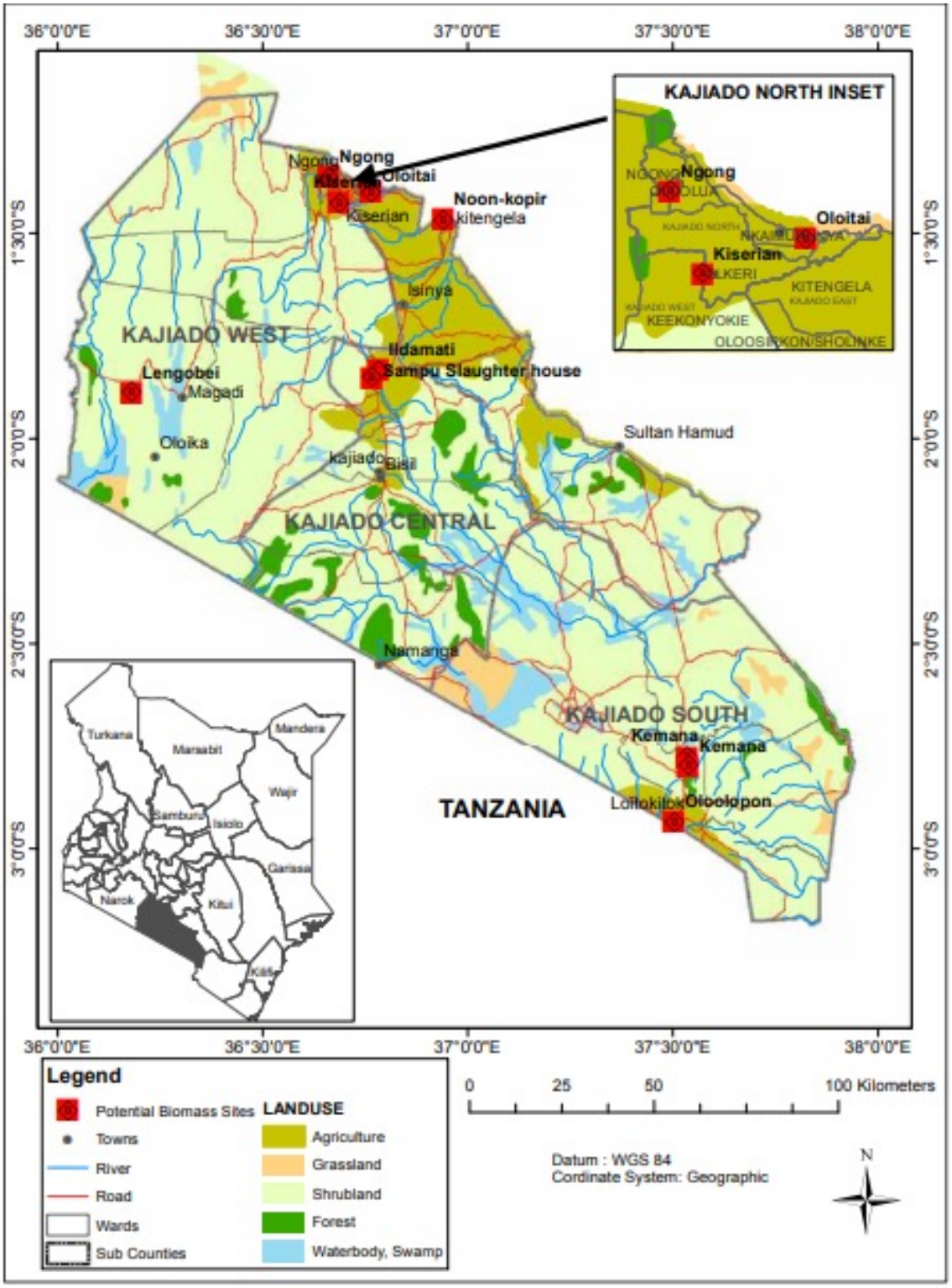
The forest cover, including woody biomass, decreased from 23% in 2009 to 18.8% in 2019, signalling a critical issue around this ecologically significant resource. Figure 2.1 shows the forest and vegetation cover as well as potential biomass-for-energy sites as captured in 2019.

The current biomass harvesting trends pose a looming firewood and charcoal deficit for Kajiado in the future if not addressed. This is especially because most firewood and charcoal in Kajiado County is sourced from natural forests with indigenous trees such acacia, which take a relatively longer period to regenerate (Kajiado lacks man-made woodlots dedicated to biomass production for energy use).

Based on the available information, there exists a notable gap in the data regarding firewood and charcoal consumption quantities in both urban and rural areas of Kajiado County.

The current biomass harvesting trends pose a looming firewood and charcoal deficit for Kajiado in the future if not addressed. This is especially because most firewood and charcoal in Kajiado County is sourced from natural forests with indigenous trees such acacia, which take a relatively longer period to regenerate.

Figure 2.1: ***Potential biomass sites in Kajiado County***
[Source: Kajiado Renewable Energy Atlas]



This data is crucial for accurately calculating deficits in firewood and charcoal supply, especially considering the significant firewood deficit potential identified within the county.

2.1.2. Agricultural Residue Resources

Kajiado County, predominantly semi-arid, exhibits pockets of high-potential farming, notably in the Kajiado North, Isinya, and Loitokitok regions. Baseline data from 2023 indicates robust agricultural output, with maize leading at 30,375 tonnes, followed by beans at 4,612 tonnes, Irish potatoes at 3,700 tonnes, and bulb onions totalling 25,233 tonnes (Kajiado County Government, 2023). According to Census data, Loitokitok emerges as the primary sub-county for crop production, with 16,618 households cultivating maize, 15,089 households growing beans, and 1,384 households engaged in cassava farming (KNBS, 2019).

However, among these crops, only maize stalks and cobs possess the potential to meaningfully contribute to household fuel mix, provided they are available in substantial volumes and at appropriate moisture content. Nevertheless, the harvestable crop residue across the county remains limited and dispersed among small-scale farmers in the identified growing areas. While these crop residues may suffice for occasional cooking needs, it's improbable that crop residues from Kajiado will significantly impact the county's fuel mix under current conditions.

2.1.3. Animal Waste Potential

Biogas derived from cattle manure presents a promising and sustainable energy source for Kajiado County. This versatile energy can be harnessed for cooking, potentially reducing the region's high dependence on firewood and charcoal.

The process of generating biogas from cattle manure not only efficiently manages waste but also potentially mitigates climate change through the reduction of methane, a potent greenhouse gas.

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At the household level, the adoption of biogas technology contributes to improved indoor air quality and reduced health risks for households by replacing traditional cooking methods like firewood or charcoal.

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The viability of tapping into the biogas potential from animal manure depends on the type of animal production system, whether zero-grazing or free-range and the accessibility to efficient biodigester systems. There are some biogas users in Kajiado County employing various types of biodigesters, ranging from large underground domes to smaller and more cost-effective canvas types.

According to Mbali (2018), on average, a dairy cow under zero grazing potentially produces 30 kg of dung per day which is the average amount required to produce biogas for approximately 4 hours. Similarly, 1 kg of manure can produce 46 litres of biogas per year. Assuming that all the 36,537 dairy cattle in Kajiado County (as per the CIDP and 2019 Census data) were to be under zero grazing, they would yield 50,434,860 litres/year of biogas.

This is however untenable in current circumstances. While free-range livestock, including 541,163 beef cattle, 877,744 goats, and 1,120,649 sheep, offers significant biogas production potential, the inability to collect their dung sustainably and in meaningful quantities for biogas production renders this potential infeasible for bioenergy development by the County Government in the short-term.

2.1.4. Domestic Waste Resources

Solid waste management in Kajiado County remains a significant challenge with low rates of waste collection by the Kajiado County management, and the absence of legislation governing the sector. Similarly, there is insufficient awareness among residents regarding solid waste management, as well as the absence of a system for separating organic, inorganic, and recyclable waste at its source.

The Kajiado County Solid Waste Management Strategy 2018-2022 (Kajiado County Government, 2018) aims at achieving approximately 80% waste recovery (recycling, composting, and waste to energy) and 20% landfilling in a sanitary landfilling (inert material) by 2030.

In the medium term it hoped to achieve 50% waste recovery (recycling, composting, and waste to energy) and 50% semi-landfilling by 2025 while in the short term, the Strategy hoped to achieve 30% waste recovery (recycling, composting) and 70% controlled dumping (25 tipping, compacting and covering) in key urban areas by 2020. However, these have not been achieved.

By adopting a strategic approach that integrates modern technologies, data gathering, collaboration with stakeholders, and effective policy implementation, Kajiado County can harness the benefits of waste-to-energy conversion while addressing both waste management and energy generation challenges sustainably, thus contributing to the county's overall development objectives.

BOX 1. **HARNESSING WASTE-TO-ENERGY POTENTIAL IN NGONG TOWN**

A potential solution involves investing in a waste-to-energy plant in Ngong Town, estimated to cost KES 2.1 billion in 2019. However, the Kajiado County Government currently lacks the necessary resources, as the total allocation for all development programmes is estimated to be 30% of the annual budget. As a result, the county may need to seek external financing for the project, contingent on a guarantee by the National Government.

Funded by GIZ, Kisumu County is currently implementing a feasibility study to establish the waste to bioenergy potential generated by the city's residents as a prerequisite for applying for GCF support—a strategy Kajiado could emulate to raise additional funding.
However, some hurdles must be overcome. First, executing such a project requires a substantial increase in the tonnage delivered to the sanitary landfill, from the current 273 tonnes per day to around 400 tonnes.

This necessitates aggregating waste from all urban centres in Kajiado County and some from neighbouring counties through intercounty arrangements to make the project viable. Secondly, the county must negotiate with Kenya Power (KP) to sell the 9 MWH (expected output) generated from the investment at $35/MWh for feasibility.

2.2. Geothermal Resources

According to the Kajiado County Renewable Energy Atlas (2020), Kajiado County has three potential geothermal regions: Mt. Suswa (northern part), Lake Magadi Springs (western part), and Kisaju Area 22 (eastern part). Figure 2.2 shows these potential areas.

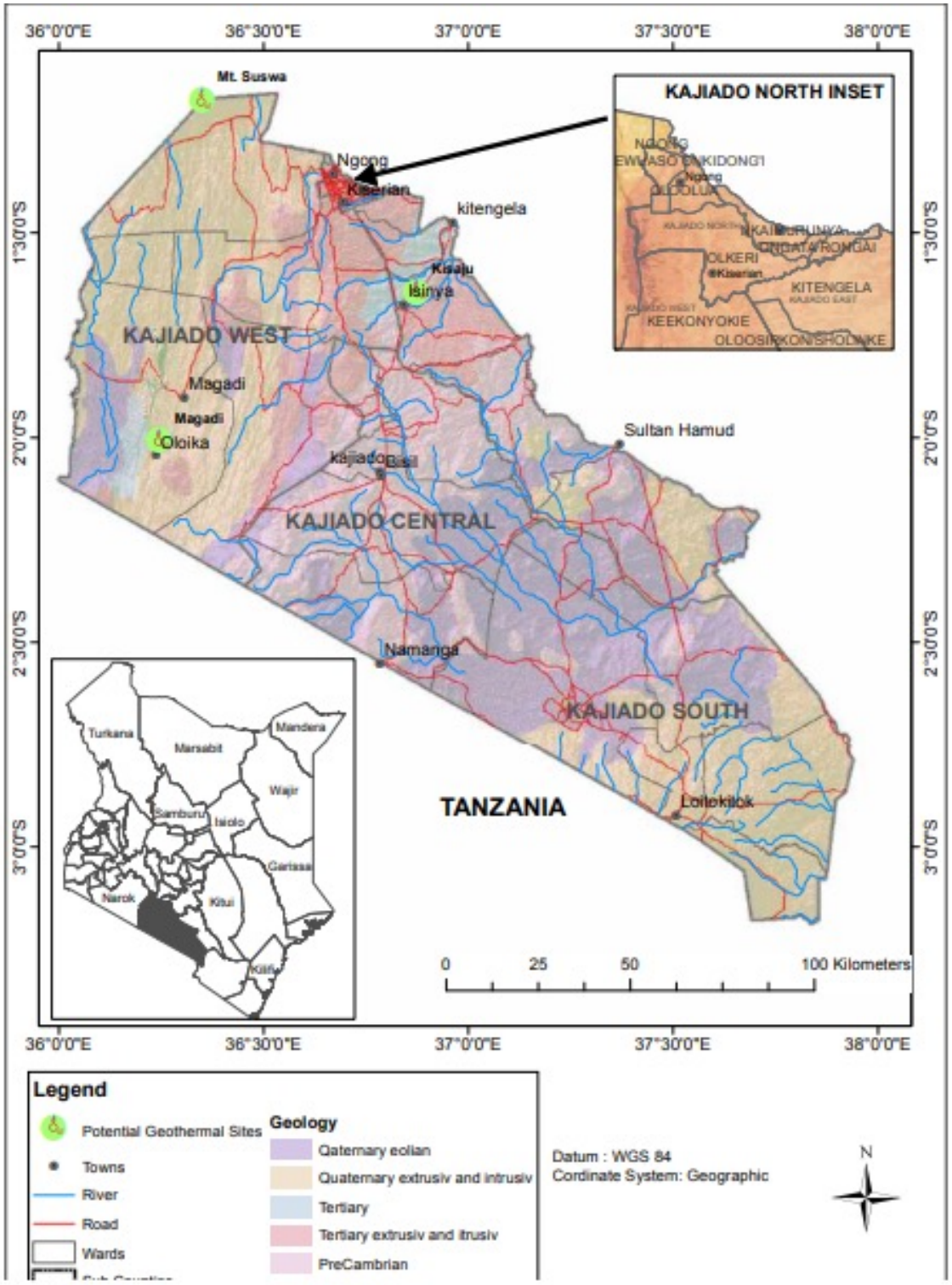

Figure 2.2: ***Potential Geothermal Energy Sites in Kajiado County***
[Source: Kajiado Renewable Energy Atlas]

Exploration of these resource potential is at different stages for several sites. The Ministry of Energy and Petroleum (MoEP) granted Geothermal Development Company (GDC) Ltd a geothermal prospecting license this purpose. This license enables GDC to explore, extract steam for electricity, and construct a geothermal power plant once found feasible. The first of these projects is around Mount Suswa and its calderas in Kajiado and Narok Counties, spanning a 12 km diameter. According to GDC, Mount Suswa has an estimated potential of 750MW, which is expected to be developed in phases.

The second is the Lake Magadi Geothermal Project whose exploration and development commenced in October 2017 covering a concession area of 3543 km2, predominantly within Kajiado County. The geothermal potential is yet to be determined since exploration is ongoing. Thirdly, the Kisaju Area 22 possesses geothermal systems with low to moderate temperatures, evident through gas springs on the surface. Comprehensive studies are required to determine its commercial viability. Geothermal potential is similarly yet to be determined.

Considering Kajiado County's substantial geothermal potential, it is imperative for the county to strategically harness this indigenous and sustainable energy source. The ongoing geothermal projects, particularly the Mount Suswa and Lake Magadi Springs, exemplify promising opportunities for electricity generation.

Emphasizing environmental sustainability in project planning and considering phased development approaches will enable Kajiado to harness its estimated geothermal potential of 750MW at Mount Suswa and additional capacities in the Lake Magadi Springs and Kisaju Area 22 regions.

Through strategic planning and collaboration, Kajiado County can position itself as a significant contributor to Kenya's geothermal energy landscape.

2.3.Hydropower Resources

Kajiado County is located in semi-arid and arid zones with minimal annual precipitation (400mm/year), and the county relies on seasonal rivers, shallow wells, springs, dams, water pans, and boreholes. The county presents an opportunity for hydroelectric power generation due to its topography and land availability thus viable for the construction of dams. Figure 2.3 shows the County's hydro potential in 2019.

The hydropower potential in Kajiado County is further enhanced by the presence and intensity of river flows during wet seasons, the mass of water, the slope of the area, and the high angle of the slope (greater than 300) contribute to the significant strength of river flows, supporting hydropower generation. For example, the high-yielding springs on Mt. Kilimanjaro slopes, averaging 20m³ per hour to 50m³per hour offers a viable hydropower generation potential that the county could tap into, further contributing to the County's hydro potential (RE Atlas, 2020). The major seasonal hydro sites identified include Entasopia River, Pakase River, Kimana River, Saikeri River, Kiserian dam, and Shompole Dam.

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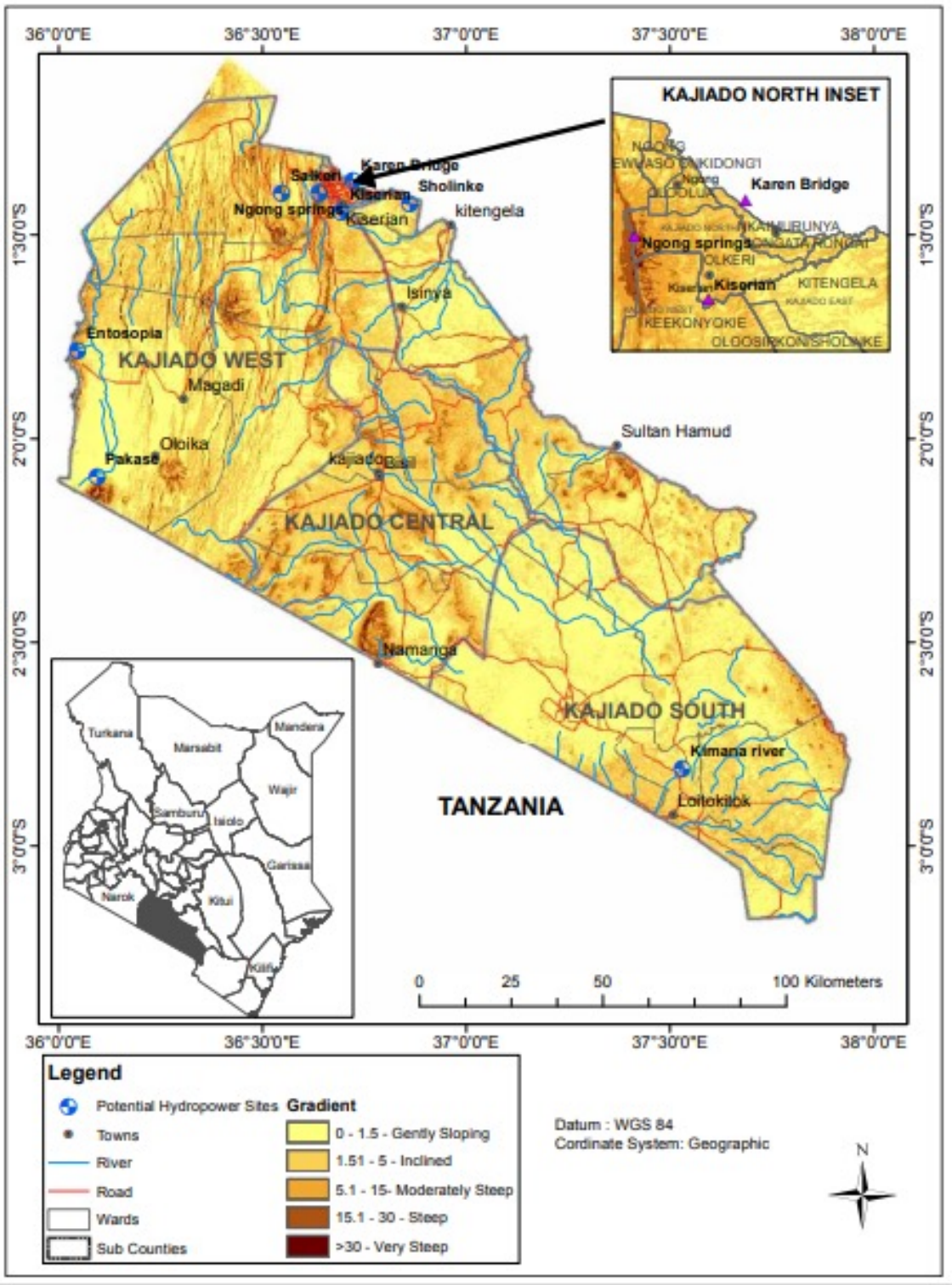


Figure 2.3: ***Potential Hydropower Sites in Kajiado County***
[Source: Kajiado Renewable Energy Atlas]

2.4. Solar Energy Resources

Benefiting from high insolation rates, Kajiado County averages 5 to 7 peak sunshine hours and receives 4 to 6 kWh/m2 daily insolation. However, only 10 to 14% of this energy can be converted into electricity due to solar PV module efficiency. Since 2006-2007, the Ministry of Energy in Kenya has actively promoted solar energy for off-grid electrification, particularly through the solar for schools programme [2], with plans to extend to clinics and dispensaries.

Solar irradiation remains a crucial, sustainable energy source for arid and semi-arid areas, providing variable but essential energy to rural communities without electricity access. The existing and potential solar energy sites are presented in Figure 2.4.

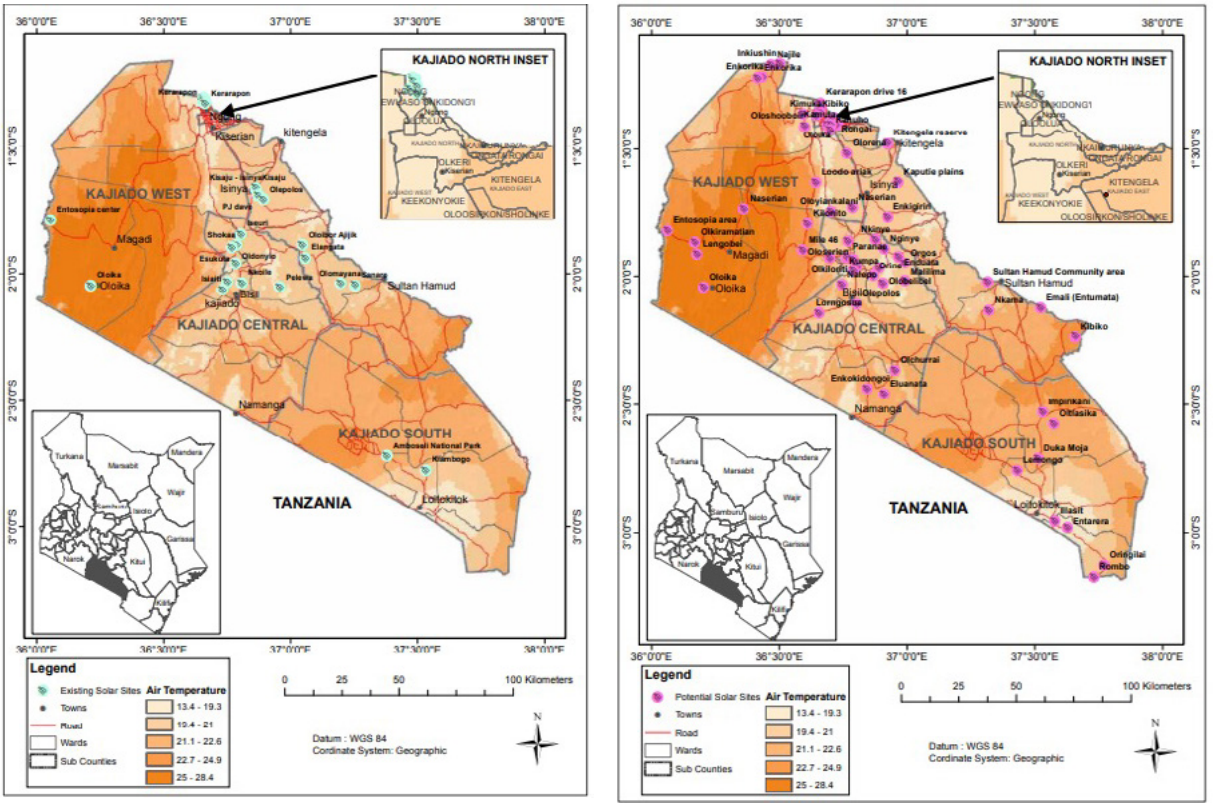
Kajiado County, with its high solar insolation rates, is conducive to solar energy generation. Notably, commercial and utility projects are operationalizing solar energy for water pumping and irrigation.

Development investors are also currently testing innovative smart grid solar technologies in Kajiado County, supported by blockchain [3]. This micro-grid system manages all data related to power distribution and purchases.

Residents with solar panels can use the technology to generate and sell excess energy to their neighbours. Sellers can easily check their monthly electricity sales or earnings by dialling a short code on their phones, while consumers on the mini-grid can monitor their power usage. The Kajiado County Renewable Energy Atlas clearly identifies all the potential sites across all sub-counties of Kajiado.

The Magadi area holds significant untapped solar energy resources, presenting an opportunity for the development of solar mini-grids. The establishment of such mini-grids could harness the abundant solar potential, contributing to sustainable and reliable power sources for the region. In Ilodokilani, the solarization of boreholes is proposed as a cost-effective measure to significantly reduce

Figure 2.4: ***Existing and potential solar energy sites in Kajiado***
[Source: Kajiado Renewable Energy Atlas]



production costs. By utilizing solar energy, there is the potential to extend pumping hours to 8 hours a day, enhancing water access and, in the long run, increasing revenue while promoting sustainable practices.

For the Keekonyokie area, the suggestion involves borehole drilling and solarization at specific locations such as Emboliei, Olooyiankalani, Oloompaluani, Kipeto, and Inchorroi. This initiative aims to provide an alternative source of potable water at a lower cost, addressing water scarcity challenges and ensuring access to clean water for local communities.

These proposed projects demonstrate a strategic focus on utilizing solar energy for various applications, ranging from power generation to water supply, with the overarching goals of sustainability, cost-effectiveness, and increased community welfare thus promoting diversified energy sources for the county.

2. For more information, see: https://www.mandomaasai.org/computer-labs#:~:text=Solar%2Dpowered%20educational%20initiative%20in%20Kajiado%2C%20Kenya&text=The%20school%20teachers%20and%20MANDO,from%20the%20core%20MANDO%20team.

3. For more information, see: https://hivos.org/local-solutions-key-in-championing-climate-justice-the-story-of-block-chain/

2.5. Wind Resources

Kajiado County possesses abundant wind resources suitable for energy development, with the most favourable locations primarily found in the northern region of Ngong Hills (see Figure 2.5). The Ngong Hill windfarm, managed by KenGen, generates about 25.5MW of power with an annual net output of 12GWh.

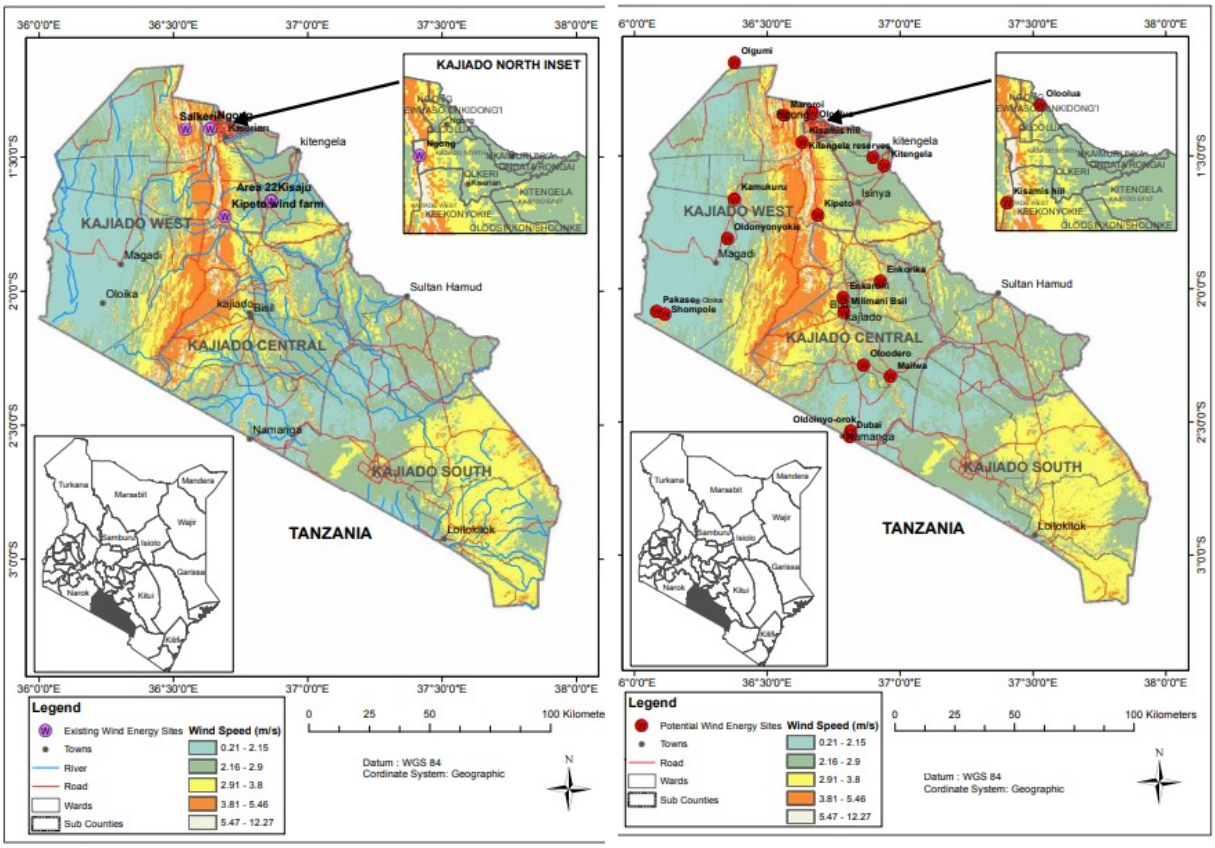
In the western part of the county, the Kipeto Wind Farm has an installed capacity of 100MW. The Kipeto wind farm is expected to extend a 17km (220KV) transmission line to connect to the Isinya substation. As highlighted earlier, wind electricity generation in Kenya rose by 653.44 GWh to 1,984.8 GWh in 2021 as a result of the addition of Kipeto Wind Power plant to the grid (Economic Survey, 2022).

Certain regions in Kajiado County exhibit elevated wind speed and air density that characterize them as potential sites for wind power technologies deployment for electricity generation. These include Oldoinyo-Orok, Mailwa, Oloodero, Milimani Bisil, Enkaroni, Enkorika, Oloorkisalie, Oldonyonyokie, Shompole, Pakase, Dubai, Esilanke Hills, Chyulu hills, Kisamis Hills, Kitengela Reserve, Maroroi, Olgumi, Corner Baridi, Oloolua, Torosei, and Oloyiankalani. Harnessing these abundant wind resources in Kajiado County stands as a promising pathway towards sustainable energy development.

With existing wind energy sites like the Ngong Hill windfarm and the Kipeto wind farm making significant contributions to the regional power supply, the County has already demonstrated the economic viability and environmental benefits of wind energy. To leverage this potential further, Kajiado County should explore additional wind energy sites with elevated wind speed and air density, as identified in regions like Oldoinyo-Orok, Enkorika, Shompole, and Kitengela Reserve.

Encouragingly, the collaborative efforts seen in the Kipeto wind farm project, involving a consortium of investors, financiers, and local community trusts, serve as a model for future initiatives.

Figure 2.5: ***Existing and Potential Wind Energy Sites (m/s)***
[Source: Kajiado Renewable Energy Atlas]



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2.6. Fossil Fuels in Kajiado County

While Kajiado County has not historically shown petroleum potential, an unexpected discovery in October 2017 by the National Oil Corporation of Kenya (NOCK) identified gas at a shallow depth of approximately 200 meters within Magadi Basin, suggesting the presence of hydrocarbons brought closer to the surface through geological fissures (Kajiado County Government, 2023; CIDP 2023-2027).

Gas analysis points to a thermogenic origin, with methane concentrations reaching 38%, while the absence of longer-chain alkanes hints at a potential biogenic source.

As exploration efforts continue, there emerges the possibility of crude oil coexisting with the gas, which has consequently led to NOCK and other investors constructing 10,000-liter tanks, improved road infrastructure, and established health centres, aligning with their Community Social Responsibility (CSR) initiatives aimed at benefiting the local community.

To be able to open new avenues for fossil fuel exploration in Kajiado County, further research and strategic planning to understand and harness these resources responsibly is key.

As exploration efforts continue, there emerges the possibility of crude oil coexisting with the gas, which has consequently led to NOCK and other investors constructing 10,000-liter tanks, improved road infrastructure, and established health centres, aligning with their Community Social Responsibility

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Chapter Three
Energy Access

3.0. Overview

Kajiado County population of 1,117,840 (495218 rural and 622,622 urban) is scattered across the six sub-counties and study regions considered for this report. To determine their energy access, a survey of 612 households and 90 institutions and SMEs was carried out to establish the consumption rates and patterns for the different fuels and energy by these key users scattered across all sub-counties.

3.1. Research Methods

To complement data from this survey, other data was obtained through stakeholder engagement and literature review of key county and national level policy reports and the academic literature as clarified in Chapter 1.

Where data was completely unavailable, the consultant made reasonable estimates to derive the County's current access to the different energy forms. This section also presents projects of energy access in the short and medium terms using modelled estimates for energy access in 2027 and 2023 in alignment with the CEP's 10-year scope.

3.2. Electricity Access

3.2.1. Electricity Access by Households

Among the 612 households surveyed in preparation of this CEP, 40% were linked to the Kenya Power grid, 5% had individual solar home systems (SHS), and 1% were connected to solar mini-grids. Notably, 46% relied on portable solar powered lighting such as lanterns and flashlights for their primary lighting. The remaining 8% of households used kerosene lamps, candles, LPG lamps, or similar sources as their primary lighting methods.

These findings demonstrate the diverse energy landscape within Kajiado County, reflecting a mix of centralized and decentralized energy provision for households to meet their electricity needs. As per the 2019 Census report, 67.4 % of Kajiado County was connected to the national grid.

The survey results indicate significant disparities in connectivity in the 6 sub-counties within Kajiado County. For example, Kajiado North had the highest percentage of surveyed electrified households at 95%, followed by Isinya sub-county at 57%, while in the remaining four sub-counties, more than 50% of the surveyed households were off-grid.

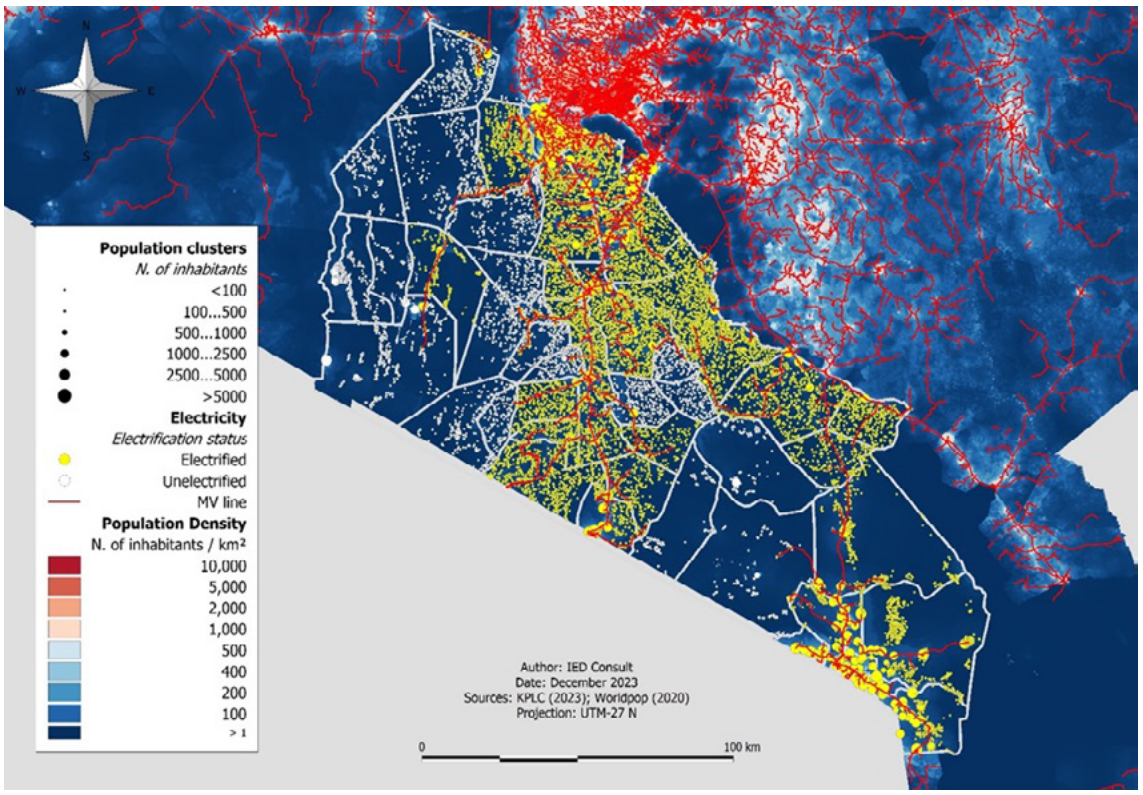
According to the 2019 census, Kajiado North was the most electrified sub-county at 95% followed by Isinya (86%), Kajiado Central (42%), Kajiado West (40%), Loitokitok (36%) and Mashuuru (35%).

The disparity in electrification rates among the sub-counties calls for tailored interventions and investments in electricity infrastructure and energy access initiatives, particularly in the underserved sub-counties.

Efforts are also needed to elevate the about 9% of these groups of households that still rely on cooking fires and candles as their primary lighting option to transition to solar home systems through affordable financing solutions.

According to a SETA report, by September 2023, Kenya Power in Kajiado had registered 315,787 domestic clients, about 84% of the 376,186 households in the county then, when the electrification status of the population clusters was as shown on the map in Figure 3.1 below.

Map 1: ***Electrification status of population clusters in Kajiado in 2023***



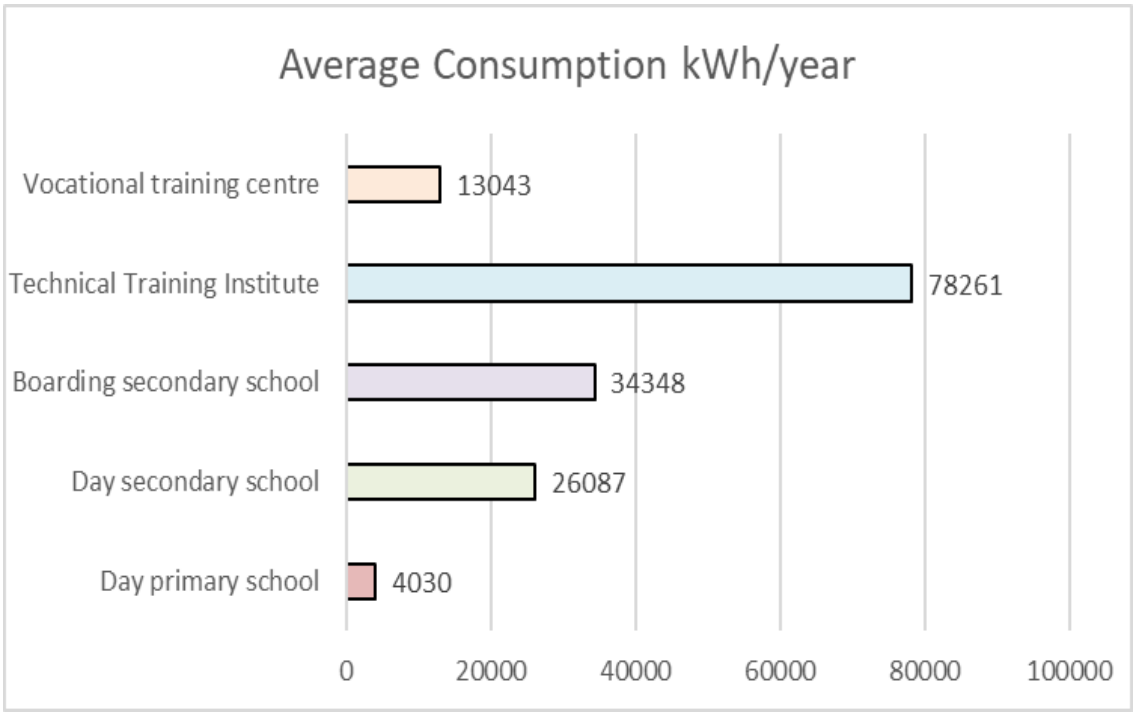
3.2.2. Electricity Access by Educational Institutions

The baseline survey was administered in 29 education facilities within the county, and it was found that 97% of the surveyed facilities were connected to the national grid through Kenya Power, however, one facility (a day school) was not electrified thus the need for consideration in any electrification plans that the county government of Kajiado has to ensure the facility has access to electricity.

To understand the energy efficiency practices being utilized in these education facilities, a question on the types of lighting bulbs used was included. It was noted that 46% of the facilities were using fluorescent tubes followed closely by LED bulbs at 39% while the rest used either fluorescent bulbs or LED tubes equally at 7%.

The baseline survey was administered in 29 education facilities within the county, and it was found that 97% of the surveyed facilities were connected to the national grid through Kenya Power, however, one facility (a day school) was not electrified thus the need for consideration in any electrification plans that the county government of Kajiado has to ensure the facility has access to electricity

Figure 3.1: ***Average annual electricity consumption per category of School***



In addition to the efficiency aspects, the electricity consumption trends were also investigated, which is shown in Figure 3.1 as the annual power consumption and is disaggregated by the type of education facility. It was observed that technical training institutes had the highest annual consumption at 7826kWh while the primary day schools had the lowest annual consumption at 4030kWh.

The high consumption can be attributed to the activities that the institute engages in such as running machinery and electric equipment and provision of accommodation facilities among others which are often energy demanding while the low consumption can be due to the first the limited energy demanding activities that day primary schools engage in and second the fact that the day schools operate during the day therefore their electricity needs are minimal.

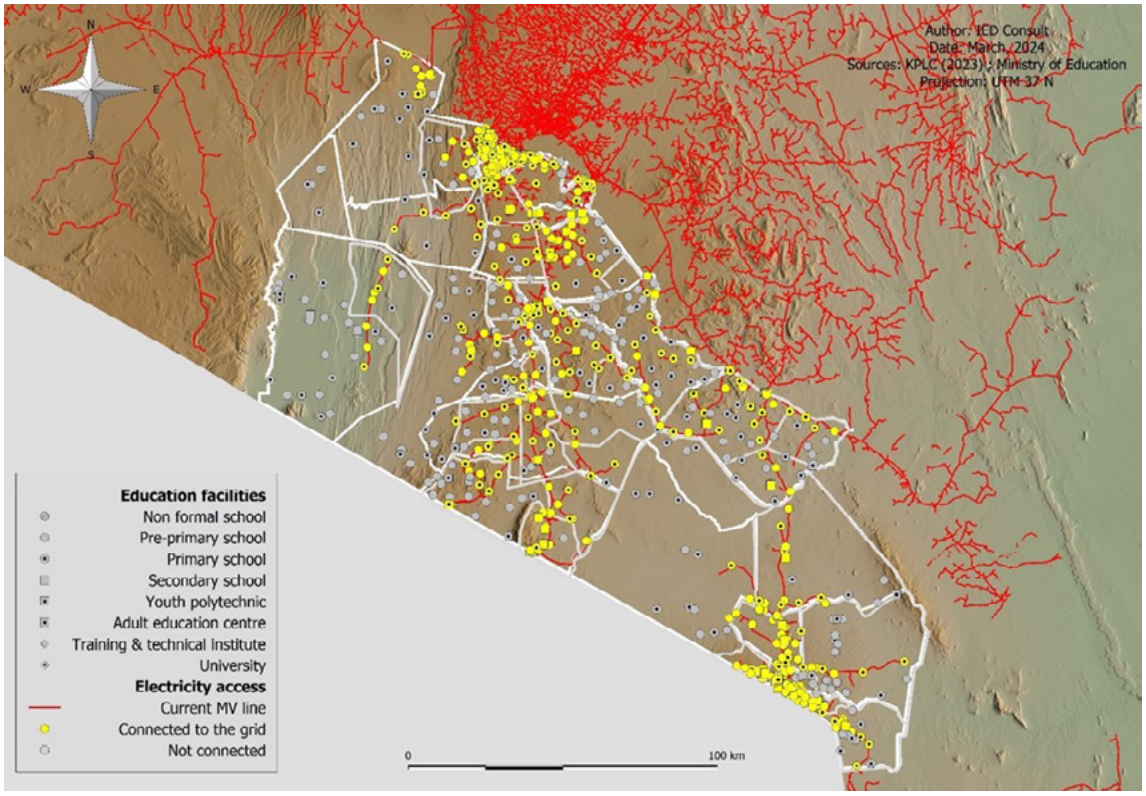
On average, a school spends KES 26,700 a month for its electricity consumption corresponding to 13,934 kWh/year. For the 1090 educational institutions, this amounts to 15.2 GWh per year.

Using the position of transformers distributed across the county to identify connected institutions, an assessment by SETA established 263 pre-primary schools (out of 912), 110 primary schools (out of 516), 2 secondary schools and 2 youth polytechnics (out of 86) were identified as not connected the national grid. The list of these institutions is available in the Appendix 6.

3.2.3. Electricity Access by Healthcare Facilities

The baseline survey included 25 healthcare facilities that were randomly selected in the service Level they represented—Level 2 to Level 4 facilities were considered. About 95% of the surveyed healthcare facilities have access to electricity, and depending on the medical services they were providing and their operation schedule, they were connected to either the single-phase or three-phase power supply transmission lines.

Map 2: ***Electrification status of education facilities in Kajiado County***



The actual full picture regarding the connectivity of all 122 healthcare facilities in Kajiado in 2024 is presented in Figure 3.2. The full list of these facilities (Level 2 and 3) is presented in Appendices 1-5. Despite most of the facilities being connected to the national grid, they all reported prevalent power outages. About 34 dispensaries (out of 95), 14 medical clinic (out of 141), 2 nursing homes (out of 8), 7 health centres (out of 32) are not connected to the grid.

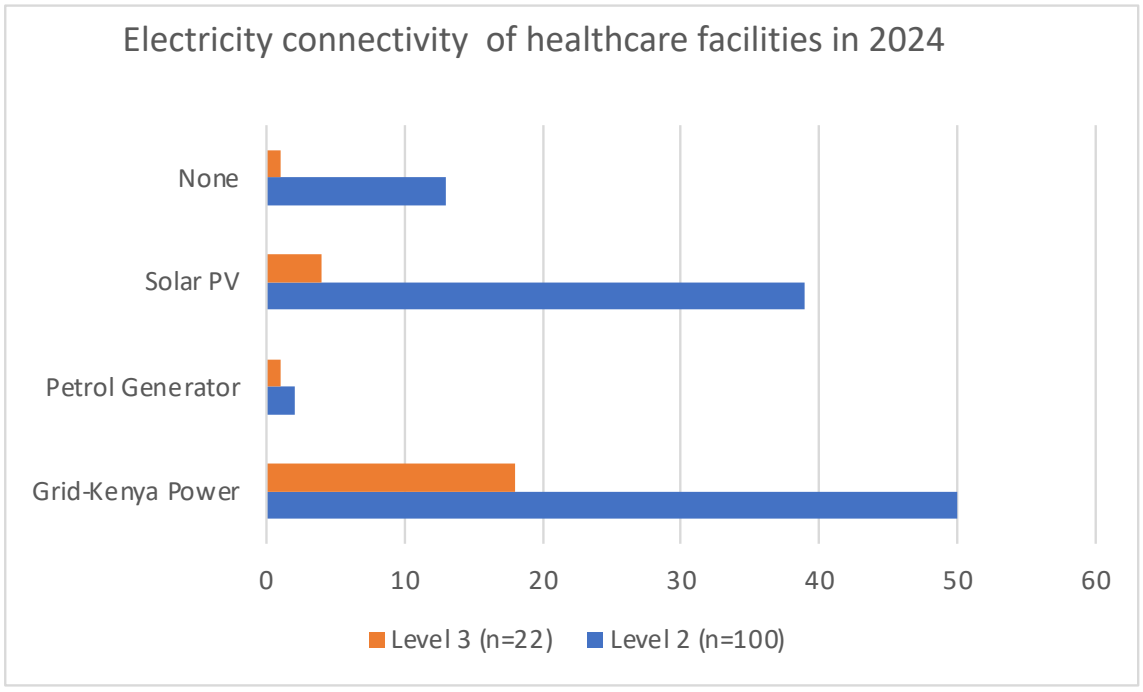
Consequently, about 56% of the medical facilities indicated having backup systems in their facilities to supply electricity during such incidents. It was further noted that 86% of facilities with backup systems were diesel or petrol-driven generators, while battery backup systems and solar photovoltaic (PV) contributed to 7% each among those equipped with backup solutions.

In terms of energy efficiency practices within the surveyed medical facilities, 55% use fluorescent tubes, 33% use LED bulbs, and the remaining facilities use compact fluorescent lamps. No data were accessible on electricity consumption by the healthcare facilities.

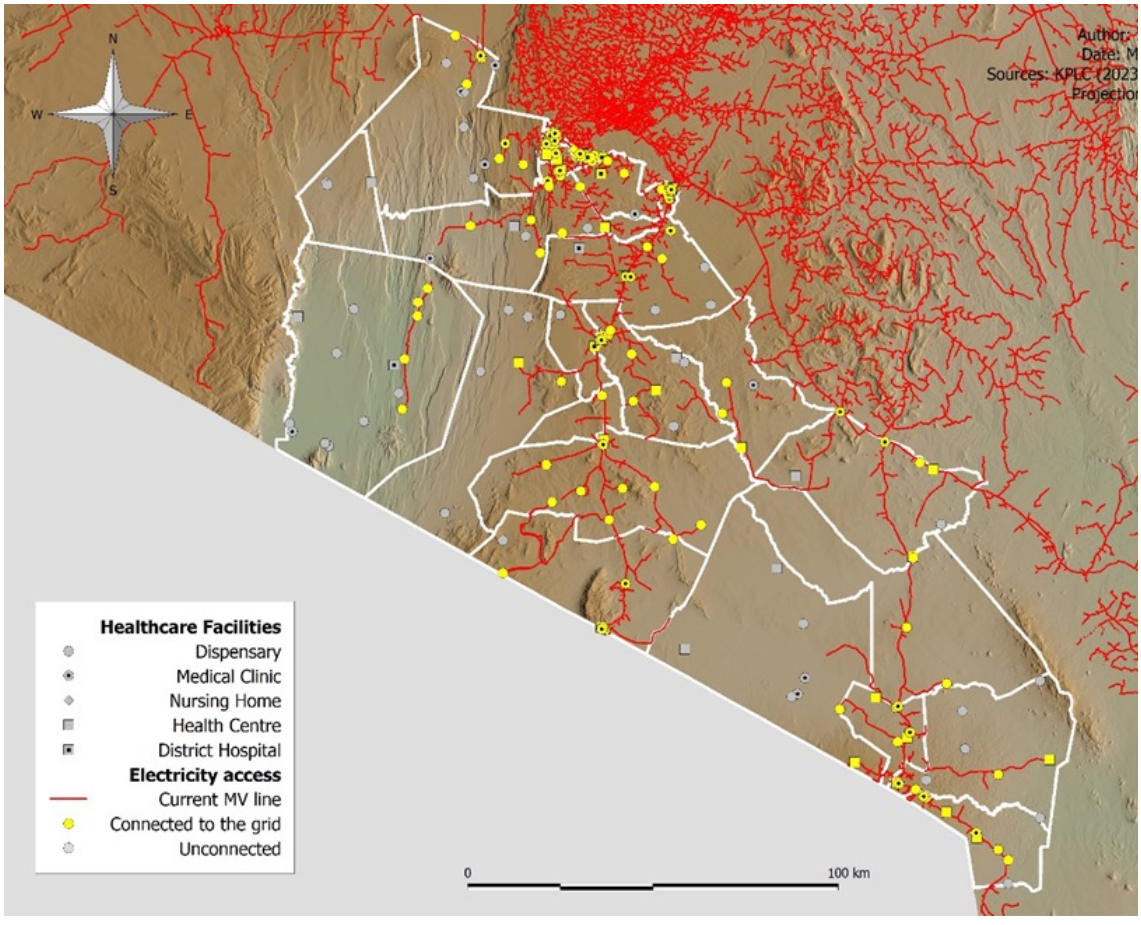
For purposes of this CEP, we assume health facility and educational institutions consume about the same, 13, 934 kWh/year. For the 122 Level 2 and 3 facilities in Kajiado, this implies 1.7 GWh/year.

Diversifying energy sources, including increased integration of solar power, can contribute to a more resilient and sustainable energy supply for these healthcare facilities. Notably, the main lighting device in electrified hospitals is the fluorescent tube, showcasing a conventional approach. Exploring energy-efficient lighting solutions, potentially incorporating solar-powered lighting systems, can contribute to cost savings and environmental sustainability.

Figure 3.2: ***Electricity connectivity by healthcare facilities in Kajiado.***
(Source: Kajiado County, Director, Department of Health)



Map 3: ***Electrification status of health facilities in Kajiado County***



3.2.4. Electricity Access by Small and Medium Enterprises

The baseline survey targeted 38 different SMEs across the 6 sub-counties such as restaurants, retail shops, artisanal shops, and beauty parlours among others. The survey results showed that 95% (36 businesses), have access to electricity from the national grid while 5% lack access to electricity from the main grid however these rely on solar lanterns for lighting purposes.

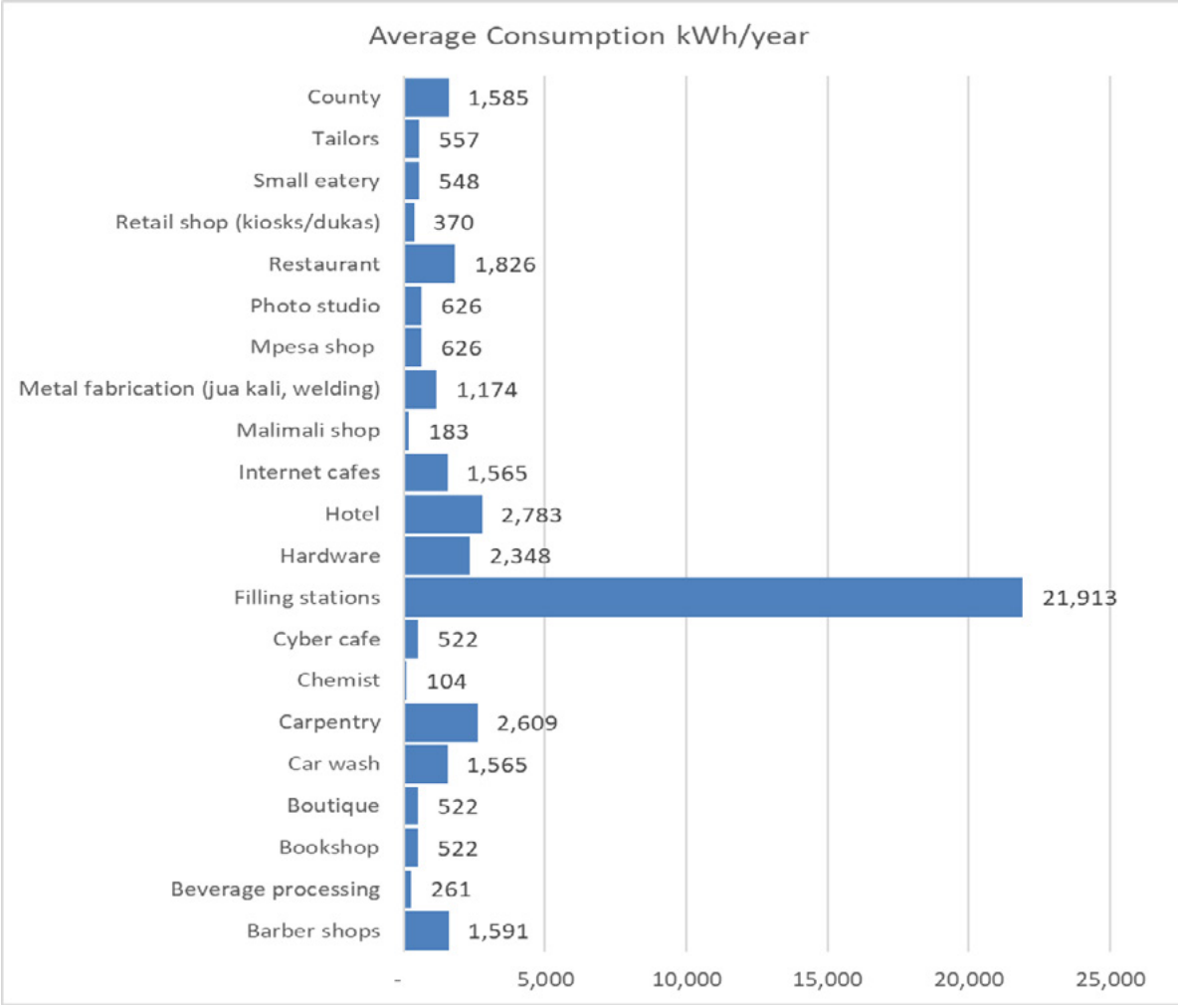
On the energy efficient practices utilized, 76% of the surveyed SMEs were using LED bulbs and 5% are CFLs, which are more efficient as compared to 19% who use fluorescent tubes.

The survey findings showed that 50% of the SME turnover was found to be below KES 25,000/month and 16% above KES 75,000.

In the latter category, there are the filling stations, the bookshops, the small eateries, the m-pesa shops, and the carpentry workshops. On average, an SME spends KES 3,000 a month for its electricity consumption corresponding to about 1,585 kWh/year. The largest consumers are the filling stations (21,913 kWh/year), Hospitality (2,783 kWh/year), carpentry (2,609 kWh/year), hardware (2,348 kWh/year), restaurants (1,826 kWh/year), and barbershops (1,591 kWh/year).

The smaller consumers are retail shops, chemists, beverage processors, and carpenters who consume less than 400 kWh/year. The full consumption picture across the diverse SMEs is presented in Figure 3.3 below. For the 46,000 SMEs registered in Kajiado, the total consumption stands at 72.91 GWh per year.

Figure 3.3: ***Average consumption kwh/year for SMEs in Kajiado***



3.3. Access to Energy for Cooking

3.3.1. Access to Household Cooking Fuels

The baseline energy access survey sampled 612 households. The survey found high dependency on woody resources (Firewood & Charcoal) with about 55% of Kajiado households relying on firewood as their primary fuel. LPG and Charcoal are primary fuels for 24% and 19% of the HHs respectively.

However, Charcoal usage in Kajiado meets the greatest share (42%) of the cooking energy demand, making it the most used fuel, followed by firewood, which meets 38% of the cooking energy demand, particularly in the rural and peri-urban areas.

The adoption of firewood and charcoal ICS is very low, the Three Stone Open Fire (TSOF) is used by 89% of the households using firewood, leading to a very low efficiency of firewood consumption.

Similarly, for households using charcoal, the majority still use metallic stoves at 67%, and only 33% use ICS stoves again translating to very low-efficiency consumption.

Figures 3.4 (a) and (b) show the average cooking energy profiles for rural and urban households, respectively in 2023. Figure 3.5 illustrates the shift in primary fuel usage in Kajiado from 2019 to 2023.

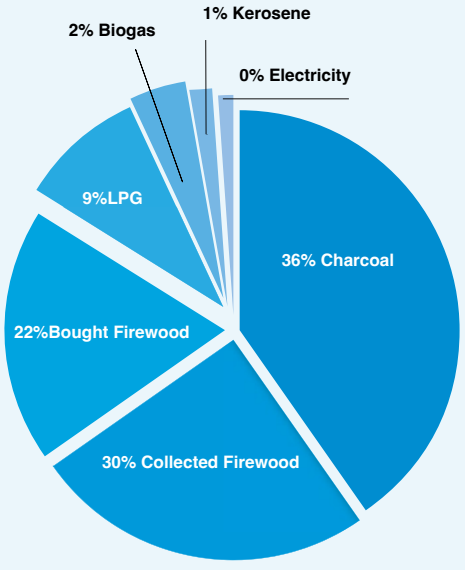


Figure 3.4 (a): ***Rural cooking energy profile***

52% of the needs are covered by firewood, while 36% is covered by charcoal and LPG covers 9% of the cooking needs. In terms of primary fuel usage in Rural HHs, firewood is used by 74% of the HH, followed by charcoal at 15% and LPG 9%.

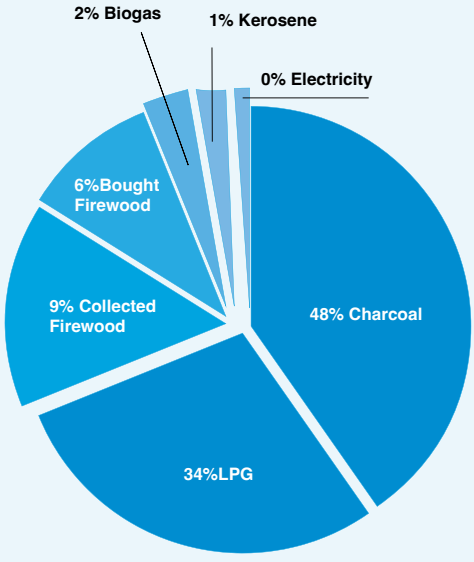


Figure 3.4 (a): ***Rural cooking energy profile***

48% of the needs is covered by charcoal, while 34% of the needs covered by LPG and firewood covers 15% of the cooking needs. Regarding primary fuel usage in Urban HHs, LPG leads at 46%, followed by Charcoal at 27%, and firewood at 23%.

Notably, there was a 50% decrease in LPG usage and a complete cessation of kerosene use as a primary cooking fuel, being relegated to secondary and tertiary use by users. Meanwhile, households reporting charcoal and firewood as primary cooking fuels nearly doubled compared to 2019.

In 2023, 7% of households still used kerosene, but only as a secondary or tertiary fuel. These changes can be attributed to several factors, including the impact of COVID-19 leading to job losses, increased taxation on all commodities, and significant rises in fossil fuel prices since early 2023.

These economic pressures likely reduced disposable incomes, prompting a return to more traditional and less expensive cooking fuel sources like charcoal and firewood.

During this period, there was also a slight increase in households reporting more frequent use of bioethanol, electricity (from 1.2% to 4%), and biogas (from 0.7% to 2%) as secondary and tertiary cooking energy sources.

In 2023, 7% of households still used kerosene, but only as a secondary or tertiary fuel. These changes can be attributed to several factors, including the impact of COVID-19 leading to job losses, increased taxation on all commodities, and significant rises in fossil fuel prices since early 2023.

Figure 3.5: Comparison of primary fuel by households between 2019 and 2023

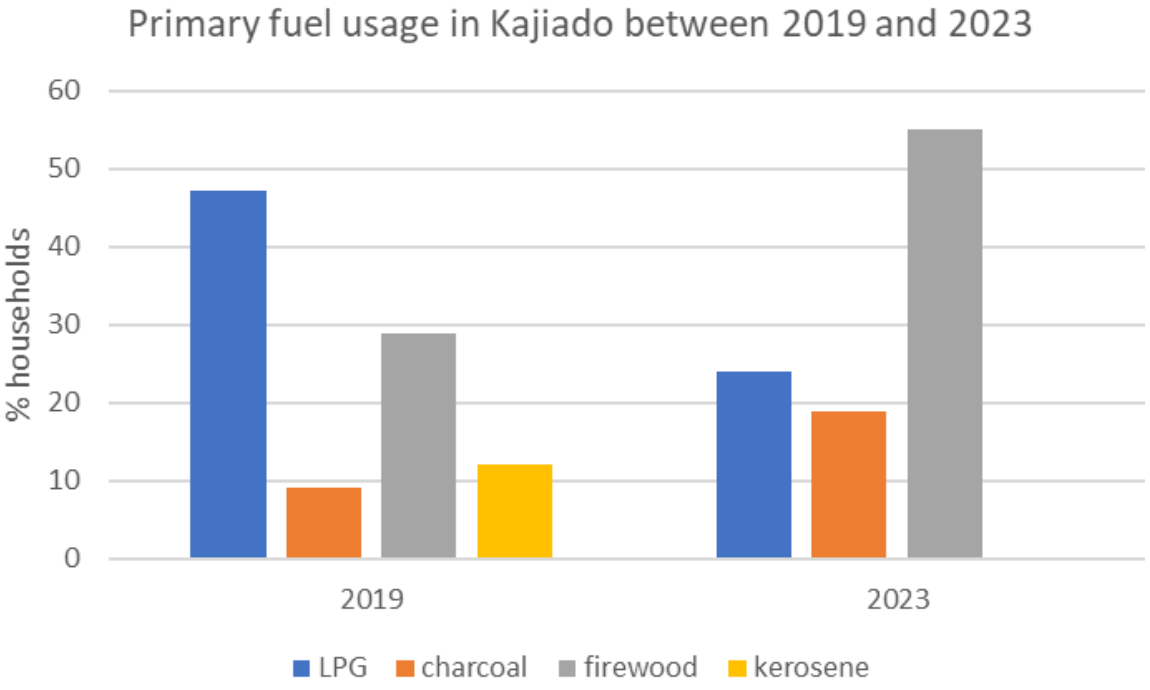


Table 3.1: ***The average cooking energy profile for Kajiado citizens*** *(Population data based on KNBS 2019)*

COOKING FUEL	ENERGY NEED GJ/PERSON/YR	ENERGY DEMAND UNIT/PERSON/YR	% OF NEED	ANNUAL DEMAND
Collected firewood	0.391	159.29 kg	23	201,976 ton
Bought firewood	0.228	92.66 kg	15	117,490 ton
Charcoal	0.630	79.80 kg	42	101,184 ton
LPG	0.251	9.35 kg	17	11,851 ton
Kerosene	0.009	0.54 ltrs	1	688,000 ltrs
Electricity	0.004	1.32 kWh	0	1,674 MWh
Biogas	0.044	4.64 m3	2	18,187 m3

Overall, female-headed households have cooking needs that are higher than male-headed households. They are using more charcoal (7%) and LPG (5%), and 10% less firewood.

Part of this consumption is probably due to some income-generating activities. Table 3.1 summarizes the Kajiado County daily and annual cooking energy picture as of the end of 2023.

From the baseline analysis, Kajiado County's woody resources fulfil approximately 80% of the total energy requirements amounting to 1.9 million GJ/yr. This is accomplished through various means, including:

- Collection of around 202,000 tons of firewood, a task predominantly carried out by women and girls;
- Purchase of approximately 117,500 tons of firewood, costing kes 1.4 Billion in 2023; and
- Acquisition of about 101,200 tonnes of charcoal, valued at kes 3.5 Billion in 2023. This charcoal is produced through the pyrolysis of an estimated 600,000 to 700,000 tons of dry wood.

The remaining 20% of cooking requirements are met through other options that include:

- A) Utilization of 690,000 litres of kerosene, amounting to an expenditure of kes 140 million in 2023. However, with the increasing accessibility to bioethanol, which saw residents spending the same amount in 2023, kerosene is anticipated to gradually phase out from the cooking fuel spectrum;
- Consumption of 11,850 tonnes of lpg, predominantly distributed in small cylinders, with an expenditure of kes 2.7 Billion in 2023;
- Usage of 1,674 mwh of electricity, costing a total of kes 38.5 Million, contributing a mere 0.3% Towards the citizens' consolidated needs; and
- Rough estimation suggests the contribution of biogas plants, with an annual capital cost of kes 110 million. This estimation roughly corresponds to 20 biogas digesters of 6 m^3 each, producing 2.4 M^3 of gas per day.

3.3.2. Access to Cooking Fuels by Educational Facilities

A cross-section of public and private educational institutions was sampled across the six representative regions of the county. These included 69% day primary schools, 21% boarding secondary schools, 3% Technical training institutes, 3% Day secondary schools, and 3% vocational training centre. Of this sample, about 59% were public institutions while 41% were private. A predominant reliance on traditional biomass fuels by educational institutions in Kajiado is evident, with 93% of those surveyed reporting firewood as their primary cooking fuel.

All institutions used charcoal for diverse cooking needs. Notably, 52% of the institutions employ three-stone open fires, a method known for its inefficiency and safety risks. Only 4% of the institutions consumed firewood in improved institutional cookstoves. However, only 3% of schools reported using LPG as their primary cooking fuel. Electric cooking was observed in private primary schools.

The major consumers of woody resources are boarding secondary schools and vocational training centres, each of which consumes an average of between 27 and 77 tonnes of firewood per year depending on their population size. Each boarding secondary school in particular further consumed an average 270 kg of charcoal and 38 kg of LPG per year. Table 3.2 shows the annual thermal energy needs of a typical institution in Kajiado. It also shows the efficiency of technology and fuels and the fuel unit price at the time of the survey.

The CIDP (2023-2027) puts the number of accredited public and private tertiary institutions at 7 for TVETS and 8 for universities. Using data in the CSP 2020-2030 we estimated the sum of 1090 educational institutions in Kajiado for 2024, assuming only ECD centres, primary and secondary schools to be a fair representation of all educational institutions for purposes of the CEP.

From this perspective, 95% of the total cooking needs in education institutions were met by 29,430 tons of firewood (Using the least consumption rate of 27 tons/yr/school for 1090 educational institutions in 2024. Considered on their own, secondary schools would consume 12,859 tons/year) complemented by 294.3 tons of charcoal (about 2354 tons dry wood) and 41.4 tons of LPG.

Table 3.2: ***Some important quantities calculated from the survey findings***

AVERAGE QUANTITIES	FIREWOOD	CHARCOAL	LPG	ELECTRICITY
Efficiency of technology/fuel	30%	35%	61%	85%
Thermal energy needs per institution (Gj/yr)	2,968	107	30	15
Percentage contribution to total need	95.1	3.4	1.0	0.5
Fuel prices (KES/unit—kg or kWh)	8	22	212	23

3.3.3. Access to Cooking Fuels by Healthcare Institutions

Among the 25 health facilities sampled across all six regions in Kajiado County, 88% reported utilizing LPG as their primary cooking fuel, indicating a widespread adoption of this cleaner energy source within the healthcare sector. About 4% use electricity while about 8% don't cook at all.

LPG meets an average of 89% of the cooking needs of health institutions, with Level 3 facilities stacking other fuel types. In 2024, Kajiado County had 100 Level-2 and 22 Level-3 healthcare facilities. The average cooking energy needs (Gj/year) for the number of healthcare facility in Kajiado have been computed in Table 3.3.

Table 3.3: ***Average cooking/thermal energy needs in GJ/year per health facility***

NEED/YEAR	FIREWOOD GJ/YEAR	CHARCOAL GJ/YEAR	LPG GJ/YEAR	ELECTRICITY GJ/YEAR	TOTAL NEEDS GJ/YEAR
Level 2 Dispensaries (n=100)		35	300		335
Level 3 Health Centre (=22)	73.04	19.8	396	6.75	495.66
Contribution to Total Need (%)	8	3	88	1	100

The six Level 2 facilities sampled did not consume any firewood at all, however, each reported using an average of 50kg/year of charcoal and 116kg/year of LPG. On the other hand, each of the 13 Level-3 facilities reported consuming an average of 1006 kg/year of firewood, 92 kg/year of charcoal, and 716 kg/year of LPG for cooking-related services. The total fuel consumption rate per year for Level-2 and Level-3 are presented in Table 3.4.

Table 3.4: ***Annual consumption levels of different fuels by Levels 2 and 3 facilities***

	FIREWOOD		CHARCOAL		LPG	
Facility type	Level 2	Level 3	Level 2	Level 3	Level 2	Level 3
Rate (kg/yr)		1006	50	92	116	716
# Facilities	100	22	100	22	100	22
Total (per Level)	0	22,132	5000	2024	11,600	15,752
Total (combined)	**22,132 kg/yr**		**7024 kg/yr**		**27,352 kg/yr**	

3.3.4. Access to Cooking Fuels by SMEs

Of the 38 SMEs sampled, only 13 (34%) are cooking or using thermal energy for their cooking-related businesses (restaurants) within their premises. The rest were enterprises not engaged in cooking services such as salons, garages, grocery shops, and petrol stations among others.

Among these restaurants, 31% reported utilizing LPG as their primary cooking fuel, whereas the rest, about 69% relied on charcoal as their primary cooking fuel. No improved, energy-efficient charcoal stoves were reportedly in use at any of the facilities sampled. For Kajiado's hospitality enterprises, charcoal meets an average 82% of their cooking thermal energy needs, with the rest (18%) being met by LPG.

Table 3.5 shows the energy needs and demand per enterprise, unit cost of the fuels and the energy efficiency considerations

As per the Micro, Small, and Medium Establishments Basic Report 2016, Kajiado County had a total of 46,100 licensed and 101,900 unlicensed MSMEs. Eight years later, we have witnessed the collapse and establishment of new small enterprises in almost equal measure.

For purposes of this CEP, we assume a lack of meaningful growth and retain the same figures for enterprises in 2024. We similarly assume a conservative 5% (2305) of registered enterprises consumed energy for cooking for commercial purposes.

These eateries, therefore, met 82% of their cooking energy needs through the consumption of 4,299 tons/yr of charcoal (about 34,391 tons/yr dry wood) while the remaining 18% were complemented by 255.4 tons/yr of LPG.

Table 3.5: ***Average cooking and thermal energy fuel consumption per SMEs category***

DEMAND/Y	CHARCOAL	LPG	OVERALL
Average fuel consumption per SME (Kg/yr)	1,865	110.8	
Average annual expenses per SME (KES/yr)	6,238.5	21,738.5	8,050
Average need per SME (GJ/year)	13.1 (82%)	2.8 (18%)	15.9
Average efficiency of conversion	25%	58%	

As per the Micro, Small, and Medium Establishments Basic Report 2016, Kajiado County had a total of 46,100 licensed and 101,900 unlicensed MSMEs. Eight years later, we have witnessed the collapse and establishment of new small enterprises in almost equal measure.

3.4. Productive Use of Energy in Agriculture Sector

Agriculture and related trade were one of the three nexus sectors identified by the TC. To inform planning for this sector, data was derived from KIIs with key sector players in crop and livestock production in the county, community engagement meetings in Matasia Town, review of available policy documentation and overall analysis by the consultant. A key challenge consistently identified by farming and animal production communities low grid connectivity, unreliable power supply from grid, inaccessible solar power systems for water extraction from their wells and boreholes.

The CSP 2020-2030 proposed in 2019 the drilling of 163 new boreholes and installation of solar-powered submersible pumps in schools & local communities and the rehabilitation and upgrade of 184 existing boreholes through connectivity to solar power. No progress has been reported towards this end and the CEP will adopt this challenge towards achieving the commercial crop and livestock development.

3.4.1. Energy for Crop Irrigation

Only 1670 km2 or 167,000 ha that receives about 500mm of annual rainfall can support rainfed agriculture—implying a paltry 7.6% of the County's land mass that can support crop agriculture. Small-scale farms average 9 ha while large-scale farms average 70 ha. The majority of the people have less than 1 acre of land under agriculture and this potential is not being harnessed owing to climate change impacts—the 2019 area under food crops was 1067 ha (mainly maize beans, potatoes, and vegetables) and acreage under cash crops was 60 ha.

Most people have small farms that are irrigated in the productive areas of Loitokitok, Isinya, Nguruman and Ngong. Furrow irrigation is dominant at 70% and drip irrigation at 20%. According to the CSP 2020-2030, there are 80 small irrigation schemes and two large irrigation schemes at Namelok in Kajiado South (annual production at KES 742 million) and Nguruman in Kajiado West (annual production KES 512 million).

It is the County's policy to make farming a business enterprise by encouraging people to do value-addition in agriculture, livestock and fisheries. The role of energy towards this goal is, hence, crucial.

The CEP implementation will aim to increase the irrigated farms from 20% to 80% in the medium term, and commercial crop-production from 60 ha (2019) to at least 120 ha in the short term (2027) and 500 ha in the medium term (2030) and food crop area from 1067 ha today to 2000 ha by 2033 through a range of energy options and non-energy solutions including:

- Promotion of greenhouse development for horticultural production;
- Increasing connectivity to grid or Solar mini-grids for post-harvest management and value-addition solutions—cooling, drying, blending and grinding operations;
- Solarizing boreholes to pump water for commercial irrigation (including for livestock and community) use;
- Link farmers to financial models to access solar and irrigation infrastructure, particularly in Isinya, and Loitokitok areas;
- Training youth and farm owners solar and irrigation systems maintenance for sustainability; and
- Linking farmers to relevant markets and value chains.

It is the County's policy to make farming a business enterprise by encouraging people to do value-addition in agriculture, livestock and fisheries. The role of energy towards this goal is, hence, crucial.

3.4.2. Energy for Beef and Dairy Production

Kajiado is largely a livestock-based pastoral economy—pastoralism being the main source of livelihood for the majority of the rural households in the County. In 2018, livestock kept in Kajiado was mainly cattle (52.4%) sheep (9.5%) and goats (8.6%).

Households also keep camels, chicken, pigs and donkeys. The livestock sector in Kajiado generated KES 50.1 million in 2016/17 financial year, 75% of this derived from livestock-related activities.

About KES 256 million was budgeted for livestock activities for the 2020/21 financial year although no records are available to show whether this amount was availed for action.

Beef production

This is particularly important in the county, the major breeds being Sahiwal, zebu, borans and exotic ones. The beef cattle population is estimated at 581,020 in 2018 with an estimated slaughter value of KES 2.05 billion. Hides and skins valued at KES 204 million.

The prolonged drought of 2017/2018 recorded 232,400 livestock deaths, then estimated at KES 13.9 billion. Kenya is a meat deficit country to the tune of 4.5 MT/year, an opportunity for Kajiado. The 2020-2023 drought caused further devastation to households despite there being no credible data on the actual loss to vulnerable rural communities who lack social safety nets such as insurance for livestock.

Recognizing the high potential of beef production for reducing poverty, creating employment, and contributing to economic growth, there's a need to improve market access and productivity for the beef value chain players and strengthen husbandry and animal management.

In response, Kajiado County launched several flagship programmes including:

- Hay production, conservation, and utilization by setting aside 10,000 acres;
- Development and strengthening of beef value chains;
- Constructing 400 small dams in collaboration with the National Irrigations Board (NIB);
- Solarize boreholes around slaughterhouses; and
- Supporting the Ward Climate Change Planning Committees across the county established by the Kajiado County Climate Change Act 2020.

The upgrade of slaughterhouses to include cold storage and lighting, tanneries for hides/skins production, lighting animal sale yards, and building and maintaining small dams and animal watering points provide an opportunity for the grid, off-grid solar, and wind energy applications depending on location.

Dairy Production

More and more farmers are investing in dairy cattle under zero grazing and semi-zero grazing systems. The dairy cattle population was estimated at 149,000 exotic and 87,000 zebu cattle, a total of 235, 522 cattle, producing 912,720 litres/year of milk valued at KES 54 million in 2019. Kajiado North and Kajiado South sub-counties lead in dairy cattle keeping and milk production, although there is a need to promote commercial dairy production and support the formation and strengthening of milk cooperatives to advance to milk processing and marketing. Cooperatives have been growing at 7.9% per annum.

There's also a need to support extension services to ensure farmer training on nutrition, breeding, fodder production, and conservation. In addition to these non-energy solutions for the sector's development, energy solutions are critical to seal gaps in dairy production and value addition.

With organized zero-grazing systems supported by extension workers and assured markets, farmers will be able to afford biogas digester infrastructure for biogas production. This gas will complement cooking and heating requirements in homes and abattoirs.

3.5. Pathways towards Clean Energy Access

3.5.1. Population Projections to 2033

The cooking landscape in Kajiado County is expected to transform as more households shift towards modern cooking solutions, particularly due to the county's increasing urbanization. In 2019, the urban population comprised 56% of the total population, with urban households representing 67% of all households (Figure 3.6).

With an annual urbanization growth rate of 3.5%, it is projected that the urban population will rise to 69% over the next decade, accompanied by a 74% share of total households. This demographic shift towards urban living suggests a concurrent shift in cooking practices towards more modern and efficient methods.

3.5.2. Accelerating Access to Clean Energy Among Households

Household Electricity Connectivity

The study conducted in Kajiado County involved testing three different scenarios based on varying levels of electricity consumption (Tiers) in both rural and urban areas. These scenarios aimed to quantify the investment required for electrification and determine the optimal electrification option for each community across the county.

The levels of consumption ranged from Tier 1+ (sufficient for basic tasks like lighting, phone charging, or radio usage) to Tier 5 (enabling the use of medium and high-load appliances such

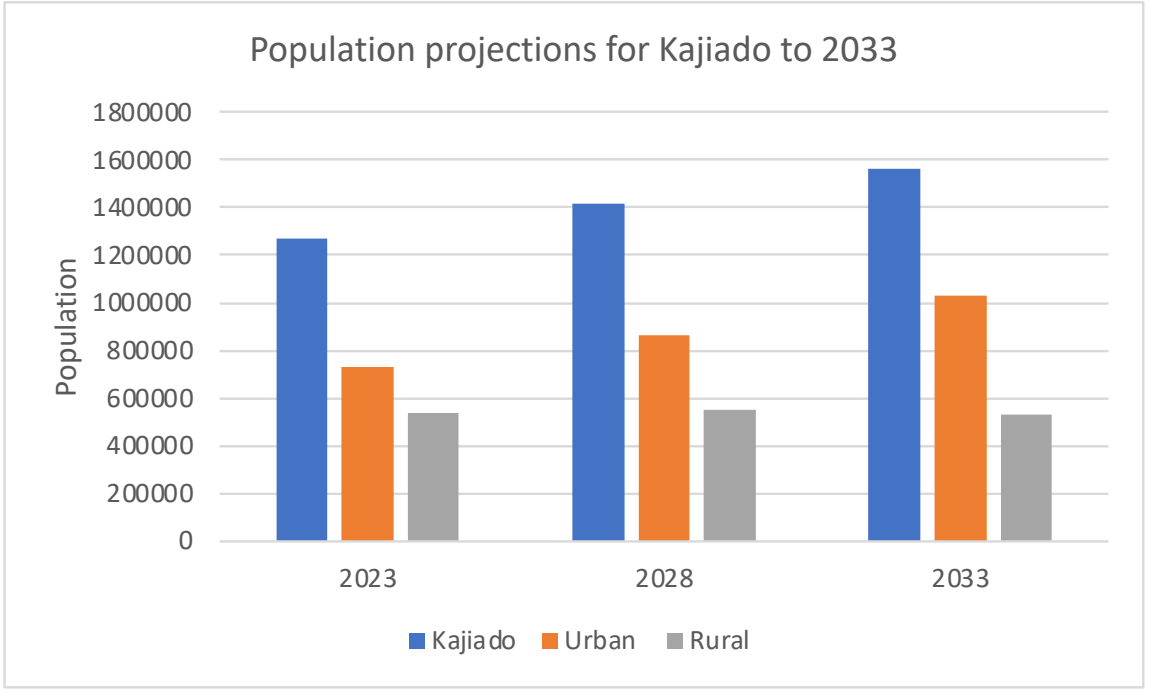


Figure 3.6: ***Trajectories for urban and rural population to 2033***

as laptops, fridges, washing machines, and others, including small business operations).

Considering the 315,000 households already electrified by Kenya Power and the projected 427,000 households expected by 2030, an additional 112,000 households will need to be electrified during this period to achieve universal access.

Table 3.6 in the report presents the distribution of user households that should be reached under each scenario by 2030.

The accompanying Figure 3.7 illustrates that the total investments required to achieve this objective vary significantly across scenarios and, consequently, across different levels of expected consumption.

Table 3.6: ***Number of new consumer connections by supply option and scenario***

SUPPLY OPTION	SCENARIO 1	SCENARIO 2	SCENARIO 3
Grid densification	70 561	80 010	80 010
SHS densification	9 449	-	-
Grid extension		9 303	9 858
Hybrid mini-grids		638	83
SHS - Remote areas	31 824	21 883	21 883
Total	**111 834**	**111 834**	**111 834**

Scenario 2, characterized by a high level of consumption equivalent to Tier 3 in rural areas, focuses on electrification primarily through enhancing the existing network to achieve the lowest Levelized Cost of Electricity (LCOE), ranging from USD 0.22 to USD 0.4 per kWh compared to over USD 0.4 kWh for solar mini-grids. In this scenario, approximately 80% of households would gain electricity access through grid connection, with 72% via grid densification and 8% via grid extension.

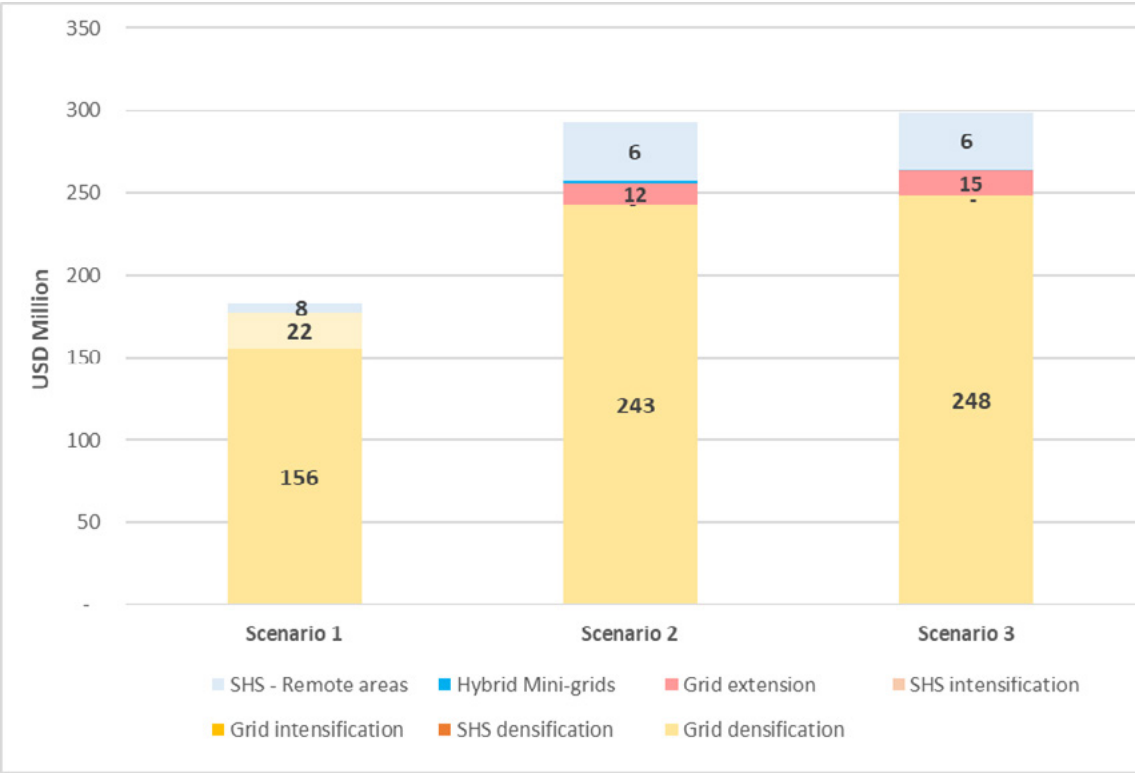
Less than 1% would rely on hybrid mini-grids (comprising 11 projects), while 20% would utilize Solar Home Systems (SHS). Implementing this scenario, depicted in Map 4, would necessitate an investment of USD 292 million.

Scenario 3 closely resembles Scenario 2, with approximately 81% of the 112,000 households being electrified through grid densification and extension. However, there's a minor deviation in the form of only 2 hybrid mini-grid projects being developed. For rural access to medium-load appliances, an estimated USD 299 million would be required.

In contrast, Scenarios 1 exhibit a stark departure from the two aforementioned scenarios. Here, only urban households within the densification area would connect to the national grid due to their anticipated high consumption levels. The remaining households, constituting 36% of those slated for electrification, would rely entirely on SHS.

Depending on whether households solely acquire lighting access or opt for additional small appliances such as televisions, fans, or computers, the investment fluctuates from USD 292 million to USD 183 million.

Figure 3.7: ***Summary of investments by scenario for universal access in the County***



With 84% of the total population residing in electrified settlements, Kajiado County lays a robust foundation for electrifying the remaining clusters. However, achieving universal access to electricity in the County remains a significant challenge, particularly as a substantial proportion of the rural populace still lacks grid coverage.

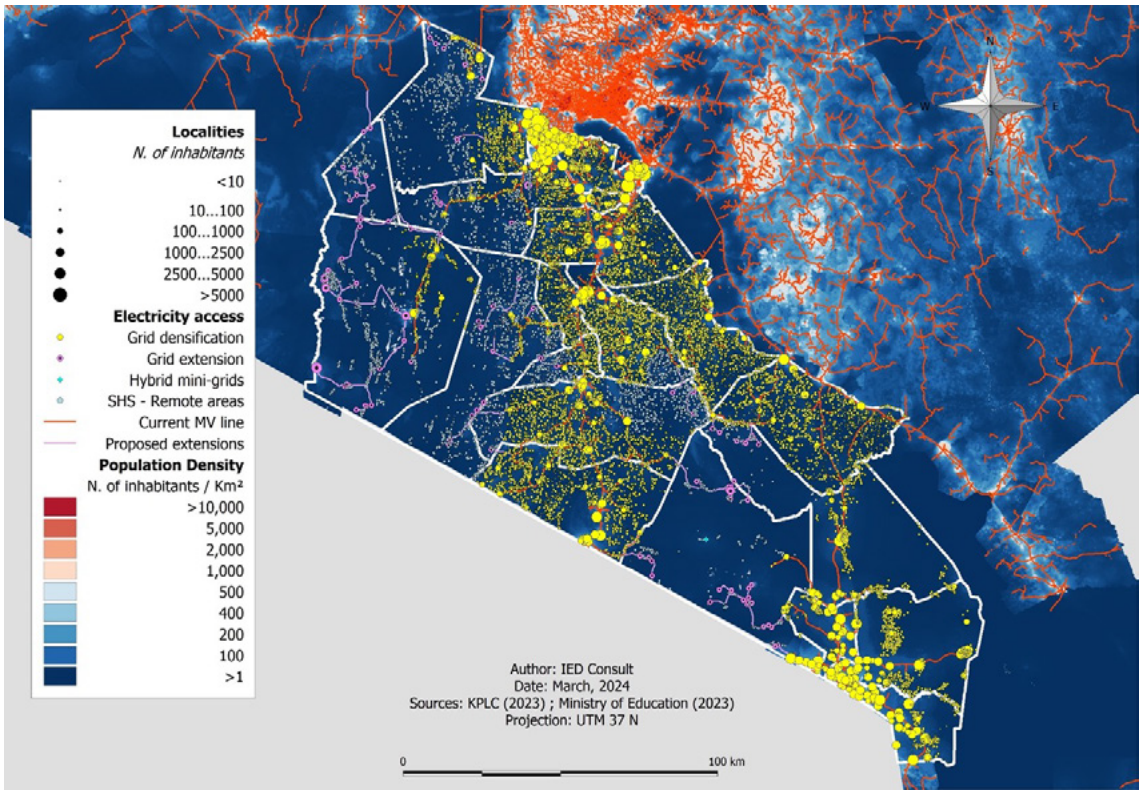
Various opportunities for attaining universal access, both through on-grid and off-grid solutions, have been identified. The decision regarding the extension of the national grid and the prioritization of grid densification to connect the numerous unconnected households within grid access is inherently political. From a socioeconomic standpoint, despite its cost-effectiveness, pursuing electrification solely following Scenario 1 might prove overly restrictive in terms of energy access.

Therefore, adopting Scenario 2 or 3 appears more prudent: emphasizing grid densification in already electrified areas, extending the grid or developing hybrid mini-grids for the few rural unconnected localities (129) with populations ranging between 100 and 3,000 inhabitants, and deploying Solar Home Systems (SHS) in small, dispersed hamlets.

Whether household electrification occurs through the interconnected network or SHS, maintaining subsidies to reduce connection costs is imperative. Additionally, facilitating access through financed installation payments enables the poorest consumers to repay the connection over several years through monthly or daily instalments.

A similar solution, exemplified by M-Kopa Solar in Kenya, alleviates the upfront financial burden for households but necessitates operators to pre-finance connection costs. County support for pre-financing could be facilitated through a commercial loan. In Scenario 1, the connection cost would involve a daily payment of KES 50 for two years, alongside a deposit of KES 6,000. Conversely, urban grid connections would require the same payment for three years or more, with a deposit of KES 10,000.

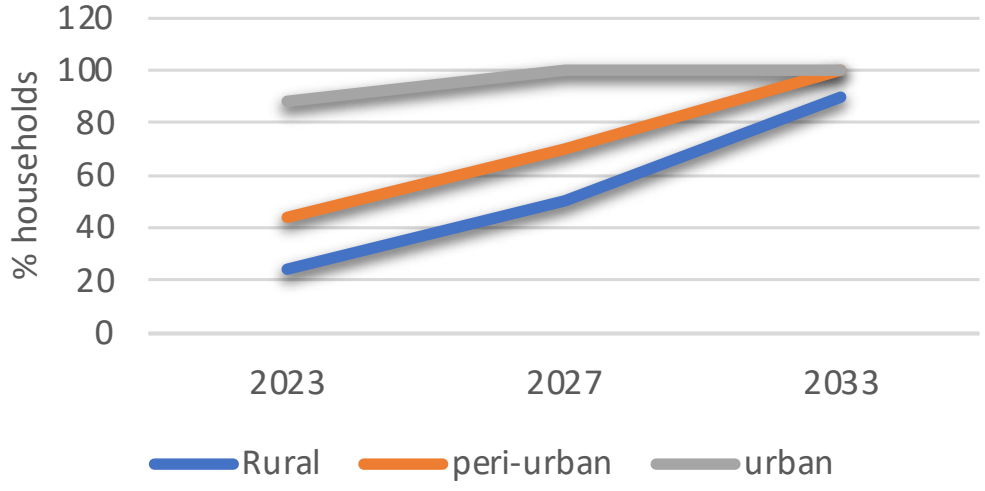
Map 4: ***Electricity supply option in Kajiado County – Scenario 2***



Household Efficient Lighting

Figure 3.8 shows proposed best-case pathways towards 2033 for Kajiado's urban, peri-urban and rural residents from the survey levels in 2023

Figure 3.8: ***Towards clean, efficient lighting in 2033 by households***



Most of the households on the grid use incandescent bulbs and fluorescent tubes—the objective is to ensure all of them replace these with LEDs by 2033. These households should be encouraged to transition gradually—where viable—to solar lighting as their primary lighting source. 85% of the off-grid households (54% of the survey sample) use simple solar lanterns and flashlights (SHS) as their primary lighting modes. The CEP implementation will ensure they upgrade to proper solar PV connectivity and wiring to access LED lights in multiple rooms. The other 15% should access the SHS so that by 2033 all are using solar home systems. To achieve these scenarios, the interventions in Table 3.7 are proposed.

Figure 3.7: ***Summary of investments by scenario for universal access in the County***

ELECTRICITY ACCESS	INTERVENTION TOWARD EFFICIENT LIGHTING
National Grid	— Switch from incandescent and fluorescent tubes to LED lamps — Install power inverters and battery storage for backup — Install solar PV as the primary lighting energy source, the KP electricity supply being the secondary option — Intensify grid connectivity to all commercially viable homes
Off-Grid Solar PV	— Household users replace all other types of lighting with LED lamps — Accelerate connectivity to the Grid where feasible to support heavy-duty domestic applications e.g. ironing, refrigeration, and water heating. — Accelerate connecting street lighting and local markets to stand-alone solar systems, using LED
No electricity	— Accelerate access to solar home systems

85% of the off-grid households (54% of the survey sample) use simple solar lanterns and flashlights (SHS) as their primary lighting modes. The CEP implementation will ensure they upgrade to proper solar PV connectivity and wiring to access LED lights in multiple rooms.

Effective roll-out and implementation of the interventions will need to be accompanied by the following:

- Develop policy promoting RE and EE solutions, their maintenance, e-waste management, training technicians, etc.;
- Pursue public awareness of the benefits of energy conservation and genuine versus counterfeits;
- Increase access to successful financial models and instruments for purchasing recommended devices (e.g. the One Acre Fund strategy where a free solar light comes with the purchase of farm inputs for an acre);
- Fight counterfeits of solar/ electrical accessories;
- Train youths on maintenance and installation of solar systems;
- Efficiency performance monitoring; and
- Tax exemptions for importers of legitimate LEDs and associated accessories.

Accelerating Access to Clean Cooking Solutions

The Transitional Pathways

Considering the current trends in cooking energy and patterns, proposed transition pathways towards clean energy access for cooking are outlined for consideration by the CEP.

For rural and peri-urban households, the following options are suggested:

- Rapid adoption of Improved Cookstoves (ICS) for firewood or Masonry stoves, which could reduce demand by approximately 40%.
- Conduct sensitization campaigns on sustainable woody resource management and forest conservation.
- Develop strategies to decrease charcoal usage, especially among peri-urban households, and conduct mapping of charcoal production while devising plans to gradually offset this production (noting that charcoal production typically requires 6-7 tonnes of firewood per 1 tonne of charcoal, depending on carbonization efficiency of 15% to 18%).
- Promote woodlots and tree planting on farms.
- Enforce existing regulations requiring 10% of farm area to be covered by trees.
- Install biogas plants on farms, particularly for households practicing zero grazing. The ABC programme, currently underway, aims to install 20,000 small to medium-scale biogas plants on farms and 250 institutional plants within the next five years.

For urban populations, the proposed transitional pathways are as follows:

- Implement measures to restrict and regulate charcoal use, particularly targeting new consumers.
- Promote the use of Liquefied Petroleum Gas (LPG) and ethanol as clean cooking fuel alternatives.
- Encourage the adoption of electric cooking appliances (e-cooking) among those who have already switched to LPG or use charcoal as their primary or secondary fuel.
- Advocate for the use of Improved Cookstoves (ICS) for firewood and charcoal among households still reliant on these fuels.

The LEAP Baseline Scenario

Figures 3.9 (a) and (b) illustrate the adoption rates of cooking technologies in rural and urban areas projected for the years 2023, 2028, and 2033, providing valuable insights into the trajectory of technology adoption over time.

Figure 3.9 (a): ***Urban technology adoption rates***

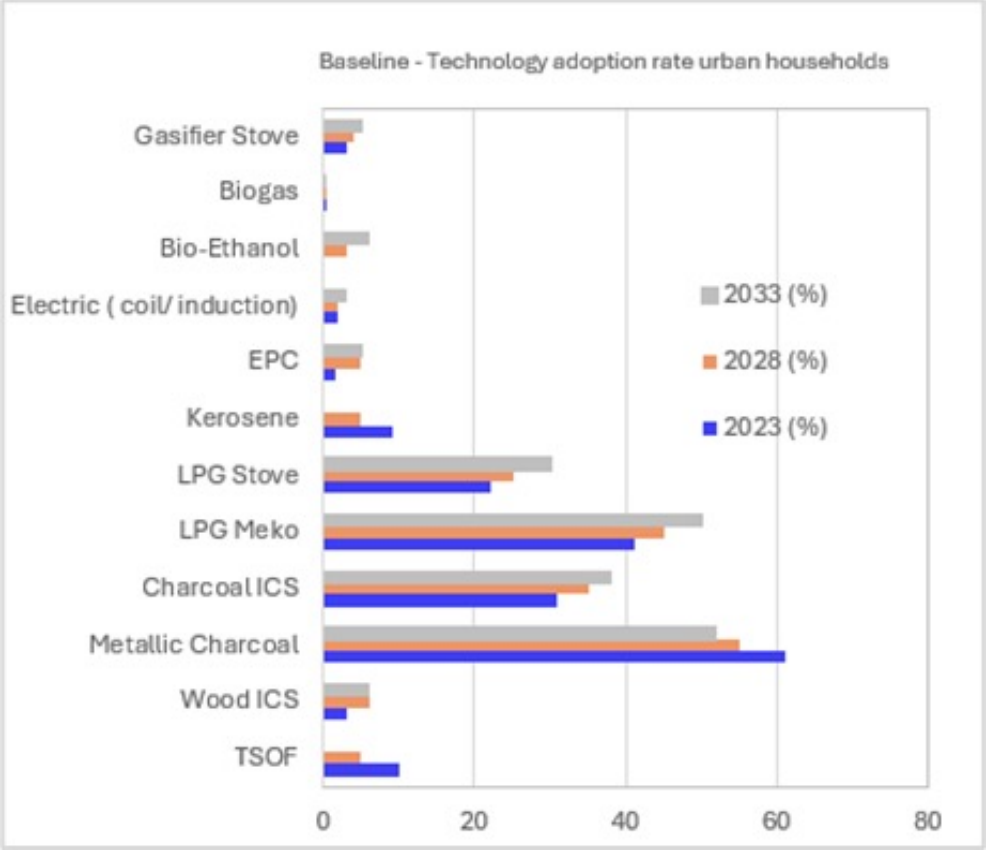
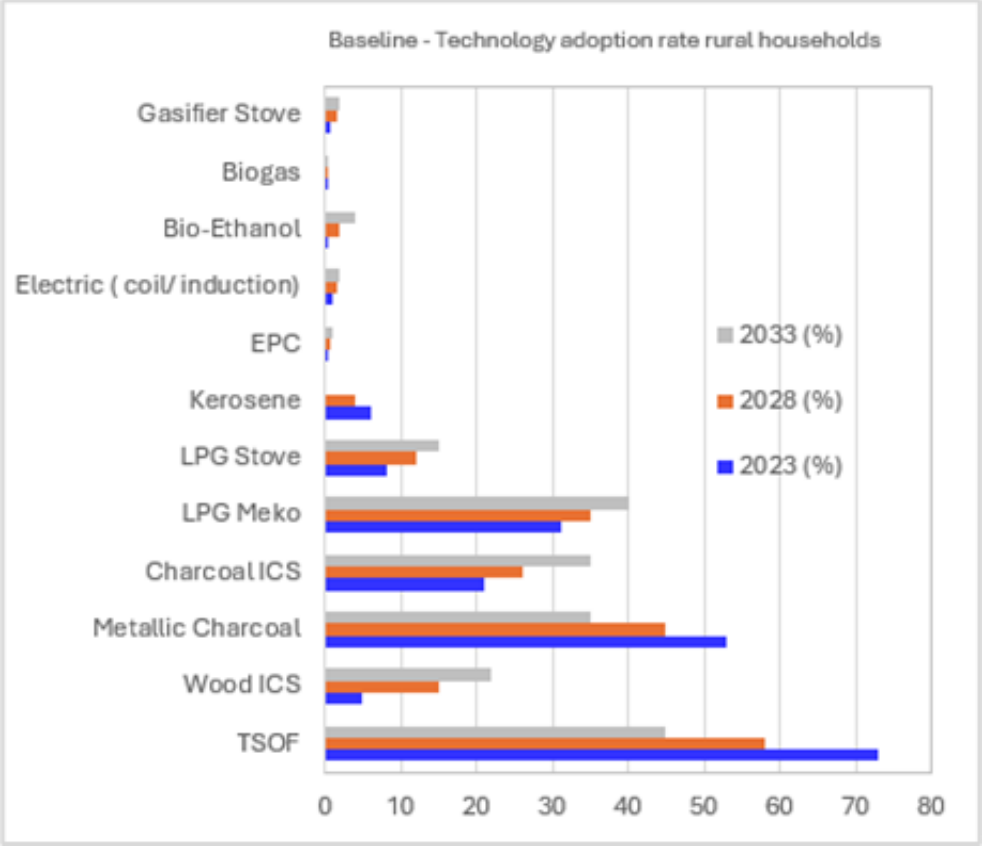


*Figure 3.9 (b)****: Rural technology adoption rates***



In the baseline scenario, current initiatives like zero-rating VAT on LPG and the Behavioural Change Campaign (BCC) contribute to increased LPG uptake and consumption, particularly in urban areas where the majority of the population resides. Nearly all households in urban areas are expected to adopt LPG appliances. Despite this shift towards LPG, firewood and charcoal will remain integral to Kajiado's cooking landscape, albeit with a transition towards Improved Cookstoves.

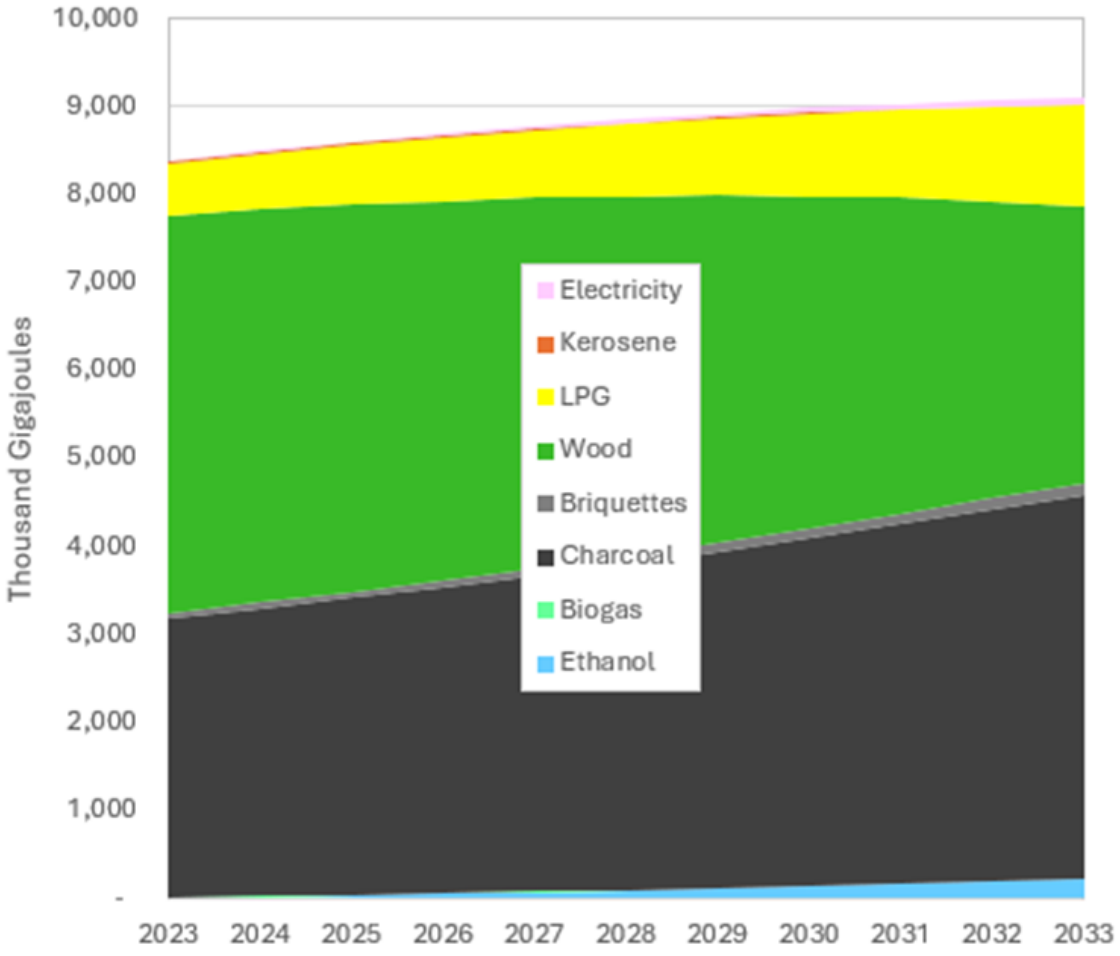
The use of Three Stone Open Fire (TSOF) will be completely phased out in urban households, while the adoption of firewood ICS in rural areas is projected to increase from 5% to 22%. Similarly, adoption of charcoal ICS in urban areas will rise from 31% to 38%.

New alternatives like Ethanol and Electric Pressure Cookers (EPCs) will be introduced in Kajiado and are anticipated to grow steadily, especially in urban areas. Additionally, an average of 10 biogas plants will be constructed per year, aiming to increase the number of domestic biogas plants to 612 by 2033, up from 471 in 2021. Implementing this Baseline scenario therefore will lead to fuel/energy demand summarized in Table 3.8 for 2023, 2028 and 2033. The evolution of energy consumption under this scenario over the 2023-2033 is shown in Figure 3.10.

Table 3.8: ***Summary of Fuel Demand under Baseline Scenario (2023-2033)***

FUEL	2023	2028	2033
Firewood (Tonnes)	291,965	264,535	204,144
Charcoal (Tonnes)	109,825	127,675	150,499
LPG (Tonnes)	12,635	17,339	23,958
Kerosene (1000Lts)	606	426	-
Electricity (MWh)	2,082	10,920	24,017
Ethanol (1,000Lts)	24,017	3,778	9,122
Biogas (1000M3)	217	252	293
Briquettes (Tonnes)	-	4,385	6,741

Figure 3.10: ***Energy Demand under Baseline Scenario (2023-2033)***



The LEAP Policy Scenario

In the policy scenario, there is a significant shift towards adopting Improved Cookstoves alongside measures aimed at balancing the supply and demand of biomass resources. Efforts are underway to phase out Three Stone Open Fire (TSOF) in urban households by 2028 and in rural households by 2033. Similarly, conventional charcoal cookstoves are targeted to be phased out completely by 2033.

The promotion of clean cooking solutions such as LPG, Electric Cooking, Ethanol, and biogas is actively encouraged throughout the county and is expected to steadily increase.

For example, all households are projected to be equipped with an LPG appliance, while the adoption of Bio-ethanol is anticipated to reach 30% in urban households and 15% in rural households.

To support this transition, there is a targeted increase of 200 biogas plants (40 per year) between 2023 and 2028, followed by 135 plants per year between 2029 and 2033. This initiative aims to expand the number of biogas plants to 1,360 (representing 1.0% of rural households) by 2033, contributing to cleaner and more sustainable cooking practices across Kajiado County.

Figures 3.11 (a) and (b) show the technology adoption rates among urban and rural households under the Policy scenario between 2023 and 2033.

Figure 3.11 (a): ***Adoption rates by urban households***

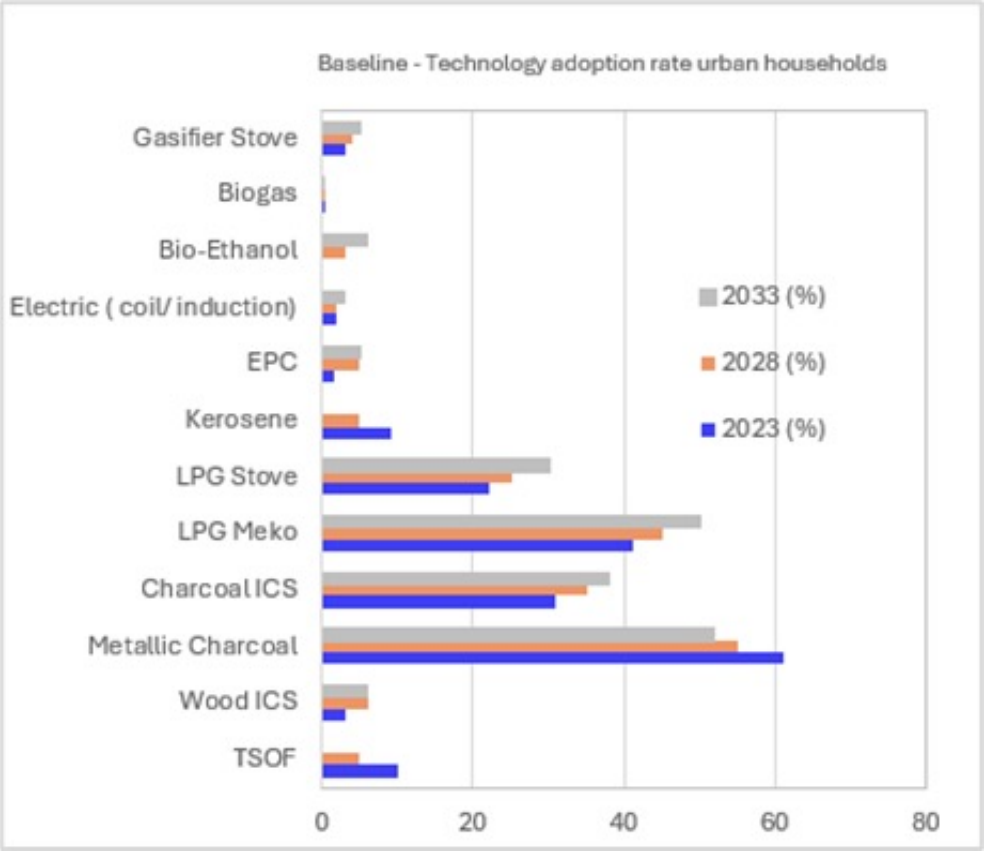


Figure 3.11(b): ***Adoption rates by rural households***

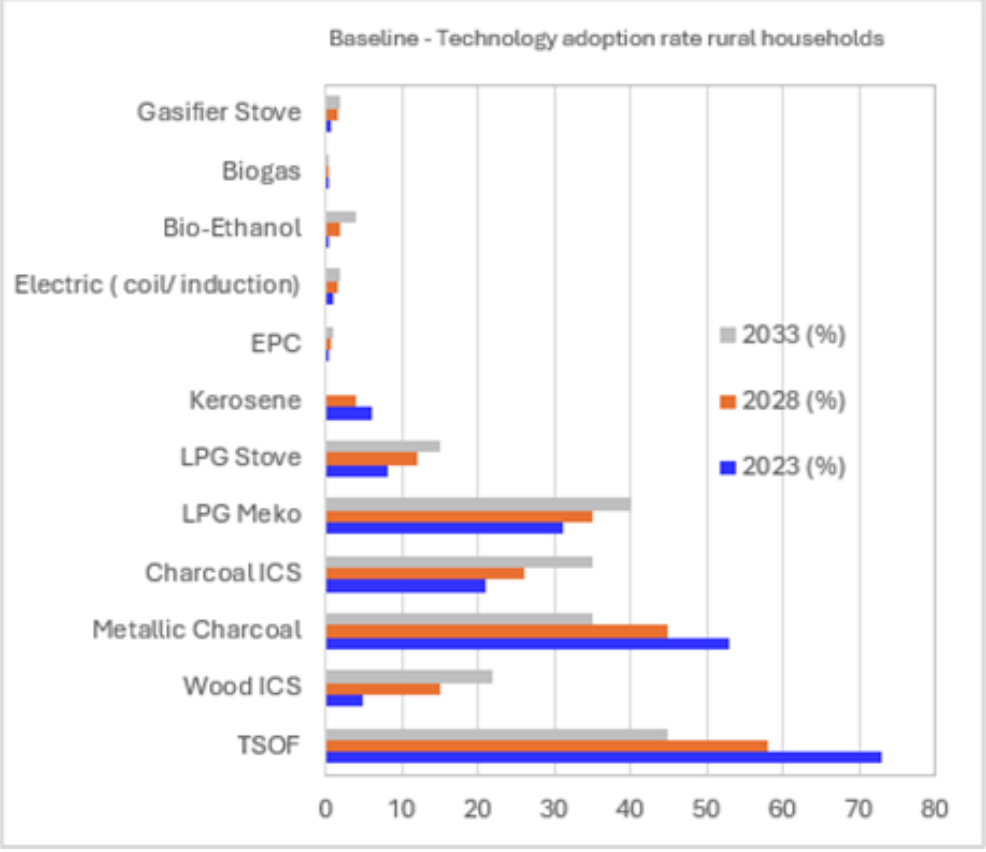
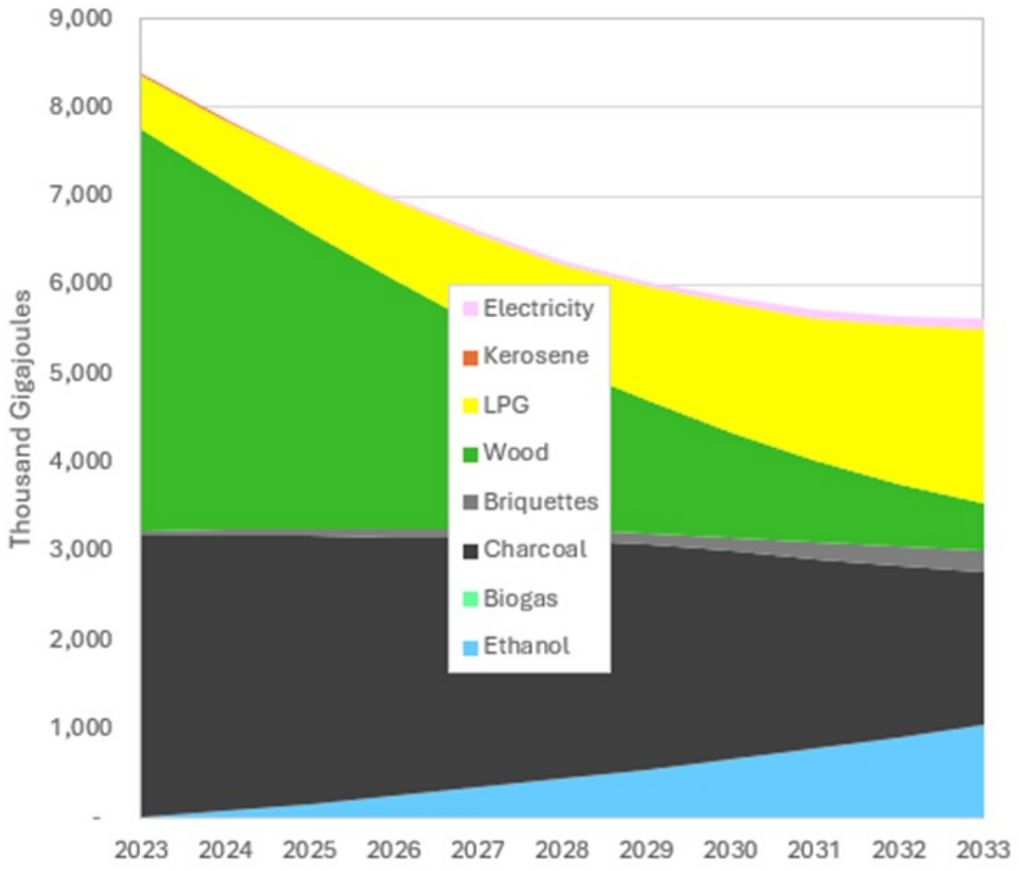


Table 3.9: ***Summary of Fuel Demand under Policy Scenario (2023-2033)***

FUEL	2023	2028	2033
Firewood (Tonnes)	291,965	119,224	119,224
Charcoal (Tonnes)	109,825	93,631a	59,298
LPG (Tonnes)	12,635	23,981	41,622
Kerosene (1000Lts)	606	-	-
Electricity (MWh)	2,082	12,955	36,927
Ethanol (1,000Lts)	-	18,165	43,779
Biogas (1000M3)	217	299	556
Briquettes (Tonnes)	-	4,993	11,519

Figure 3.12: ***Energy Demand under Policy Scenario (2023-2033)***



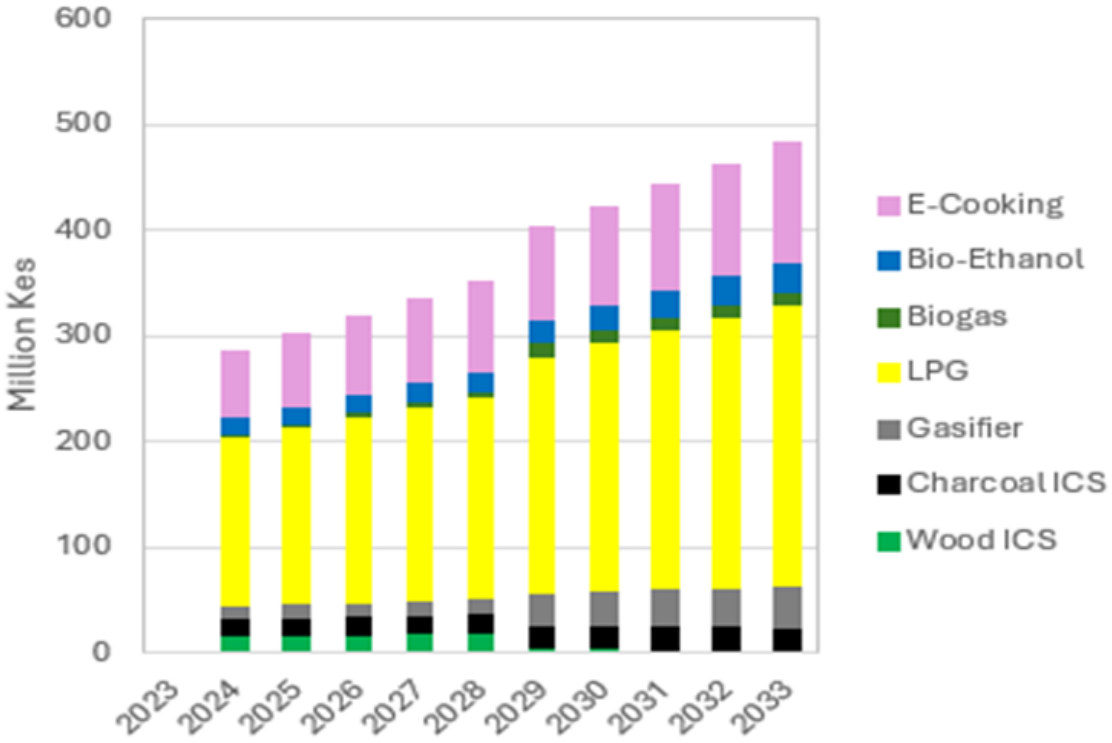
The projection in the policy scenario is that the demand for wood (firewood and charcoal feedstock) is expected to reduce by approximately 900,000 tonnes by 2033. LPG demand increases by 30,000 tons.

The demand for electricity increases significantly to 81,734 MWh, whereas ethanol demand is expected to be 60 million litres by 2033. Table 3.9 summarizes the fuel demand under this scenario in 2023, 2028 and 2033 while Figure 3.12 shows how these will evolve.

A review of the investment needs to implement the Policy scenario reveals an average annual requirement of KES 380 million, as illustrated in Figure 3.13.

The total investment cost for the Policy scenario is KES 3 billion, which is twice the cost of the Baseline scenario. However, when examining the discounted fuel costs, the Baseline scenario stands at KES 86.9 billion, which compares favourably with the projected fuel costs of KES 91 billion for the Policy scenario.

Figure 3.11(b): ***Adoption rates by rural households***



3.5.3. Accelerating Access to Clean Energy Among Educational Institutions

Only ECD and TVET institutions are in the County Government's purview concerning their governance and development support. That is, the focus of the county is on ECDs and TVETs.

Implementation of the CIDP-2 saw the number of ECDs in Kajiado grow from 41 in 2017 to 226 in 2021 (Governor's Manifesto).

The focus during 2022-2027 leadership will not be to increase the number but rather to strengthen their management, to equip them with teachers, equipment, and nutritional support to enhance enrolment. Similarly, for TVETs, the previous administration equipped 5 of the 7 Vocational Training Centres and will continue with this trend during the 2022-2027 period.

The CEP recommends for Lighting:

- Intensify grid connectivity of off-grid institutions where viable to support equipment and training facilities at all institutions;
- Make solar lighting the primary form of lighting in all public ECDs and TVETs through retrofitting and allow grid to serve as back-up (for lighting) and primary for heavy-duty training equipment; and
- All public ECD and TVETs be required through policy to replace all inefficient incandescent bulbs and fluorescent tubes with LED lighting.

To accelerate access to clean cooking options:

As the largest consumers of firewood other than households, public schools are predicted to increase fuelwood consumption to 43,157 tons/year by 2033 from the current 31,784 tons/year without policy intervention.

Require all public ECDs and TVETs to fast-track adoption of LPG using a phased approach to allow the differently-endowed institutions to mobilize resources.

In the transition period, institutions must be required to adopt institutional ICS for controlled charcoal and firewood usage. By 2033, each institution should endeavour to meet 50% of its cooking/heating requirements that currently stands at 1% from LPG.

- As part of this transition, all ECD and TVET institutions could be mandated through public policy to shift their cooking methods to LPG within a specified period, and aligning with existing national government policies promoting LPG use in public schools. Institutional ICS could be adopted in the interim period as a transitional option, where none is in use currently.
- Concurrently, the County government could regulate fuelwood harvesting and license eligible commercial vendors/ suppliers to these institutions to ensure sustainable sourcing practices.
- Launch a deliberate tree planting programme to increase forest cover from the current 0.08% to 2% by 2033.

Implementation of the CIDP-2 saw the number of ECDs in Kajiado grow from 41 in 2017 to 226 in 2021 (Governor's Manifesto).

The focus during 2022-2027 leadership will not be to increase the number but rather to strengthen their management, to equip them with teachers, equipment, and nutritional support to enhance enrolment.

3.5.4. Accelerating Access to Clean Energy in Healthcare Facilities

According to the governor's manifesto—in his Afya Bora kwa Jamii plan, the Governor proposes to increase healthcare facilities by 34 (13 health centres and 21 dispensaries) by 2027, when the total would be 156. Beyond this point, we assume the next county government will focus its plan on equipping these facilities to improve their effectiveness.

To accelerate access to efficient lighting in the facilities:

- The CEP proposed to transition all lighting from grid supply to Solar PV lighting as the primary lighting source of energy in all Level 2 and 3 facilities to address the irregular supply challenge.
- Replace all incandescent and fluorescent tubes in all public Level 2 and 3 facilities with LED bulbs/tubes.
- Intensify connectivity to grid and other off-grid options including wind power where feasible.

To accelerate clean cooking access:

- Promote adoption of EPC and other viable forms of electric cooking.
- The transition from the use of 6 and 13-kg cylinders to bulk orders from certified suppliers that guarantee safety and guard against frequent refills to overcome procurement challenges.
- Level 2 and 3 healthcare facilities should adopt solar systems for boiling water needed for various functions within these institutions.
- Adopting biogas systems utilizing all available biomass feedstock accessible to these facilities. This approach not only promotes sustainability but also enhances resilience and reduces reliance on traditional energy sources.

3.5.5. Accelerating Access to Clean Energy in SMEs

To accelerate access to electricity and efficient lighting in the different SMEs in Kajiado's urban and peri-urban areas:

- Install power backup systems for all grid-connected businesses, enabled through technical support and access to pocket-friendly financing mechanisms;
- Depending on factors e.g. lease agreement restrictions, building type and location, transition all lighting from grid supply to Solar PV lighting as the primary lighting source of energy in all SMEs to address the irregular supply challenge;
- Replace all incandescent and fluorescent tubes in all SMEs with LED bulbs/tubes; and
- Intensify connectivity to the grid and other off-grid options including wind power where visible.

To accelerate access to clean cooking/thermal energy requirements, the CEP focuses on eateries or restaurants in Kajiado's urban and peri-urban areas that are currently meeting 82% of their cooking energy needs through the consumption of charcoal and the remaining 18% from LPG.

The target is to meet at least 50% of the cooking needs from LPG in the short term (2027) and 80% in the medium term (2033). Key activities proposed include:

- Awareness raising through demonstrations of functionality and benefits (economic, environmental, health) of switching to LPG and viable electric cooking/heating solutions;
- Promote access to SME/ institutional size ICS for charcoal usage as a transition option;

- Increase access to finance to facilitate the faster adoption of cleaner/efficient/ modern cooking solutions for the SMEs;
- In peri-urban areas, where access to LPG and electric cooking may be limited, promoting the uptake of improved institutional and SME charcoal cookstoves becomes crucial, especially considering the high charcoal consumption rate per enterprise. Alongside this promotion, it is essential to implement stringent regulations on charcoal production, particularly focusing on tree species usage and conversion technology efficiency to ensure sustainability and minimize environmental impact; and
- Enforcing strict regulations on counterfeit devices in collaboration with regulatory bodies such as KEBS (Kenya Bureau of Standards) and EPRA (Energy and Petroleum Regulatory Authority) can further support the transition to cleaner cooking technologies.

3.5.6. Accelerate Exploration and Development of Renewable Energy Resource Potential

Bioenergy

Opportunities abound in the urban centres of Ngong, Kitengela, Ongata Rongai, Matasia, and others within Kajiado North to harness bioenergy by converting domestic waste (including kitchen and human waste) and municipal landfills.

However, to kickstart this process, several critical initial steps must be taken, including the establishment of Public-Private Partnerships (PPPs) to consolidate waste into centralized facilities, the formulation of pertinent policies and regulations, and community sensitization efforts to alter perceptions regarding biogas derived from human waste.

In the short term (2027):

- Mapping dairy farming hotspots to pinpoint areas of high prevalence.
- Assessing the prevalence of zero-grazing systems to gauge their contribution.
- Quantifying manure generation by considering cattle numbers and seasonal variations.
- Evaluating existing infrastructure and accessibility factors relevant to biogas production and distribution, while concurrently implementing capacity-building and awareness initiatives.
- Formulating supportive policies that offer incentives and mechanisms to spur investments in biogas production systems, potentially including financial support and technical assistance.

Geothermal, Wind and Hydro

The Kajiado County Renewable Energy Atlas reveals significant potential in geothermal, wind, and hydro power scattered across various geographical areas within the county. Despite private sector efforts to develop some of these resources, much of this potential remains untapped.

Overcoming several barriers is necessary for its development, with a primary obstacle being the absence of a clear policy framework for County Government investment and equitable benefit-sharing with the National Government, which currently holds control over significant exploration contracts with foreign investors. Additionally, a lack of accurate data on

resource potential hampers effective energy development planning by the Counties.

To accelerate the exploitation and development of the Renewable Energy (RE) resources identified in the County, the following are proposed for the short term (2027):

- Commission feasibility studies to evaluate all potential recommended sites in the RE Atlas and identify those with best-bet commercially viable energy development options; and
- Showcase the potential for investment through conferences and other communication strategies to attract investments to develop or expand energy infrastructure.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Chapter Four

County Energy Efficiency and Conservation Measures

4.0. Overview

Energy Efficiency (EE) entails using less energy to perform the same task. The importance of energy efficiency for the county government of Kajiado cannot be overstated. This encompasses various benefits such as cost savings for households, institutions, and businesses, both in terms of energy usage and finances.

4.1. Research Challenges

Energy Effiiciency contributes, albeit modestly, to reducing greenhouse gas emissions, aligning with the County's Climate Change Action Plan objectives and the nation's Nationally Determined Contributions (NDC).

Through stakeholder consultations and document reviews, two primary obstacles to implementing effective energy efficiency systems were identified.

Firstly, there's a lack of data concerning energy consumption rates and efficiency within Kajiado County. Secondly, there's a dearth of official policy on energy efficiency to provide guidance for the County's initiatives.

Additionally, there's a scarcity of publicly available analyses of the barriers to enhancing energy efficiency across households, public institutions, and businesses.

Drawing from literature and experiences documented in other counties in Kenya, potential barriers and constraints to energy efficiency interventions include:

- Insufficient awareness and technical knowledge about energy efficiency and conservation across various ministries and public institutions.
- Inadequate or poor-quality data regarding energy consumption in different sectors, households, and public institutions.
- Limited public awareness regarding the benefits of energy efficiency and conservation measures.
- High initial costs associated with investing in energy-efficient appliances and equipment.
- Limited availability of energy-efficient appliances and equipment at the county level.

The consultations also identified clear opportunities for promoting energy efficiency through the utilization of more efficient appliances and the adoption of more efficient fuels and technologies, which will be advocated for through this Comprehensive Energy Plan (CEP).

Energy Effiiciency contributes, albeit modestly, to reducing greenhouse gas emissions, aligning with the County's Climate Change Action Plan objectives and the nation's Nationally Determined Contributions (NDC).

BOX 2: **THE ROLE OF COUNTY GOVERNMENTS IN PROMOTING ENERGY EFFICIENCY AND CONSERVATION**

The Constitution of Kenya, under the fourth schedule and the Energy Act 2019, recognizes the county government's role in energy development. The two documents specify the roles of the national and county governments in energy. Part II section (3) of the Energy Act states that “each county government shall develop and submit a county energy plan to the Cabinet Secretary in respect of its energy requirements.” This provides an opportunity for county governments to identify measures to promote energy efficiency and conservation in the county.

Part VIII of the Energy Act 2019, section 193-196, proposes specific roles of county governments in promoting energy efficiency and conservation measures. A county government may:

- With the approval of EPRA, amend the energy conservation building codes to suit the local climatic conditions and may, by rules made by it, specify and notify energy efficiency and conservation building codes with respect to the use of energy in buildings,
- Direct every owner or occupier of a building or building complex, being a designated consumer, to comply with the provisions of the energy efficiency and conservation building codes,
- Direct, if considered necessary for efficient use of energy and its conservation, any designated consumer referred to in paragraph (b) to have an energy audit conducted by an accredited energy auditor in such a manner and at such intervals of time as maybe specified by the regulations,
- Take all measures necessary to create awareness and disseminate information for the efficient use of energy and its conservation,
- Train personnel and specialists in techniques for the efficient use of energy and its conservation,
- Take steps to encourage preferential treatment for the use of energy-efficient equipment or appliances,
- Direct any designated consumer to furnish the EPRA, in such form and manner and within such period as may be specified by rules made by it, with information regarding the energy consumed by such consumer,
- Specify the matters to be included for the purposes of inspection,
- Establish a fund for the promotion of the efficient use of energy and its conservation within the county,
- Appoint as many inspecting officers as necessary for the purpose of enforcing energy efficiecy and conservation measures.

Source: Kenya National Energy Efficiency & Conservation Strategy, 2021

4.2. Status of Energy Efficiency in Kajiado

4.2.1. Energy Efficiency Gaps at the Household Level

In addressing the need for enhanced household lighting quality in Kajiado County, it is crucial to prioritize energy-efficient solutions including those for off-grid electricity systems and lighting equipment. Despite 211,109 households being connected to the grid and having access to electricity (KNBS, 2019), there is a pressing need to facilitate a complete shift from filament bulbs to more energy-efficient options such as Compact Fluorescent Lights (CFL) or LED lights.

Despite significant efforts by Kenya Power to promote the adoption of energy-efficient light bulbs nationwide, the continued use of filament bulbs indicates a substantial opportunity for improving energy conservation.

Nevertheless, further research is warranted to identify barriers to the adoption of more efficient appliances, not only for lighting but also for other household utilities like refrigerators, irons, and water heaters in urban areas of the county. This research will inform the development of appropriate interventions, including public education campaigns, aimed at promoting the use of energy-efficient appliances.

4.2.2. Public Institutions

There are significant opportunities to enhance the energy efficiency of buildings in the county, particularly public structures such as government offices, large health facilities, and educational institutions, which are among the top energy consumers. According to UN-Habitat, buildings in East African countries typically account for up to 57% of national electricity consumption, surpassing the energy usage of both transportation and industry combined (UN-Habitat, 2016).

Well-designed buildings inherently consume less energy and require lower maintenance compared to standard constructions. However, the lack of publicly available data hinders understanding of energy consumption patterns in public buildings within Kajiado County. Conducting an energy audit would be necessary to assess current energy usage levels based on building design and identify opportunities for efficiency improvements through architectural modifications.

Regarding energy consumption for cooking, heating, and lighting in public institutions, electrifying health and educational facilities presents an opportunity to not only expand electricity access but also promote energy efficiency through the selection of appropriate energy systems and appliances.

The need for improved basic health services, particularly in remote and underserved areas, emerged as a priority during community engagement sessions for the Comprehensive Energy Plan (CEP). Many level two and three health facilities in Kajiado lack electricity, while others rely on inefficient power systems that require upgrades.

Additionally, the assessment process revealed issues with the reliability of electricity services in both grid-connected and off-grid facilities, as well as a lack of standardized appliances in these institutions. Therefore, providing mandated energy-efficient appliances to level two and three facilities as part of the health solution presents a significant opportunity.

Similarly, with 3,213 public schools in the county, including early childhood development education (ECDE), primary, secondary, and technical and vocational education and training (TVET) institutions, there is potential to improve energy efficiency in institutional cooking by adopting more efficient fuels and technologies. However, reliable and comprehensive data on the heating and cooking requirements and practices in public institutions are necessary to develop an effective strategy for enhancing their energy efficiency.

4.2.3. MSME Sector

In Kajiado County, there exists a plethora of micro, small, and medium enterprises (MSMEs). Within the framework developed to address the critical need for bolstering these enterprises' capacity to access and deliver quality products and services, particularly in remote or underserved communities, several key gaps were identified.

Typically, equipment found in rural areas tends to be older, utilizing less efficient and outdated designs and components. Embracing high-efficiency appliances can significantly reduce electricity generation requirements for off-grid systems, thereby simplifying and reducing costs associated with such systems.

These include the lack of reliable electricity services for both on-grid and off-grid MSMEs, as well as limited access to efficient appliances and equipment.

Typically, equipment found in rural areas tends to be older, utilizing less efficient and outdated designs and components. Embracing high-efficiency appliances can significantly reduce electricity generation requirements for off-grid systems, thereby simplifying and reducing costs associated with such systems. For grid-connected applications, adopting higher efficiency appliances can lower operational expenses for equipment, while also decreasing overall grid demand. This, in turn, can enhance grid services for other MSMEs connected to the grid.

A promising approach towards fostering energy-efficient MSMEs across various sectors in the County could involve two key components. Firstly, conducting a thorough mapping of the distribution chain for high-efficiency appliances to better understand linkages, efficiencies, and incentives within these chains. Additionally, exploring aggregation opportunities through support entities such as business associations could be beneficial. Secondly, establishing connections between efficient appliance suppliers and retail outlets, along with local agents, while leveraging potential synergies with established entities like the Kenya Renewable Energy Association (KEREA).

Building upon KEREA's prior efforts in certifying actors within energy access supply chains can ensure that only high-quality products and services, including essential after-sales support, reach customers.

4.3. Priority Actions to Improve Energy Efficiency in Kajiado

Although Kajiado currently lacks its own county Energy Efficiency (EE) policy and strategy, its action plan can still be informed by the Kenya National Energy Efficiency and Conservation Strategy (KNEECS 2021).

This national strategy positions counties as key players in its implementation framework, focusing on five thematic sectors, including buildings, households, and agriculture, and establishing targets for energy efficiency and conservation within each sector.

In developing Kajiado's inaugural EE strategy, the following priority actions could serve as the foundation for its intervention in the CEP.

Technical Interventions

The implementation of the CEP presents the County Government with an opportunity to enhance energy efficiency within specific sectors, departments, and institutions in Kajiado County targeted by the CEP solutions.

Despite the presence of other key actors in Kajiado such as transport and cement industry among others, stakeholder consultations called for priority technical interventions to focus on the following high-impact targets:

Households — Cooking and lighting appliances.

Institutions — Early Childhood Development Education (ECDEs), Technical and Vocational Education and Training (TVETs), and healthcare facilities (Level 2&3).

Streetlights — Quality lighting equipment e.g. LED and solar lighting accessories.

County buildings — Examples of activities could include:

- For county hospitals, incorporate solar water heating systems in the electric bulk water heater in the surgical ward, laundry washing machines, and laboratory to preheat hot water and reduce electricity consumption by at least 30% of hot water grid energy requirements.
- Transition the county buildings (especially hospitals) to cleaner fuels such as LPG, biogas or electricity.
- Substitute at least 25% of grid electricity with renewable solar PV electricity in all County buildings and facilities e.g., water treatment plants to reduce emissions associated with fossil fuels and reduce energy costs.

Energy Efficiency Assessment (EEA)

Conduct an assessment for Kajiado covering buildings, industry, commercial activities, households, and institutions and recommending an intervention plan.

Energy Efficiency Demonstration Centres

Create demonstration centres to showcase efficiency appliances.

Capacity Building

Support/ensure capacity building for relevant county officers and facilitate managers in the training of Certified Energy Auditors and Managers to support compliance.

Policy Framework

The County Government can conduct an 'energy efficiency policy audit' to assess the current policy landscape regarding energy efficiency and conservation across public and private sectors in the County. This entails identifying any policy gaps concerning regulations, efficiency standards, procurement practices, and product/technology benchmarks.

Kajiado Building Codes

Partner with MoEP and KGBS to develop a building code specific to the county guided by Minimum Energy Performance Standards (MEPS) established by KEBS, or the Excellence in Design and Greater Efficiency (EDGE) guidelines by IFC, the Kenya National Energy Efficiency & Conservation Strategy (KNEECS) by the MoEP, or the Kenya Green Building Society (KGBS) Codes

Partnerships

Opportunities exist to establish short and long-term collaborations with relevant external stakeholders, including the Kenya Association of Manufacturers (KAM), Centre for Energy Efficiency and Conservation (CEEC), Kenya Renewable Energy Association (KEREA), Rural Electrification and Renewable Energy Corporation (REREC), and civil society organizations like the Kenya Green Building Society (KGBS). These partnerships can facilitate the implementation of proposed interventions outlined in the CEP.

Communicating Energy Efficiency

Develop a communication strategy for Energy Efficiency and Conservation aimed at:

- Establishing and educating stakeholders on the business case for energy efficiency at the state, utility and other appropriate levels, addressing relevant customer, utility, and societal perspectives,
- Communicating the role of energy efficiency and conservation in lowering customer energy bills, and system costs and risks over time by promoting behaviour change in households,

- Communicating the role of building codes, appliance standards and other incentives,
- Media communication strategy targeting social media, radio, television, newspaper advertisements, leaflets, billboards, direct mail, and electronic newsletters, and
- Reaching all stakeholders in the energy efficiency and conservation sector.

For county hospitals, incorporate solar water heating systems in the electric bulk water heater in the surgical ward, laundry washing machines, and laboratory to preheat hot water and reduce electricity consumption by at least 30% of hot water grid energy requirements.

4.4. Resource Mobilization for Energy Efficiency

The Energy Act 2019 states the "county government may establish a fund for the promotion of efficient use of energy and its conservation within the county". The following are some of the potential sources of finance that could build up this Fund.

- The eligible projects under the National Government Constituencies Development Fund (NG-CDF) Act are only those entailing works or services falling under the functions of the national government, as provided for in the constitution. Energy is among those functions.
- County governments should identify and propose energy efficiency and conservation projects and initiatives to development partners for consideration, e.g. GIZ, UNDP etc.
- There are several non-governmental actors involved in the provision of energy services. Their role is crucial as they supplement government efforts in the provision of energy services.
- The national or county government can provide a concession to private investors to carry out an activity on its behalf: for example, waste management through waste-to-energy technology and commercial biogas for electricity generation. The Private Public Partnerships (PPP) parties will financially benefit from the PPP through revenue-sharing agreements.
- County governments will develop policy interventions and incentives to attract private actors to invest in energy efficiency and conservation projects/ programmes. These incentives may include tax incentives, letters of support to reduce the cost of credit, creating a revolving fund to support investors, and other initiatives.

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Chapter Five
Bioenergy

5.0. Overview

Bioenergy refers to energy derived from biological sources, such as plants, animals, and organic waste. It is a renewable energy source because it relies on organic matter that can be replenished over time.

5.1. Production of Bioenergy

Bioenergy can be obtained through various processes summarized in Figure 5.1, key among these being:

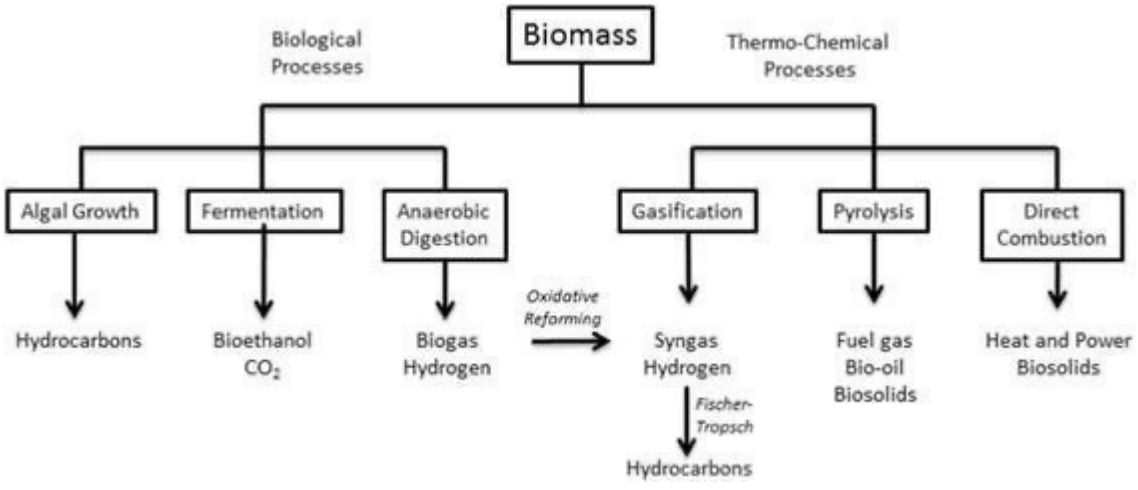
- **Biomass combustion:** Burning organic materials, such as wood, crop residues, or animal dung, to generate heat or electricity.
- **Biogas production:** Anaerobic digestion of organic materials, such as agricultural waste, sewage sludge, or food scraps, to produce methane-rich biogas that can be used for heating, electricity generation, or as a vehicle fuel.
- **Biofuel production:** Conversion of biomass into liquid or gaseous fuels, such as biodiesel or ethanol, through processes like fermentation, transesterification, or thermochemical conversion.

Bioenergy is considered a sustainable energy option because the carbon dioxide emitted during combustion or decomposition is part of the natural carbon cycle, and the plants used for bioenergy production can absorb carbon dioxide during their growth, offsetting the emissions. However, bioenergy sustainability depends on factors such as land use, feedstock selection, and production methods to ensure minimal environmental impact and social benefits.

5.2. Exploiting the Bioenergy Potential in Kajiado

The bioenergy potential is Kajiado has been reasonably examined in Chapter 2 of this plan. The greatest potential that the county may integrate in its development matrix include, inter alia, promoting:

Figure 5.1: ***A summary of biomass to bioenergy transformation processes***
[Source: Bruno Perlatti et al., 2014]



Biogas from Both Animal and Human Waste

Dairy farmers practicing zero grazing in Isinya, Kajiado North as well as abattoirs scattered in far flung areas of the county. Improved biodigester technologies exist on the market with greatly improved prices that could be promoted to generate biogas for cooking and heating in particular. Similarly, gas production potential from municipal bio-waste exists, albeit the small amount of feedstock available in urban areas where such feedstock is to be found in collectable form. Technology is mature for waste-to-energy options, though the main barrier to its beneficial exploitation is absence of aggregation capacity across all urban centres and counties, and poor feed-in-tariff offered by Kenya Power for its grid.

Sustainable Charcoal Production

This will be from regulated supply sources using improved pyrolytic processes, and consumed using improved charcoal cookstoves (e.g. Jikokoa) that still remain inaccessible to many in the villages. Policy and regulatory intervention is critical for this endeavour to succeed. In some locations, briquette production using charcoal dust and sawdust has been mooted though no data exists to demonstrate the commercial viability of the briquette option.

Bioethanol Production

This is not feasible at the moment owing to lack of sustainable feedstock production in the county. However, the county's urban and peri-urban communities are consuming bioethanol for fuel as one of those in the stack. There is an opportunity to promote its accelerated adoption in the county by removing all barriers—awareness, initial cost of the fuel technology and accessories.

5.3. Enabling Environment

Although the national Bioenergy Strategy 2020-2027 exists, Kajiado County does not have its cascaded version or policy to guide the sustainable production and consumption of bioenergy from diverse feedstock as depicted in Figure 5.1. An opportunity avails itself to derive useful guidance from diverse policies, strategies and plans available at the county and national levels. For instance, the Forest (Charcoal) Regulations 2012, which oversee charcoal production, transport, and sales, highlight the challenges faced in enforcing regulations and combating forest degradation attributed to charcoal burning.

Reasons for non-compliance to these rules have been identified to include weak regulations, enforcement challenges, corruption, lack of transparency, market demand for legal products, poverty, and lack of alternatives. Delayed licensing and light penalties hinder enforcement (Sola et al., 2021). Lessons from these experiences must be incorporated into the development of the Kajiado County bioenergy strategy. Additionally, The Kajiado County Sustainable Forest Resources Management and Exploitation (Charcoal) Policy 2018 aims to inter alia achieve 10% forest cover in Kajiado County.

Policies and plans related to livestock production, municipal waste management, and crop cultivation for biofuel crops such as sorghum, corn, and sugarcane also offer valuable insights for bioenergy strategy development in Kajiado. Moreover, consultations with the national bioethanol master plan and relevant sections of the Energy Act of 2019 can provide useful guidance. Despite the low current usage of biogas as a primary energy source in Kajiado (reported to be at 2% from the baseline survey), there is potential for bioenergy development, particularly from domestic waste generated in rapidly urbanizing areas like Kitengela, Ngong, and Kiserian, as well as from livestock manure.

A few cross-cutting issues could potentially stand in the way of bioenergy development. Cultural norms may further inhibit women's involvement in energy initiatives. It's essential to recognize that empowering women with access to clean energy not only enhances their economic opportunities but also contributes to environmental preservation. Strategic measures are needed to ensure sustainable production and utilization of bioenergy feedstock, including effective regulation, responsible land management, and stakeholder engagement. By effectively communicating the benefits and risks associated with bioenergy use, as well as sharing successful local initiatives, awareness can be raised, and support garnered for the adoption of sustainable bioenergy practices.

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Chapter Six
Programmes and Projects

6.0. Energy Planning

Energy planning involves advocating for a shift towards cleaner and more efficient energy alternativesEnergy planning involves advocating for a shift towards cleaner and more efficient energy alternatives. It also entails fostering markets for modern energy appliances, raising awareness of the health, economic, and environmental benefits, and creating an environment conducive to private sector investment in energy solutions.

The County Energy Plan (CEP) presents Kajiado County with a distinct opportunity to meet its energy objectives as detailed in the County Integrated Development Plan 2023-2027, the County Renewable Energy Atlas (2021), County Spatial Plan 2020-2030 and the County Climate Change Action Plan 2021. This section outlines specific programmes and projects that, if implemented as proposed, are likely to achieve the desired outcome.

Acacia seedling germinating from a seed ball. ©Teddy Kinyanjui / Kenya Seedball Company

PROGRAMME	SPECIFIC ACTIVITIES	TARGET BENEFICIARY	ESTIMATED BUDGET(KES)	IMPLEMENTING AGENCY
National Level				
Programme 1: Comprehensive inter-governmental collaboration and benefit-sharing framework involving large-scale projects (Geothermal, Hydro, Wind energy)	a) Develop a County energy policy for engagement with the National Government. b) Facilitate the development of Community Benefit Agreements (CBAs) to outline how benefits from large-scale projects, such as wind farms, will be shared with local communities. c) Convene energy investment conference on all energy resources to attract international investors to explore the abundant potential as outlined in the County Renewable Energy Atlas.	Kajiado County citizens	Activity (a): KES 5,000,000 Activity (b): KES 3,000,000 Activity c: KES 30,000,000 **Total**: **KES 38,000,000**	County Government, National Government Agencies, Community Representatives, Project Developers
County Level				
Programme 1: Strengthening energy sector governance and coordination.	a) Strengthen the Energy Directorate (including recruitment of relevant technical staff). b) Technical Committee (TC) be formalized per INEP to enable effective implementation of the energy projects & plans. c) Budget—Integrate proposals in the subsequent ADPs and push for increased budgetary allocation from County. Engage policymakers at both national and county levels to advocate for higher budget allocations towards energy initiatives. d) Data—establish partnership with higher learning and research institutions for continuous data generation relevant to energy planning.	County Energy Department Physical Planning Department University students and departments	Activity (a): KES 30,000,000 Activity (b): KES 4,000,000 Activity (c): KES 2,000,000 Activity (d): KES 5,000,000 **Total: KES 41,000,000**	Department of Energy Department of Physical Planning County Assembly of Kajiado Local Universities (those with energy research units)

PROGRAMME	SPECIFIC ACTIVITIES	TARGET BENEFICIARY	ESTIMATED BUDGET(KES)	IMPLEMENTING AGENCY
Programme 2: Promotion of biogas production and use of renewable energy among livestock farmers and slaughterhouses.	a) Promote financial and non-financial incentives specifically tailored to livestock farmers to invest in biogas digesters for waste management and energy production. b) Conduct demonstration projects showcasing the benefits and feasibility of biogas technology in both livestock farming and slaughterhouse operations. c) Provide technical assistance and training on the installation, operation, and maintenance of biogas digesters to ensure successful adoption and integration into daily practices. d) Solarize lighting and water pumping services at all Kajiado abattoirs. e) Support the establishment of a Centre of Excellence for biogas promotion at MTTI	Livestock farmers Abattoirs TVET Graduates and others through in-service upgrading	Activity (a): KES 3,000,000 Activity (b): KES 15,000,000 Activity (c): KES 10,000,000 Activity (d): KES 15,000,000 Activity (e): KES 20,000,000 **Total: 63,000,000**	County and development partners Association of Biogas Contractors in Kajiado Slaughterhouse owners, dairy cooperatives and farmers County Energy and Livestock departments, financial sector players, NGOs like SNV Maasai Technical Training Institute
Programme 3: Accelerate access to clean and modern fuels and technologies.	a) Sensitization of community members on the health and economic benefits of adopting clean and modern energy for cooking and lighting services (EPCs, LPG, LEDs, etc.) b) Strengthen distribution networks through licensing and regulations for EPC, LEDs and other imported accessories. Work with regulatory authorities to ensure the licensing and regulation of LPG refilling stations. c) Establish financing programmes for clean cooking solutions. Promote models for accessing efficient lighting equipment (e.g. One Acre Fund bundling with farm input purchase).	1. Phased approach, starting with the municipalities, Second phase—peri urban, Rural Entrepreneurs in Kajiado	Activity (a): KES 5,000,000 Activity (b): KES 5,000,000 Activity (c) KES 3,000,000 **Total: KES 13,000,000**	LPG business association, NEMA, PIEA, EPRA County Government Energy Department Mass media, youth enterprises

PROGRAMME	SPECIFIC ACTIVITIES	TARGET BENEFICIARY	ESTIMATED BUDGET(KES)	IMPLEMENTING AGENCY
Programme 4: Accelerate access to clean and modern energy services in public educational and health institutions.	a)Promote LPG and Electric cooking in ECDs and TVETs through practical demonstrations and information sharing on health and economic benefits of switching . b)Vetting and licensing and regulation of vendors to expand distribution network; c)Promote financing programmes appropriate for public education and health institutions. d) Retrofit all lighting in ECD, TVET and healthcare institutions (Level-2 and 3) with LED and Solar systems for lighting and water heating and pumping. e) Require all ECD, TVET and healthcare institutions (Level-2 and 3) to install solar-powered backup systems with clear maintenance schedules. f) Conduct sensitization workshops for ECD and TVET staff and students on the benefits of biogas from biological waste, emphasizing its cleanliness and sustainability. g) Establish demonstration projects within ECD, TVET and healthcare institutions (Level-2 and 3) showcasing the process of biogas generation and its utilization for cooking. h) Collaborate with Kenya Power to connect all commercially feasible Level 2 and 3 facilities to a three-phase power supply, ensuring stable and reliable power supply.	Kajiado residents Entrepreneurs TVET institutions and students Institutional managers	Activity (a): KES 10,000,000 Activity (b): KES 5,000,000 Activity (c): KES 8,000,000 Activity (d): KES 15,000,000 Activity (e): KES 15,000,000 Activity (f): KES 3,000,000 Activity (g): KES 20,000,000 Activity (h): KES 15,000,000 **Total: KES 91,000,000**	Heads/Principals' caucuses, at county and sub-county level Boards of Management for the public institutions Biogas technology providers County Government Energy/Education Departments

PROGRAMME	SPECIFIC ACTIVITIES	TARGET BENEFICIARY	ESTIMATED BUDGET(KES)	IMPLEMENTING AGENCY
Programme 5: Solarizing boreholes for enhanced horticultural and livestock development as well as linking to local and export value chains (CCAP)	a) Mapping and drilling or rehabilitating 10 boreholes per sub county for horticultural and livestock use. b) Installing appropriate solar pumping systems or connecting to mini-grids. c) Identify and promote locally viable crops and link farmers (youth groups) to key value chains and markets. d) Training of youth groups on servicing and maintenance of installed irrigation systems and on basic farming technologies. e) Establish and operationalize 5 mega water pans per sub-county for livestock use around the boreholes.	Communities in various regions, particularly Youth Groups.	Activity (a): KES 17,000,000 Activity (b): KES 15,000,000 Activity (c): KES 3,000,000 Activity (d): KES 5,000,000 Activity (e): KES 15,000,000 **Total: KES 55,000,000**	Technology vendors Horticultural development and exporters Department of Water Department of Environment & Climate Change Ward Climate Change Committees (FLoCCA)

PROGRAMME	SPECIFIC ACTIVITIES	TARGET BENEFICIARY	ESTIMATED BUDGET(KES)	IMPLEMENTING AGENCY
Programme 6: Increase Kajiado County's forest cover by conservation through energy sector interventions (CCAP).	a) Establish one mega tree nursery per sub-county and mobilize communities to plant and nurture 1 million trees. b) Enact and implement a policy/legislation mandating the gradual phasing out of firewood and charcoal procurement for cooking in public institutions, coupled with strict monitoring and enforcement mechanisms to ensure compliance. c) Allocate all public schools special grants for LPG uptake. CDF and development partners may be approached for additional support. d) Map and regulate access to special forests for controlled charcoal production and trade. e) License and regulate LPG and charcoal ICS vendors as well as suppliers of fuelwood to local markets. f) Promote accelerated access to ICS (both charcoal and firewood) through sensitization of the public on the benefits (health and economics) and linking them to available financing programmes g) Promote LPG uptake in peri-urban and rural locations through packaging in smaller volumes, and licensing distributors. h) Provide incentives or recognition for schools that successfully adopt clean cooking technologies. i) Promote tree planting initiatives through schools as well as setting a tree planting week on the county's calendar when all individuals can plant a tree.	All Kajiado residents and ecosystems Special projects for Mashuuru, Kajiado West and Kajiado Central regions	Activity (a): KES 125,000,000 Activity (b): KES 3,000,000 Activity (c): KES 20,000,000 Activity (d): KES 3,000,000 Activity (e): KES 2,000,000 Activity (f): KES 5,000,000 Activity (g): KES 5,000,000 Activity (h): KES 3,000,000 Activity (i) KES 5,000,000 Total: KES 171,000,000	School boards, NEMA, County Energy/ Education/Enforcement Departments. Department of Environment and Climate Change Kenya Forest Service Ward Climate Change Committee (FloCCA)

PROGRAMME	SPECIFIC ACTIVITIES	TARGET BENEFICIARY	ESTIMATED BUDGET(KES)	IMPLEMENTING AGENCY
Programme 7: Promote energy efficiency awareness and technology uptake by all users of electrical equipment.	a) Establish demonstration centres (e.g. e-cooking hubs under MECS) to showcase the performance of energy-efficient technologies, as well as installation and maintenance for SMEs and the general public. b) Conduct energy audits of all government buildings in Kajiado including ECD, TVET, and healthcare institutions (Level-2 and 3) to assess power needs and design appropriate solar energy solutions and plans. c) Promote labelling for lighting equipment, and sensitize vendors, retailers, and distributors. Collaborate with regulatory bodies to enforce stringent measures against counterfeit electrical equipment. d) Organize energy efficiency awareness workshops and seminars (EPRA does this) for school administrators, teachers and students. Distribute educational materials on energy-efficient lighting options and their benefits	Kajiado County residents Entrepreneurs	Activity (a): KES 20,000,000 Activity (b): KES 15,000,000 Activity (c): KES 2,000,000 Activity (d): KES 5,000,000 **Total: KES 42,000,000**	Manufacturers and distributors to provide hands-on training and product demonstrations County Government Energy Department, Business Associations KPLC, KEBS, REREC, EPRA…
Programme 8: Support feasibility studies and exploration of potential energy resource development projects.	a) Revamp the Waste-to-Energy proposal by addressing concerns around aggregation and feed-in tariff with Kenya Power. b) Carry out feasibility studies for installing wind energy (small turbines) along the potential wind pathway and explore opportunities for hybrid systems with solar systems to power far-off areas with economic potential. c) Carry out a feasibility study for mini-hydro power generation at sites identified in Kajiado North by the RE Atlas. d) Quantify the contribution of energy to the county's GCP (Gross County Product)	Residents	Activity (a): KES 1,000,000 Activity (b): KES 3,000,000 Activity (c): KES 2,000,000 Activity (d): KES 1,000,000 Total: KES 7,000,000	Department of Economic Planning Private sector players (e.g. Kipeto Energy, etc.) Energy Economists (Consultants)

PROGRAMME	SPECIFIC ACTIVITIES	TARGET BENEFICIARY	ESTIMATED BUDGET(KES)	IMPLEMENTING AGENCY
Programme 9: Build the capacity of TVET institutions in training energy development and systems maintenance technicians.	a) Establish special short courses for solar PV, biogas potential mapping, installation, and maintenance at selected TVET institutions (MTTI). b) Work with KNQA to test and award certificates to existing artisans (solar and biogas technologies) under KNQA Recognition of Prior Learning (RPL) programme at selected TVETs. c) Review services and equip the Career Advisory departments of selected TVETs to offer better guidance to interested students on energy-related opportunities in the market. d) Establish partnerships between the TVETs and local private sector associations to exploit the potential for internships in solar PV and biogas systems.	MTTI Students Local enterprises	Activity (a): KES 3,000,000 Activity (b): KES 2,000,000 Activity (c): KES 2,000,000 Activity (d): KES 2,000,000 Total: KES 9,000,000	Maasai Technical Training Institute Government of Kajiado Department of Energy KNQA
Programme 10: Resource mobilization for energy development and conservation.	a) Establish a fund for the promotion of efficient use of energy and its conservation within the county, b) Mobilize resources (partnerships and funds) from potential sources including NG-CDF, FLoCCA, National Treasury's NCF, donors and PPPs to support RE & EE initiatives. c) Develop policies and incentives to attract private actors to invest in energy efficiency and conservation projects/ programmes.	Investors Local enterprises	Activity (a): KES 20,000,000 Activity (b): KES 5,0000 Activity (c): KES 3,000,000 **Total: KES 28,000,000**	Department of Trade, Energy Directorate, Environment and Climate Change, County Treasury/Finance
GRAND TOTAL KES 558,000,000				

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Chapter Seven
Implementation & Coordination Framework

7.0. The Implementation Framework

The INEP Framework outlines a typical County Energy Planning (CEP) implementation structure for counties. To optimize the effectiveness of energy plans, a structured governance framework is proposed.

7.1. Implementation and Coordination

The INEP Framework outlines a typical County Energy Planning (CEP) implementation structure for counties. To optimize the effectiveness of energy plans, a structured governance framework is proposed. This framework includes a County Energy Planning Committee (CEPC), comprising representatives from county departments and relevant stakeholders at both county and national levels (refer to Appendix 8).

The committee was established at the onset of the CEP process and is chaired by the County Executive Committee Member (CECM) responsible for Energy, Water, Environment & Natural Resources, with the Chief Officer (CO) from the same department serving as the deputy chair.

INEP Section 8.2.2 advises counties to establish energy coordination structures tailored to their needs. Accordingly, Kajiado County will establish a dedicated Energy Directorate to coordinate energy planning effectively. The Directorate will serve as the CEPC secretariat and oversee day-to-day energy planning at the county level. Other than the Director, the Directorate will have three other officers seconded from other relevant departments of the county government whose job descriptions will be elaborated during the detailed design and establishment of the Directorate.

These are (a.) Partnerships and Resource Mobilization Officer (b.) Advocacy and Communications Officer, and (c.) Data, Monitoring Evaluation, and Learning Officer. The Energy Directorate's mandate, recommended by INEP, is detailed in Appendix 8.

The Directorate will be led by a Director, seconded from the Department of Energy, overseen by the Technical Committee (TC) inaugurated at the start of the CEP development process. The composition of the TC membership, along with their mandates and service duration, is clearly outlined in the INEP framework (refer to Appendix 8).

Moreover, for national alignment and coordination, the County Governor will maintain close communication with the Cabinet Secretary for Energy & Petroleum and the Council of Governors' (CoG) technical committee for Infrastructure and Energy. To integrate priority CEP projects into the County Integrated Development Plan (CIDP) process, proposed projects will align with subsequent Annual Development Plans (ADP) and CIDP-4 for effective and coordinated implementation.

7.2. Monitoring, Evaluation and Learning Framework

Effective monitoring, evaluation, and learning (MEL) are crucial for the successful implementation of the County Energy Plan (CEP). Clear roles and strategies are essential to enhance this process. The Data, Monitoring, Evaluation, and Learning Officer, assigned to the Energy Directorate, will act as the primary focal point for monitoring and evaluating CEP implementation. Guided by the theory of change depicted in Figure 7.1, this officer will collaborate with relevant departments and stakeholders

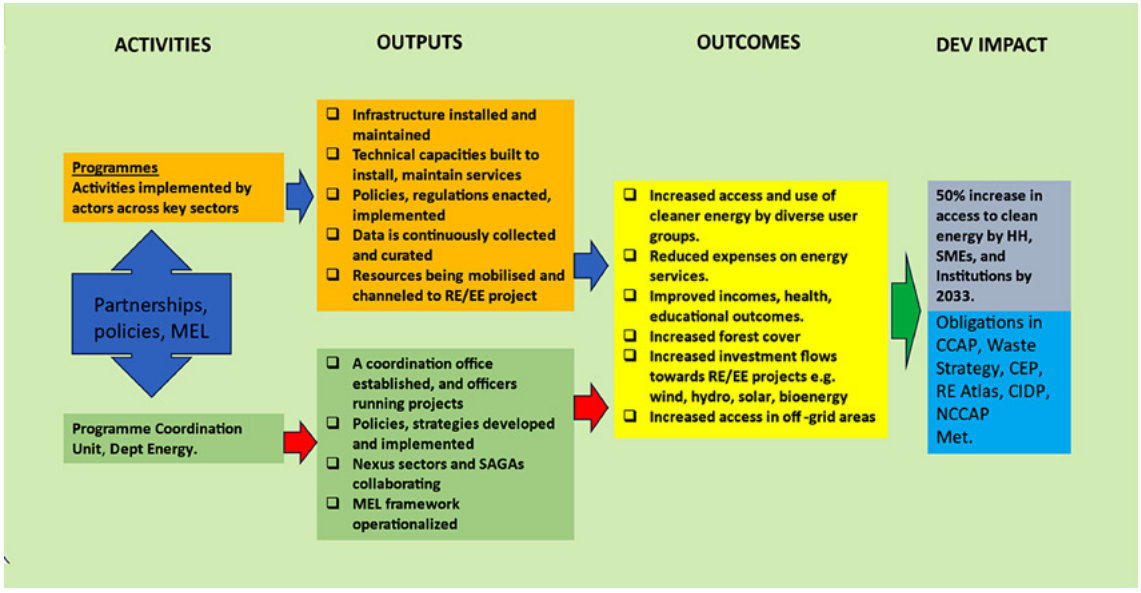
To integrate priority CEP projects into the County Integrated Development Plan (CIDP) process, proposed projects will align with subsequent Annual Development Plans (ADP) and CIDP-4 for effective and coordinated implementation.

responsible for CEP implementation to gather necessary data and information for developing quarterly progress reports.

In addition, the Director of Monitoring & Evaluation from the Governor's Development Unit will provide advisory support to ensure high-level visibility of the energy plan's progress. To improve access to quality and reliable data, ongoing efforts to review the Monitoring & Evaluation (M&E) Policy should prioritize the incorporation of mechanisms for regular data collection from all county departments into county operations.

A dedicated Monitoring & Evaluation framework, outlined in Table 7.1, has been developed to highlight key output indicators that effectively monitor the progress of CEP implementation. This framework will facilitate systematic tracking and reporting on the plan's achievements and challenges, enabling informed decision-making and continuous improvement throughout the implementation phase.

Figure 7.1. ***The theory of change for the proposed transmission pathways***



7.3. Programmes and Activities Towards Clean Energy Access

Table 7.1: ***Proposed programmes and activities towards clean energy access for Kajiado County***

PROGRAMME	OUTCOME INDICATORS	BASELINE (2024)	TARGET (2033)	MEANS OF VERIFICATION
National Level				
Programme 1: Comprehensive inter-governmental collaboration and benefit-sharing framework involving large-scale projects (Geothermal, Hydro, Wind energy)	Inter-governmental policy on collaboration for energy resource development in place	None	Policy in place	Policy document published
County Level				
Programme 1: Strengthening energy sector governance and coordination.	Energy-related activities are well integrated and implemented across all nexus sectors.	Energy Department with Director. No cross-sectoral collaboration policy, staff and budget.	County Energy Directorate (CED) in place, with Director, clear cross-sectoral operating framework, seconded staff, and budget.	County Annual Reports, CED reports
Programme 2: Promotion of biogas production and use of other renewable energy among zero-grazing farmers and slaughterhouses.	Increased adoption rate of biogas, and improved livelihoods.	Baseline Survey data: 0.5% adoption of biogas for cooking.	At least 4% adoption rate	County annual reports, Dept of Livestock extension reports.

PROGRAMME	OUTCOME INDICATORS	BASELINE (2024)	TARGET (2033)	MEANS OF VERIFICATION
Programme 3: Accelerate access to clean and modern fuels and technologies.	a)Increased adoption of cleaner and modern energy sources by households across the county.	Contribution of different energy sources to annual cooking needs.	Contribution of different energy sources to annual cooking needs.	Dept Reports, Annual reports
	b) Increased vegetation cover, c) Reduced number of people collecting or purchasing woodfuel, d) Reduced cases of respiratory illnesses.	Collected firewood 23% Bought firewood 15% Charcoal 42% LPG 17% Kerosene 1% Electricity 0% Biogas 2% Bioethanol <1%	Collected firewood 5% Bought firewood 5% Charcoal 10% LPG 50% Kerosene 0% Electricity 10% Biogas 10% Bioethanol 10%	
Programme 4: Accelerate access to clean and modern energy services in public educational (ECD & TVET) and health institutions (level 2&3).	a) Reduced deforestation and vegetation loss. b) Reduced energy bills c) Improved educational performance	Lighting—educational (% institutions) Fluorescent 46% LED 39% Cooking—educational (% need per year) Woodfuel 98.5% LPG 1% Electricity 0.5%	Lighting—educational (% institutions) Fluorescent 0% LED 100% Cooking—educational (% need per year) Woodfuel 10% LPG 80% Electricity 10%	Department of Energy M&E Reports

PROGRAMME	OUTCOME INDICATORS	BASELINE (2024)	TARGET (2033)	MEANS OF VERIFICATION
Programme 5: Solarizing boreholes for enhanced horticultural and livestock development as well as linking to local and export value chains (CCAP)	No of solarized boreholes in use Increased horticultural and livestock product yields and earnings Increased area of commercial food production No of youth employed in the sector	184 boreholes, not solarized 60 ha under commercial food production Beef value KES 2.05 billion Dairy yields 912,720 lit/yr	347 boreholes, all solarized 120 ha under commercial food production Beef value KES 5 billion Dairy yield 3 million lit/yr	Dept of Agriculture and livestock annual reports
Programme 6: Increase Kajiado County's forest cover by conservation through energy sector interventions (CCAP).	Increased vegetation cover and rejuvenated ecosystem services e.g. revived river flows, wildlife species, etc	Size of gazetted forests 16,861.88 ha covering about 0.08%	Increase gazetted forest cover to 2% of county area	Forest assessment reports
Programme 7: Promote energy efficiency awareness and technology uptake by all users of electrical equipment.	Number of energy users adopting efficient accessories. Wide-scale reduction of energy bills	Lighting — (% users) Fluorescent 26% Incandescent bulbs 45% LED 39%	Lighting — (% users) Fluorescent 0% Incandescent bulbs 0% LED 100%	Energy Audit reports
Programme 8: Support feasibility studies and exploration of potential energy resource development projects.	Quantified renewable energy potential — commercially accessible	RE Atlas 2020 hinted at potential availability and sites	Specific sites and magnitude of energy resources with commercial values	Exploration reports

PROGRAMME	OUTCOME INDICATORS	BASELINE (2024)	TARGET (2033)	MEANS OF VERIFICATION
Programme 9: Build the capacity of TVET institutions in training energy development and systems maintenance technicians.	Abundance of skilled youth installing and maintaining solar and other electrical systems in households and communal institutions	No specialized training for maintenance and installation	Centre of Excellence established at MTTI training on energy systems installation and maintenance	Physical visit at MTTI, Dept of TVET reports
Programme 10: Resource mobilization for energy development and conservation.	Energy fund established and resourced with adequate financing from diverse sources No. of energy efficiency projects benefiting from the fund for transition	No. fund in place	Fund established, anchored on PFM Act 2015 and regulations enacted by Kajiado County Assembly	Fund document

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Conclusions & References

8.0. Conclusions

Sustainability Concerns in Biomass Energy Use

Kajiado faces a critical challenge with its biomass energy consumption, currently exceeding its forest stock by threefold. Most of its fuelwood supply could be emerging from woodlands and bushlands. Echoing concerns raised by Osinde (2019), urgent forest conservation interventions are imperative. The CEP proposes targeted programmes and projects to mitigate this pressing issue.

Barriers to Universal Electricity Access

Despite Kenya Power's reported high connectivity rate in 2023, many households in close proximity to the grid remain unconnected. Least Cost Electrification modelling presents three scenarios, two of which offer viable pathways to achieving universal electricity access by 2030. However, the decision-making process for selecting the optimal scenario is primarily political, emphasizing the need for proper guidance from the energy directorate.

Untapped Renewable Energy Potential

Kajiado harbours vast untapped renewable energy resources, including solar, wind, hydro, and bioenergy, which hold the key to the county's development. Policy initiatives mandating solar connectivity for public institutions or short-term adoption of LPG for cooking could yield significant benefits. Rapid assessments, building upon preliminary findings from the Kajiado County RE Atlas, are essential for developing business cases and garnering investor support for small hydro, wind, and biogas projects to advance universal energy access efforts.

Water Access and Agricultural Development

Water scarcity remains a major obstacle to optimizing opportunities for food security and livelihood improvements through agricultural ventures in specific areas of Kajiado County. By rehabilitating and solarizing existing boreholes identified in the CSP 2020-2030, and expanding their number, water resources can be harnessed to support agricultural endeavours. These ventures can be strategically linked to value chains and domestic or international markets, enhancing economic prospects.

Need for a Comprehensive County Energy Policy

The absence of a county energy policy is a glaring gap, hindering progress towards universal energy access. The focus should be on data collection, removing barriers to forest conservation efforts, incentivizing private sector investment in energy efficiency, developing the county's unique renewable energy potential, and establishing an energy fund to mobilize resources from diverse sources.

This policy framework is essential for guiding stakeholders and fostering sustainable energy development in Kajiado County.

A Dearth of Data

Addressing the significant lack of data available for energy planning in Kajiado County should be a priority element in the proposed county energy policy. Efforts to gather comprehensive and accurate data on energy usage patterns, current energy sources, demand projections, infrastructure gaps, and potential renewable energy resources are essential for developing effective and targeted energy plans and strategies.

By prioritizing data collection and analysis, the county can make informed decisions, allocate resources efficiently, and implement sustainable energy solutions that meet the needs of its residents while promoting economic and environmental objectives. This commitment to data-driven energy planning will be crucial in advancing energy access, reliability, and sustainability in Kajiado County.

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Appendices

Appendix 1: Kajiado Central Health Centres Access to Power

CODE	NAME OF THE FACILITY	KEPH LEVEL	SUB COUNTY	ELECTRICITY	GENERATOR	SOLAR
29361	Enkaroni Dispensary	Level 2	Kajiado Central	YES	NO	NO
28627	Oloilalei Dispensary	Level 2	Kajiado Central	NO	NO	NO
26934	Ilpartimaro Dispensary	Level 2	Kajiado Central	YES	NO	NO
26931	Illmotiok Dispensary	Level 2	Kajiado Central	NO	NO	YES
22654	Nentonai Dispensary	Level 2	Kajiado Central	YES	NO	NO
22518	Maili Tisa Dispensary	Level 2	Kajiado Central	YES	NO	NO
22517	Kumpa Dispensary	Level 2	Kajiado Central	YES	NO	NO
21950	Eluanata Dispensary	Level 2	Kajiado Central	YES	NO	NO
21430	Irmarba Dispensary	Level 2	Kajiado Central	NO	NO	NO
21156	Olelleshwa dispensary	Level 2	Kajiado Central	NO	NO	NO
19337	Karero Dispensary	Level 2	Kajiado Central	NO	NO	YES
19267	Oloirimirim Dispensary	Level 2	Kajiado Central	NO	NO	YES
15109	Mailwa Dispensary	Level 2	Kajiado Central	YES	NO	NO
14259	Bissil Health Centre	Level 3	Kajiado Central	YES	NO	YES
16429	Olenarau Dispensary	Level 2	Kajiado Central	NO	NO	YES
16426	Pelewa Dispensary	Level 2	Kajiado Central	NO	NO	YES

CODE	NAME OF THE FACILITY	KEPH LEVEL	SUB COUNTY	ELECTRICITY	GENERATOR	SOLAR
15515	Sajiloni Dispensary	Level 2	Kajiado Central	YES	NO	NO
15294	Namanga Health Centre	Level 3	Kajiado Central	YES	YES	NO
15182	Meto Dispensary	Level 2	Kajiado Central	YES	NO	NO
15122	Maparasha Dispensary	Level 2	Kajiado Central	YES	NO	NO
15087	Lorngoswa Dispensary	Level 2	Kajiado Central	YES	NO	NO
14652	Kajiado County Referral Hospital	Level 4	Kajiado Central	YES	YES	NO
14451	Emurua Dikir Dispensary	Level 2	Kajiado Central	NO	NO	YES
14448	Emotoroki Dispensary	Level 2	Kajiado Central	YES	NO	YES
15340	Ngatataek Health Centre	Level 3	Kajiado Central	YES	NO	NO
14463	Enkorika Health Centre	Level 3	Kajiado Central	YES	NO	NO
31367	Inkiito Dispensary	Level 2	Kajiado Central	YES	NO	NO
31368	Olgirra Dispensary	Level 2	Kajiado Central	NO	NO	YES

Appendix 2: Kajiado East Health Centres Access to Power

Code	Name of the Facility	KEPH Level	Sub County	Electricity	Generator	Solar
30648	Ewangan Health centre	Level 3	Kajiado East	No	No	Yes
30561	Isara Dispensary	Level 2	Kajiado East	No	No	No
29598	Oloibor Ajijik Dispensary	Level 2	Kajiado East	No	No	Yes
29045	Lempei Dispensary	Level 2	Kajiado East	No	No	Yes
21472	Kima Dispensary	Level 2	Kajiado East	No	No	Yes
21473	Kiloh Dispensary	Level 2	Kajiado East	No	No	Yes
24893	Samuli Dispensary	Level 2	Kajiado East	Yes	No	No
24832	Olmerrui Dispensary	Level 2	Kajiado East	No	No	Yes
21904	Osarai Dispensary	Level 2	Kajiado East	No	No	Yes
18511	Olturoto Dispensary	Level 2	Kajiado East	Yes	No	No
18284	Ngatu Dispensary	Level 2	Kajiado East	No	No	No
18088	Oloosirkon Dispensary	Level 2	Kajiado East	Yes	No	No
14517	Kitengela GK Prison Dispensary	Level 2	Kajiado East	Yes	Yes	No
15574	Simba Health Centre	Level 3	Kajiado East	Yes	No	No
14475	Ereteti Dispensary	Level 2	Kajiado East	Yes	No	No
15041	Ilpolosat Dispensary	Level 2	Kajiado East	Yes	No	Yes

Code	Name of the Facility	KEPH Level	Sub County	Electricity	Generator	Solar
15150	Mashuuru Sub-County Hospital	Level 4	Kajiado East	Yes	Yes	No
14565	Ilkilinyet Dispensary	Level 2	Kajiado East	No	No	Yes
14441	Emaroro Dispensary	Level 2	Kajiado East	Yes	No	No
14950	Kitengela Sub-County hospital	Level 4	Kajiado East	Yes	Yes	No
14582	Isinya Health Centre	Level 3	Kajiado East	Yes	No	No
14460	Enkirgirri Dispensary	Level 2	Kajiado East	No	No	Yes

Appendix 3: Kajiado North Health Centres Access to Power

Code	Name of the Facility	KEPH Level	Sub County	Electricity	Generator	Solar
25961	Gataka Dispensary	Level 2	Kajiado North	Yes	No	No
25184	Olekasasi Health Centre	Level 3	Kajiado North	Yes	No	No
22612	Matasia Health Centre	Level 3	Kajiado North	Yes	No	No
17799	Ololua Dispensary	Level 2	Kajiado North	Yes	Yes	No
15351	Ngong Sub-County Hospital	Level 4	Kajiado North	Yes	Yes	No
15440	Ongata Rongai Sub-County Hospital	Level 4	Kajiado North	Yes	Yes	No

Appendix 4: Kajiado West Health Centres Access to Power

Code	Name of the Facility	KEPH Level	Sub County	Electricity	Generator	Solar
30913	Oldepe Dispensary	Level 2	Kajiado West	No	No	Yes
30915	Embarbal Dispensary	Level 2	Kajiado West	No	No	Yes
30627	Kiserian Health Centre	Level 2	Kajiado West	No	No	No
29899	Enduata Olorropil Dispensary	Level 2	Kajiado West	Yes	No	No
28740	Emurkea Dispensary	Level 2	Kajiado West	Yes	No	No
25250	Enkoireroi Dispensary	Level 2	Kajiado West	No	No	Yes
22761	Musenke Dispensary	Level 2	Kajiado West	No	No	Yes
22487	Oldonyo lasho Dispensary	Level 2	Kajiado West	No	No	No
22485	Enkisukudo Dispensary	Level 2	Kajiado West	Yes	No	No
22072	Kisharu Dispensary	Level 2	Kajiado West	No	No	Yes
19724	Ilparakuo Dispensary	Level 2	Kajiado West	Yes	No	No
19676	Ilkilorit Dispensary	Level 2	Kajiado West	No	No	Yes
17795	Pakase Dispensary	Level 2	Kajiado West	No	No	Yes
14957	KMQ Dispensary	Level 2	Kajiado West	Yes	No	No
15419	Oloiyangalani Dispensary	Level 2	Kajiado West	Yes	No	No
15046	Loodoariak Dispensary	Level 2	Kajiado West	Yes	No	No
15283	Najile Dispensary	Level 2	Kajiado West	Yes	No	No

Code	Name of the Facility	KEPH Level	Sub County	Electricity	Generator	Solar
15403	Olgumi Dispensary	Level 2	Kajiado West	No	No	Yes
15409	Olkiramatian Dispensary	Level 2	Kajiado West	No	No	Yes
15429	Olosho-Oibor Dispensary	Level 2	Kajiado West	Yes	No	No
15434	Oltepesi Dispensary	Level 2	Kajiado West	Yes	No	No
16431	Murantawa Dispensary	Level 2	Kajiado West	No	No	Yes
16428	Kilonito Dispensary	Level 2	Kajiado West	No	No	Yes
15737	Torosei Dispensary	Level 2	Kajiado West	No	No	Yes
15582	Singiraine Dispensary	Level 2	Kajiado West	No	No	Yes
14486	Ewuaso Kedong Health Centre	Level 3	Kajiado West	Yes	No	No
15513	Saikeri Dispensary	Level 2	Kajiado West	Yes	No	No
15425	Olooseos Dispensary	Level 2	Kajiado West	Yes	No	No
15418	Oloika Dispensary	Level 2	Kajiado West	No	No	Yes
15395	Oldorko Dispensary	Level 2	Kajiado West	No	No	Yes
15393	Oldonyo Nyokie Dispensary	Level 2	Kajiado West	Yes	No	No
14891	Kipeto Dispensary	Level 2	Kajiado West	Yes	No	No
15226	Mosiro Dispensary (Kajiado West)	Level 2	Kajiado West	No	No	Yes
16427	Esonorua Dispensary	Level 2	Kajiado West	Yes	No	NO

Code	Name of the Facility	KEPH Level	Sub County	Electricity	Generator	Solar
15560	Shompole Health Centre	Level 3	Kajiado West	No	No	No
14556	Icross Dispensary	Level 2	Kajiado West	Yes	No	No
14541	GSU Field Dispensary (Kajiado)	Level 2	Kajiado West	Yes	No	No
14469	Entasopia Health Centre	Level 3	Kajiado West	No	No	Yes
15185	Mile 46 Health Centre	Level 3	Kajiado West	Yes	No	No
15424	Olooltepes Dispensary	Level 2	Kajiado West	Yes	No	No

Appendix 5: Kajiado South Health Centres Access to Power

Code	Name of the Facility	KEPH Level	Sub County	Electricity	Generator	Solar
30916	Enkii Dispensary	Level 2	Kajiado South	No	No	Yes
30578	Lenkism Dispensary	Level 2	Kajiado South	Yes	No	No
29716	Kikelelwa Dispensary	Level 2	Kajiado South	Yes	No	No
28398	Impiron Dispensary	Level 2	Kajiado South	No	No	No
22605	Inkariak Ronkena Dispensary	Level 2	Kajiado South	No	No	No
22604	Oloolakir Dispensary	Level 2	Kajiado South	No	No	No
22603	Meshinani Dispensary	Level 2	Kajiado South	No	No	Yes

Code	Name of the Facility	KEPH Level	Sub County	Electricity	Generator	Solar
22602	Lemongo Dispensary	Level 2	Kajiado South	No	No	No
21435	Olchorro Dispensary	Level 2	Kajiado South	Yes	No	No
21321	Iloirero Dispensary	Level 2	Kajiado South	No	No	No
20762	Kuku Dispensary	Level 2	Kajiado South	Yes	No	No
20761	Oloirien Dispensary	Level 2	Kajiado South	Yes	No	No
20372	Illasit Health Centre	Level 3	Kajiado South	Yes	No	No
19108	Imbirikani Level 4 Hospital	Level 4	Kajiado South	Yes	Yes	No
17813	Enkongu Narok Dispensary	Level 2	Kajiado South	Yes	No	No
17671	Oldoinyo Oibor Dispensary	Level 2	Kajiado South	No	No	Yes
17053	Ilchalai Dispensary	Level 2	Kajiado South	Yes	No	No
15359	Njukini Health Centre (Loitokitok)	Level 3	Kajiado South	No	No	Yes
15051	Loitokitok Sub-County Hospital	Level 4	Kajiado South	Yes	Yes	No
14200	Amboseli Dispensary	Level 2	Kajiado South	Yes	No	No
15402	Olgulului Health Centre	Level 3	Kajiado South	Yes	No	No
15435	Oltiasika Dispensary	Level 2	Kajiado South	No	No	Yes
15426	Olorika Dispensary	Level 2	Kajiado South	No	No	Yes

Code	Name of the Facility	KEPH Level	Sub County	Electricity	Generator	Solar
15296	Namelok Health Centre	Level 3	Kajiado South	Yes	No	No
15366	Nolasit Dispensary	Level 2	Kajiado South	No	No	Yes
15361	Nkama Dispensary	Level 2	Kajiado South	Yes	No	No
15012	Langata Enkima Dispensary	Level 2	Kajiado South	No	No	Yes
14581	Isinet Health Centre	Level 3	Kajiado South	Yes	No	No
14868	Kimana Health Centre	Level 3	Kajiado South	Yes	No	No
14573	Immurtot Health Centre	Level 3	Kajiado South	Yes	No	No
14569	Iltilal Health Centre	Level 3	Kajiado South	Yes	No	No
14467	Entarara Health Centre	Level 3	Kajiado South	Yes	No	No
14450	Emumwenyi Dispensary	Level 2	Kajiado South	Yes	No	No

Appendix 6: List of Education Facilities not Connected to the Interconnected Grid

Name	Sublocation	Level
ADEN PRE SCH	OLMOLELIAN	ECD/PRE-PRIMARY SCHOOL
AIC ELMUNGUSH ECD	ERANKAU	ECD/PRE-PRIMARY SCHOOL
ARROI NUR SCH	ARROI	ECD/PRE-PRIMARY SCHOOL
ARROI PRI SCH	ARROI	PRIMARY SCHOOL
BAPTIST ENKURUNGA NUR SCH	KITENKELA	ECD/PRE-PRIMARY SCHOOL
CATHOLIC SHURIE NUR SCH	OLORIKA	ECD/PRE-PRIMARY SCHOOL
ELANGATA ENKIMA NUR SCH	OLORIKA	ECD/PRE-PRIMARY SCHOOL
ELANGATA ENKIMA PRI SCH	OLORIKA	PRIMARY SCHOOL
ELANGATA NANYOKIE NUR SCH	OLGORRA	ECD/PRE-PRIMARY SCHOOL
EMAKUTAN ECD	TOROSEI	ECD/PRE-PRIMARY SCHOOL
EMARTI PRE SCH	EMARTI	ECD/PRE-PRIMARY SCHOOL
EMARTI PRI SCH	EMARTI	PRIMARY SCHOOL
EMASHINI NUR SCH	ESSELENGEI	ECD/PRE-PRIMARY SCHOOL
EMASHINI PRI SCH	ESSELENGEI	PRIMARY SCHOOL
EMBARBAL ECD	EMBARBAL	ECD/PRE-PRIMARY SCHOOL
EMBARBAL PRI SCH	EMBARBAL	PRIMARY SCHOOL
EMBIRIKA PRE SCH	OLKIRAMATIAN	ECD/PRE-PRIMARY SCHOOL
EMBOLIEI ECD	OLTEPESI	ECD/PRE-PRIMARY SCHOOL
EMBOLIEI PRI SCH	OLTEPESI	PRIMARY SCHOOL
EMERRUMORI PRE-SCH	ILPOLOSAT	ECD/PRE-PRIMARY SCHOOL
EMPUKANI NUR	KUMPA	ECD/PRE-PRIMARY SCHOOL
EMURKEYA ECD	TOROSEI	ECD/PRE-PRIMARY SCHOOL
EMURKEYA PRI SCH	TOROSEI	PRIMARY SCHOOL
EMURWA OLDULE NUR SCH	AMBOSELI	ECD/PRE-PRIMARY SCHOOL
ENAKISHOMI ECD	MAGADI	ECD/PRE-PRIMARY SCHOOL

Name	Sublocation	Level
ENALEPO NUR	OLDONYO OROK	ECD/PRE-PRIMARY SCHOOL
ENALUSU NUR DCH	KUKU	ECD/PRE-PRIMARY SCHOOL
ENARAU ECD	OLOYIANKALANI	ECD/PRE-PRIMARY SCHOOL
ENDERKESI FPFK NUR SCH	NJUKINI	ECD/PRE-PRIMARY SCHOOL
ENDERKESI NUR	KUMPA	ECD/PRE-PRIMARY SCHOOL
ENDIKIR NUR SCH	MASHURU	ECD/PRE-PRIMARY SCHOOL
ENDIKIR PRI SCH	MASHURU	PRIMARY SCHOOL
ENDOINYIO ENKAMPI NUR	NKOILE	ECD/PRE-PRIMARY SCHOOL
ENDOINYIO ENKAMPI PRI	NKOILE	PRIMARY SCHOOL
ENDOINYIO ENKER NUR SCH	SULTAN HAMUD	ECD/PRE-PRIMARY SCHOOL
ENDOINYIO ENKER PRI SCH	SULTAN HAMUD	PRIMARY SCHOOL
ENDOINYO OLASHO PRE SCH	SHOMPOLE	ECD/PRE-PRIMARY SCHOOL
ENDOINYO OLASHO PRI SCH	SHOMPOLE	PRIMARY SCHOOL
ENDONYIO SIDAI NUR	KISAJU	ECD/PRE-PRIMARY SCHOOL
ENDUATA LITTLE SCHOLARS ECD	SAJILONI	ECD/PRE-PRIMARY SCHOOL
ENKERESUNA NUR	RUANCHE	ECD/PRE-PRIMARY SCHOOL
ENKERESUNA PRI	RUANCHE	PRIMARY SCHOOL
ENKII NUR SCH	ESSELENGEI	ECD/PRE-PRIMARY SCHOOL
ENKILELE PRE-SCH	ILPOLOSAT	ECD/PRE-PRIMARY SCHOOL
ENKIRGIRR ECD	ENKIRIGIRRI	ECD/PRE-PRIMARY SCHOOL
ENKIRGIRRI BAPTIST EX-CELLENT ECD	ENKIRIGIRRI	ECD/PRE-PRIMARY SCHOOL
ENKIRGIRRI PRIMARY SCH	ENKIRIGIRRI	PRIMARY SCHOOL
ENKOIREROI ECD	EREMIT	ECD/PRE-PRIMARY SCHOOL
ENKOIREROI PRI SCH	EREMIT	PRIMARY SCHOOL
ENKOLILI ST PETERS NUR SCH	OLORIKA	ECD/PRE-PRIMARY SCHOOL
ENKOLILII NUR SCH	LOROGOSWA	ECD/PRE-PRIMARY SCHOOL
ENKONGU NAROK NUR SCH	AMBOSELI	ECD/PRE-PRIMARY SCHOOL

Name	Sublocation	Level
ENKONGU NAROK PRI SCH	AMBOSELI	PRIMARY SCHOOL
ENKUSERO NUR SCH A	KUKU	ECD/PRE-PRIMARY SCHOOL
ENKUSERO NUR SCH B	KUKU	ECD/PRE-PRIMARY SCHOOL
ENKUSERO-SAMPU NUR SCH	OLOOSHOIBOR	ECD/PRE-PRIMARY SCHOOL
ENKUTOTO NUR SCH	ESSELENGEI	ECD/PRE-PRIMARY SCHOOL
ENOOSAMPURRUMPURR NUR	OLDONYO OROK	ECD/PRE-PRIMARY SCHOOL
ENOOSAMPURRUMPURR PRI	OLDONYO OROK	PRIMARY SCHOOL
ENTAAMO PRE SCH	OLKERI	ECD/PRE-PRIMARY SCHOOL
ENTASHATA PRE SCH	TOROSEI	ECD/PRE-PRIMARY SCHOOL
ENTASOPIA ECD	ENTASOPIA	ECD/PRE-PRIMARY SCHOOL
ENTASOPIA PRI SCH	ENTASOPIA	PRIMARY SCHOOL
ENTASOPIA YOUTH POLYTECHNIC	ENTASOPIA	YOUTH POLYTECHNIC
ENYORNYOR PRE SCH	SAJILONI	ECD/PRE-PRIMARY SCHOOL
EREMIT ECD	EREMIT	ECD/PRE-PRIMARY SCHOOL
EREMIT PRI SCH	EREMIT	PRIMARY SCHOOL
ESARUNOTO NUR	ILPARTIMARO	ECD/PRE-PRIMARY SCHOOL
ESARUNOTO NUR SCH	SULTAN HAMUD	ECD/PRE-PRIMARY SCHOOL
ESARUNOTO PRI SCH	SULTAN HAMUD	PRIMARY SCHOOL
ESILALE PRE SCH	OLEMURKAT	ECD/PRE-PRIMARY SCHOOL
ESITETI NUR SCH	MURUESHI	ECD/PRE-PRIMARY SCHOOL
ESITETI NUR SCH	AMBOSELI	ECD/PRE-PRIMARY SCHOOL
ESITETI PRI SCH	AMBOSELI	PRIMARY SCHOOL
ESOIT SAMPU NUR SCH	SULTAN HAMUD	ECD/PRE-PRIMARY SCHOOL
ESOIT SAMPU PRI SCH	SULTAN HAMUD	PRIMARY SCHOOL
FPFK NUR SCH B	KUKU	ECD/PRE-PRIMARY SCHOOL
ILAIMIRROR NUR SCH	LENKISM	ECD/PRE-PRIMARY SCHOOL
ILAIMIRROR PRI SCH	LENKISM	PRIMARY SCHOOL

Name	Sublocation	Level
ILANKERMANI PRE SCH	SHOMPOLE	ECD/PRE-PRIMARY SCHOOL
ILDERKES NUR SCH	EMALI	ECD/PRE-PRIMARY SCHOOL
ILKELUNYETI PRI SCH	MURUESHI	PRIMARY SCHOOL
ILKELUNYIETI ADULT ED-UCATION CENTRE	MURUESHI	ADULT EDUCATION CENTRE
ILKIDEMI NURSERY SCHOOL	MASHURU	ECD/PRE-PRIMARY SCHOOL
ILKIDEMI PRI SCH	MASHURU	PRIMARY SCHOOL
ILKILORIT NUR SCH	SAIKERI	ECD/PRE-PRIMARY SCHOOL
ILKILORIT PRI SCH	SAIKERI	PRIMARY SCHOOL
ILKIUSHIN NUR	OLTUROTO	ECD/PRE-PRIMARY SCHOOL
ILMAMEN PCEA NUR SCH	ARROI	ECD/PRE-PRIMARY SCHOOL
ILMAO NUR SCH	ERANKAU	ECD/PRE-PRIMARY SCHOOL
ILMARBA NUR	AMBOSELI	ECD/PRE-PRIMARY SCHOOL
ILMISIGYO NUR SCH	LOROGOSWA	ECD/PRE-PRIMARY SCHOOL
ILMOLELIAN NUR SCH	NKOILE	ECD/PRE-PRIMARY SCHOOL
ILMOLELIAN PRI SCH	NKOILE	PRIMARY SCHOOL
ILMOTIO NUR	RUANCHE	ECD/PRE-PRIMARY SCHOOL
ILMOTIO PRI	RUANCHE	PRIMARY SCHOOL
ILNTIRPEN NUR	KUMPA	ECD/PRE-PRIMARY SCHOOL
ILOIRERO NUR SCH	ESSELENGEI	ECD/PRE-PRIMARY SCHOOL
ILOIRERO PRI SCH	ESSELENGEI	PRIMARY SCHOOL
ILOSHON PRE SCH	TOROKA	ECD/PRE-PRIMARY SCHOOL
ILPARAKUO ECD	ENKORIKA	ECD/PRE-PRIMARY SCHOOL
ILPOLOSAT NUR	OLTUROTO	ECD/PRE-PRIMARY SCHOOL
ILPOLOSAT PRI	OLTUROTO	PRIMARY SCHOOL
ILTARETO PRE SCH	ISEURI	ECD/PRE-PRIMARY SCHOOL
ILTARETO PRI SCH	ISEURI	PRIMARY SCHOOL
ILTULETA NUR SCH	ESSELENGEI	ECD/PRE-PRIMARY SCHOOL

Name	Sublocation	Level
ILTULETA PRI SCH	ESSELENGEI	PRIMARY SCHOOL
ILUANAT ECD	MAGADI	ECD/PRE-PRIMARY SCHOOL
IMBUKO NUR SCH	IMBUKO	ECD/PRE-PRIMARY SCHOOL
IMPALUANI NUR	RUANCHE	ECD/PRE-PRIMARY SCHOOL
IMPIRARO ECD SCH	SAIKERI	ECD/PRE-PRIMARY SCHOOL
IMPUSIARIAK NUR	KUMPA	ECD/PRE-PRIMARY SCHOOL
INAUDOT ADULT EDU-CATION CENTER	SINGIRAINE	ADULT EDUCATION CENTRE
INAUDOT PRE SCH	SINGIRAINE	ECD/PRE-PRIMARY SCHOOL
INAUDOT PRI SCH	SINGIRAINE	PRIMARY SCHOOL
INCHIL NUR SCH	ARROI	ECD/PRE-PRIMARY SCHOOL
INDEPEN PRE SCH	TOROSEI	ECD/PRE-PRIMARY SCHOOL
INDIONYIO ECD	IMPIRO	ECD/PRE-PRIMARY SCHOOL
INDOINYO NUR SCH	LOROGOSWA	ECD/PRE-PRIMARY SCHOOL
INDUPA PRE SCH	KILONITO	ECD/PRE-PRIMARY SCHOOL
INDUPA PRI SCH	KILONITO	PRIMARY SCHOOL
INGOROIN NUR SCH	ROMBO	ECD/PRE-PRIMARY SCHOOL
INKOKIRDINGA ECD	KISAJU	ECD/PRE-PRIMARY SCHOOL
INTINYIKA ECD	ILAISER	ECD/PRE-PRIMARY SCHOOL
INTOROSI ADULT ED CENTER	ESOKOTA	ADULT EDUCATION CENTRE
INTOROSI PRE SCH	TORIOK	ECD/PRE-PRIMARY SCHOOL
IRNGOSWANI ECD	MUSENGE	ECD/PRE-PRIMARY SCHOOL
IRRATA PRE SCH	ENKARONI	ECD/PRE-PRIMARY SCHOOL
ISIAIT NUR SCH	NKOILE	ECD/PRE-PRIMARY SCHOOL
ISIAIT PRI SCH	NKOILE	PRIMARY SCHOOL
JENA EDUCATIONAL IN-STITUTE ECD	NGURUMAN	ECD/PRE-PRIMARY SCHOOL
KALEMBWANI NUR SCH	LESONKOYO	ECD/PRE-PRIMARY SCHOOL

Name	Sublocation	Level
KALEMBWANI PRI SCH	LESONKOYO	PRIMARY SCHOOL
KARERO NUR	OLDONYO OROK	ECD/PRE-PRIMARY SCHOOL
KILONITO ECD	KILONITO	ECD/PRE-PRIMARY SCHOOL
KILONITO PRI SCH	TOROKA	PRIMARY SCHOOL
KIMELOK NUR SCH	NAJILE	ECD/PRE-PRIMARY SCHOOL
KIMELOK PRI SCH	NAJILE	PRIMARY SCHOOL
KIPAKOT ADULT EDU CENTRE	LOROGOSWA	ADULT EDUCATION CENTRE
KIPAKOT NUR SCH	RUANCHE	ECD/PRE-PRIMARY SCHOOL
KIPAKOT PRI SCH	LOROGOSWA	PRIMARY SCHOOL
KIRKURIA ECD	OLOYIANKALANI	ECD/PRE-PRIMARY SCHOOL
KIRKURIA PRI	OLOYIANKALANI	PRIMARY SCHOOL
KISERIAN NUR SCH	OLORIKA	ECD/PRE-PRIMARY SCHOOL
KISHARU ECD	OLGUM	ECD/PRE-PRIMARY SCHOOL
KISHARU PRI SCH	OLGUM	PRIMARY SCHOOL
KOMITI PRE SCH	OLKIRAMATIAN	ECD/PRE-PRIMARY SCHOOL
KOMIYA NUR SCH	MAGADI	ECD/PRE-PRIMARY SCHOOL
KOMIYA PRI SCH	MAGADI	PRIMARY SCHOOL
KOORA ECD	KOORA	ECD/PRE-PRIMARY SCHOOL
KOORA PRI SCH	KOORA	PRIMARY SCHOOL
KUKUO NUR	KUMPA	ECD/PRE-PRIMARY SCHOOL
KUNCHU NUR SCH	SULTAN HAMUD	ECD/PRE-PRIMARY SCHOOL
KUNCHU PRI SCH	SULTAN HAMUD	PRIMARY SCHOOL
LEITOIRE NUR	OLMOLELIAN	ECD/PRE-PRIMARY SCHOOL
LEKOBEI PRE SCH	SHOMPOLE	ECD/PRE-PRIMARY SCHOOL
LEMASUSU NUR SCH	OLORIKA	ECD/PRE-PRIMARY SCHOOL
LEMONGO NUR SCH	ROMBO	ECD/PRE-PRIMARY SCHOOL
LENCHANI CENTRAL NURSERY	ILPOLOSAT	ECD/PRE-PRIMARY SCHOOL

Name	Sublocation	Level
LENKAITOLE NUR SCH	OLORIKA	ECD/PRE-PRIMARY SCHOOL
LENKISM NUR SCH	LENKISM	ECD/PRE-PRIMARY SCHOOL
LENKISM PRI SCH	LENKISM	PRIMARY SCHOOL
LESHUTA ECD SCH	KISAMIS	ECD/PRE-PRIMARY SCHOOL
LESHUTA PRI SCH	KISAMIS	PRIMARY SCHOOL
LESONKOYO NUR	KUMPA	ECD/PRE-PRIMARY SCHOOL
LIBERTY NUR	OLTUROTO	ECD/PRE-PRIMARY SCHOOL
LOLTIAMILOI NUR	KUMPA	ECD/PRE-PRIMARY SCHOOL
LOOLAKER NUR SCH	LENKISM	ECD/PRE-PRIMARY SCHOOL
LOOLAKER PRI SCH	LENKISM	PRIMARY SCHOOL
LOOLEPO NURSERY SCHOOL	KUKU	ECD/PRE-PRIMARY SCHOOL
LORMARORO NUR SCH	KUKU	ECD/PRE-PRIMARY SCHOOL
LOSINYAI PRE SCH	KOORA	ECD/PRE-PRIMARY SCHOOL
MAGADI ADULT EDU-CATION CENTER	MAGADI	ADULT EDUCATION CENTRE
MAGADI JUNIOR PRE SCH	MAGADI	ECD/PRE-PRIMARY SCHOOL
MAGADI JUNIOR PRI SCH	MAGADI	PRIMARY SCHOOL
MAGADI PRE SCH	MAGADI	ECD/PRE-PRIMARY SCHOOL
MAGADI PRI SCH	MAGADI	PRIMARY SCHOOL
MAGADI SEC SCH	MAGADI	SECONDARY SCHOOL
MAISIKIRIA NUR SCH	LOROGOSWA	ECD/PRE-PRIMARY SCHOOL
MAISIKIRIA PRI SCH	LOROGOSWA	PRIMARY SCHOOL
MARANDAWUA PRE SCH	OLKILORIT	ECD/PRE-PRIMARY SCHOOL
MATALI ECD CENTER	KITENKELA	ECD/PRE-PRIMARY SCHOOL
MATEPES NUR SCH	NJUKINI	ECD/PRE-PRIMARY SCHOOL
MATEPES PRI SCH	NJUKINI	PRIMARY SCHOOL
MEGUMI NUR SCH	ESSELENGEI	ECD/PRE-PRIMARY SCHOOL
MEGUMI PRI SCH	ESSELENGEI	PRIMARY SCHOOL

Name	Sublocation	Level
MITON NUR	KUMPA	ECD/PRE-PRIMARY SCHOOL
MOILO NUR SCH	KUKU	ECD/PRE-PRIMARY SCHOOL
MOKONGI NUR	KUMPA	ECD/PRE-PRIMARY SCHOOL
MUSENKE PRI SCH	LOROGOSWA	PRIMARY SCHOOL
NAIKA NUR SCH	IMBILINI	ECD/PRE-PRIMARY SCHOOL
NAILUMPE NUR SCH	OLGORRA	ECD/PRE-PRIMARY SCHOOL
NAILUMPE PRI SCH	OLGORRA	PRIMARY SCHOOL
NAIRRONDE NUR SCH	OLOOSHOIBOR	ECD/PRE-PRIMARY SCHOOL
NALEPO NUR SCH	NKOILE	ECD/PRE-PRIMARY SCHOOL
NAMELOK NUR SCH	NKOILE	ECD/PRE-PRIMARY SCHOOL
NAMELOK PRE SCH	TOROKA	ECD/PRE-PRIMARY SCHOOL
NAMELOK PRE SCH	EMARTI	ECD/PRE-PRIMARY SCHOOL
NAMUNYAK NUR	OLTUROTO	ECD/PRE-PRIMARY SCHOOL
NAMUNYAK NUR	BISSIL	ECD/PRE-PRIMARY SCHOOL
NAMUNYAK NUR SCH	OLTUROTO	ECD/PRE-PRIMARY SCHOOL
NANING'OI ECD	MOSIRO	ECD/PRE-PRIMARY SCHOOL
NANING'OI PRI SCH	MOSIRO	PRIMARY SCHOOL
NANYOKI ECD	NAJILE	ECD/PRE-PRIMARY SCHOOL
NAORO ECD	MOSIRO	ECD/PRE-PRIMARY SCHOOL
NAORR ENKARE NUR SCH B	AMBOSELI	ECD/PRE-PRIMARY SCHOOL
NAORR ENKARRE (INKII-TO) NUR SCH	AMBOSELI	ECD/PRE-PRIMARY SCHOOL
NAORR-ENKARE NUR A	AMBOSELI	ECD/PRE-PRIMARY SCHOOL
NAORR-ENKARE PRI SCH	AMBOSELI	PRIMARY SCHOOL
NASARU PRE SCH	ESOKOTA	ECD/PRE-PRIMARY SCHOOL
NASERIAN ECD	OLOYIANKALANI	ECD/PRE-PRIMARY SCHOOL
NASERIAN NUR	OLTUROTO	ECD/PRE-PRIMARY SCHOOL
NASERIAN PRI SCH	OLTUROTO	PRIMARY SCHOOL

Name	Sublocation	Level
NASIPAI NUR	KUKU	ECD/PRE-PRIMARY SCHOOL
NASIPAI PRI SCH	KUKU	PRIMARY SCHOOL
NEMASI NUR SCH	MURUESHI	ECD/PRE-PRIMARY SCHOOL
NOOMAYAI NUR	LOROGOSWA	ECD/PRE-PRIMARY SCHOOL
NOOMPALA NUR SCH	LENKISM	ECD/PRE-PRIMARY SCHOOL
NOOMPALA PRI SCH	LENKISM	PRIMARY SCHOOL
NOONG'ABOLO NUR SCH	SULTAN HAMUD	ECD/PRE-PRIMARY SCHOOL
NOONG'ABOLO PRI SCH	SULTAN HAMUD	PRIMARY SCHOOL
NOONKOBEN NUR SCH	KIBOKO	ECD/PRE-PRIMARY SCHOOL
NOOSIDAN NUR SCH	MURUESHI	ECD/PRE-PRIMARY SCHOOL
NOOSIDAN PRI SCH	MURUESHI	PRIMARY SCHOOL
NOSOTUA NUR SCH	OLORIKA	ECD/PRE-PRIMARY SCHOOL
OLANTI NUR SCH	ESELENKEI	ECD/PRE-PRIMARY SCHOOL
OLANTI PRI SCH	ESELENKEI	PRIMARY SCHOOL
OLBILI NUR SCH	OLORIKA	ECD/PRE-PRIMARY SCHOOL
OLBILI PRI SCH	OLORIKA	PRIMARY SCHOOL
OLCHOKUT SUPAT NUR	OLORIKA	ECD/PRE-PRIMARY SCHOOL
OLCHURRAI NUR SCH	KUKU	ECD/PRE-PRIMARY SCHOOL
OLDARPOI NUR SCH	ESSELENGEI	ECD/PRE-PRIMARY SCHOOL
OLDEPE NUR SCH	EREMIT	ECD/PRE-PRIMARY SCHOOL
OLDEPE PRI SCH	MOSIRO	PRIMARY SCHOOL
OLDOINYIO LENKAI NUR SCH	MASIMBA	ECD/PRE-PRIMARY SCHOOL
OLDOINYIO LENKAI PRI SCH	MASIMBA	PRIMARY SCHOOL
OLDORKO ECD	MOSIRO	ECD/PRE-PRIMARY SCHOOL
OLDORKO ECD	OLDORKO	ECD/PRE-PRIMARY SCHOOL
OLDORKO PRI SCH	MOSIRO	PRIMARY SCHOOL
OLDORKO PRI SCH	OLDORKO	PRIMARY SCHOOL

Name	Sublocation	Level
OLE NKOTILA NUR	OLTUROTO	ECD/PRE-PRIMARY SCHOOL
OLE NKOTILA PRI SCH	OLTUROTO	PRIMARY SCHOOL
OLE POLOS ACK CHURCH ECD	KISAJU	ECD/PRE-PRIMARY SCHOOL
OLEKIMUNKE ECD	OLTEPESI	ECD/PRE-PRIMARY SCHOOL
OLEKIMUNKE PRI SCH	OLTEPESI	PRIMARY SCHOOL
OLEMBUYA NUR SCH	SULTAN HAMUD	ECD/PRE-PRIMARY SCHOOL
OLENARAU PRE SCH	SAJILONI	ECD/PRE-PRIMARY SCHOOL
OLENARAU PRI SCH	SAJILONI	PRIMARY SCHOOL
OLENTOKO NUR SCH	NAJILE	ECD/PRE-PRIMARY SCHOOL
OLENTOKO PRI SCH	NAJILE	PRIMARY SCHOOL
OLERAI ECD	OLOYIANKALANI	ECD/PRE-PRIMARY SCHOOL
OLKARIA NUR SCH	KUKU	ECD/PRE-PRIMARY SCHOOL
OLKARIA PRI SCH	KUKU	PRIMARY SCHOOL
OLKATETEMAI NUR SCH	MURUESHI	ECD/PRE-PRIMARY SCHOOL
OLKATETEMAI PRI SCH	MURUESHI	PRIMARY SCHOOL
OLKIRAMATIAN ARID ZONE PRI SCH	OLKIRAMATIAN	PRIMARY SCHOOL
OLKIRAMATIAN PRE SCH	OLKIRAMATIAN	ECD/PRE-PRIMARY SCHOOL
OLKITAMANYUNEILE SARASHIE ECD	ENKORIKA	ECD/PRE-PRIMARY SCHOOL
OLMADINU NUR SCH	NJUKINI	ECD/PRE-PRIMARY SCHOOL
OLMADINU PRI SCH	NJUKINI	PRIMARY SCHOOL
OLMANIE NUR SCH	OLDONYO OROK	ECD/PRE-PRIMARY SCHOOL
OLMANIE NUR SCH	MASHURU	ECD/PRE-PRIMARY SCHOOL
OLMANIE PRI SCH	OLDONYO OROK	PRIMARY SCHOOL
OLMAYIANA PRE SCH	TOROSEI	ECD/PRE-PRIMARY SCHOOL
OLMEROI PRE SCH	SAIKERI	ECD/PRE-PRIMARY SCHOOL
OLMOTI NUR SCH	AMBOSELI	ECD/PRE-PRIMARY SCHOOL

Name	Sublocation	Level
OLMOTI PRI SCH	AMBOSELI	PRIMARY SCHOOL
OLMOTIANY NUR	OLLESSOS	ECD/PRE-PRIMARY SCHOOL
OLNG'ARUA NUR SCH	NAJILE	ECD/PRE-PRIMARY SCHOOL
OLNG'ARUA PRI SCH	NAJILE	PRIMARY SCHOOL
OLODO-ENTERIT PRE SCH	KILONITO	ECD/PRE-PRIMARY SCHOOL
OLODUNG'ORO NUR SCH	NAJILE	ECD/PRE-PRIMARY SCHOOL
OLODUNG'ORO PRI SCH	NAJILE	PRIMARY SCHOOL
OLOIBOR AJIJIK NUR SCH	EMARTI	ECD/PRE-PRIMARY SCHOOL
OLOIBOR AJIJIK PRI SCH	EMARTI	PRIMARY SCHOOL
OLOIBOR-SOIT ECD	NJUKINI	ECD/PRE-PRIMARY SCHOOL
OLOIBOR-SOIT ECD	NJUKINI	ECD/PRE-PRIMARY SCHOOL
OLOIBOR-SOIT 'B' ECD	NJUKINI	ECD/PRE-PRIMARY SCHOOL
OLOIBOR-SOIT 'B' ECD	NJUKINI	ECD/PRE-PRIMARY SCHOOL
OLOIBOR-SOIT B NUR SCH	ROMBO	ECD/PRE-PRIMARY SCHOOL
OLOIBOR-SOIT NUR SCH	ROMBO	ECD/PRE-PRIMARY SCHOOL
OLOIBOR-SOIT PRI SCH	ROMBO	PRIMARY SCHOOL
OLOIBOR-SOIT PRIMARY SCH	NJUKINI	PRIMARY SCHOOL
OLOIBOR-SOIT PRIMARY SCH	NJUKINI	PRIMARY SCHOOL
OLOIBORTOTO NUR SCH	NGURUMAN	ECD/PRE-PRIMARY SCHOOL
OLOIBORTOTO PRI SCH	NGURUMAN	PRIMARY SCHOOL
OLOIKA NUR	ILPARTIMARO	ECD/PRE-PRIMARY SCHOOL
OLOIKA PRE SCH	OLOIKARERE	ECD/PRE-PRIMARY SCHOOL
OLOIKA PRI	ILPARTIMARO	PRIMARY SCHOOL
OLOIKA PRI SCH	OLOIKARERE	PRIMARY SCHOOL
OLOILALEI ECD	ESOKOTA	ECD/PRE-PRIMARY SCHOOL
OLOILALEI NUR SCH	LENKISM	ECD/PRE-PRIMARY SCHOOL
OLOILALEI PRI SCH	LENKISM	PRIMARY SCHOOL

Name	Sublocation	Level
OLOIRIMIRIMI ADULT EDUC CENTRE	KUMPA	ADULT EDUCATION CENTRE
OLOIRIMIRIMI NUR	KUMPA	ECD/PRE-PRIMARY SCHOOL
OLOIRIMIRIMI PRI	KUMPA	PRIMARY SCHOOL
OLOKERI ECD	MOSIRO	ECD/PRE-PRIMARY SCHOOL
OLOKERI PRI SCH	MOSIRO	PRIMARY SCHOOL
OLOLOPON NUR SCH	SULTAN HAMUD	ECD/PRE-PRIMARY SCHOOL
OLOMAIYANA NUR SCH	ARROI	ECD/PRE-PRIMARY SCHOOL
OLOMAIYANA PRI SCH	ARROI	PRIMARY SCHOOL
OLOMAYIANA NUR	ILPARTIMARO	ECD/PRE-PRIMARY SCHOOL
OLOMAYIANA NUR	BISSIL	ECD/PRE-PRIMARY SCHOOL
OLOMAYIANA PRE SCH	EMARTI	ECD/PRE-PRIMARY SCHOOL
OLOMAYIANA PRE SCH	SAJILONI	ECD/PRE-PRIMARY SCHOOL
OLOMAYIANA PRI	BISSIL	PRIMARY SCHOOL
OLONGUSUA ECD	SHOMPOLE	ECD/PRE-PRIMARY SCHOOL
OLOOLERA PRE SCH	TOROKA	ECD/PRE-PRIMARY SCHOOL
OLOOLONGOSUAN NUR	OLTUROTO	ECD/PRE-PRIMARY SCHOOL
OLOOLTOI NUR SCH	SINGIRAINE	ECD/PRE-PRIMARY SCHOOL
OLOONKURMAN ECD	LOODORIAK	ECD/PRE-PRIMARY SCHOOL
OLOONKURMAN PRI SCH	LOODORIAK	PRIMARY SCHOOL
OLOORNGOSUANI ADULT CLASS	KILONITO	ADULT EDUCATION CENTRE
OLOORNGOSUANI ECD	KILONITO	ECD/PRE-PRIMARY SCHOOL
OLOOSIYAMALIL NUR SCH	NKOILE	ECD/PRE-PRIMARY SCHOOL
OLOOSIYAMALIL PRI SCH	NKOILE	PRIMARY SCHOOL
OLORIKA NUR SCH	OLORIKA	ECD/PRE-PRIMARY SCHOOL
OLORIKA PRI SCH	OLORIKA	PRIMARY SCHOOL
OLORUKOTI NUR SCH	EMARTI	ECD/PRE-PRIMARY SCHOOL
OLOSERIAN NUR	OLMOLELIAN	ECD/PRE-PRIMARY SCHOOL

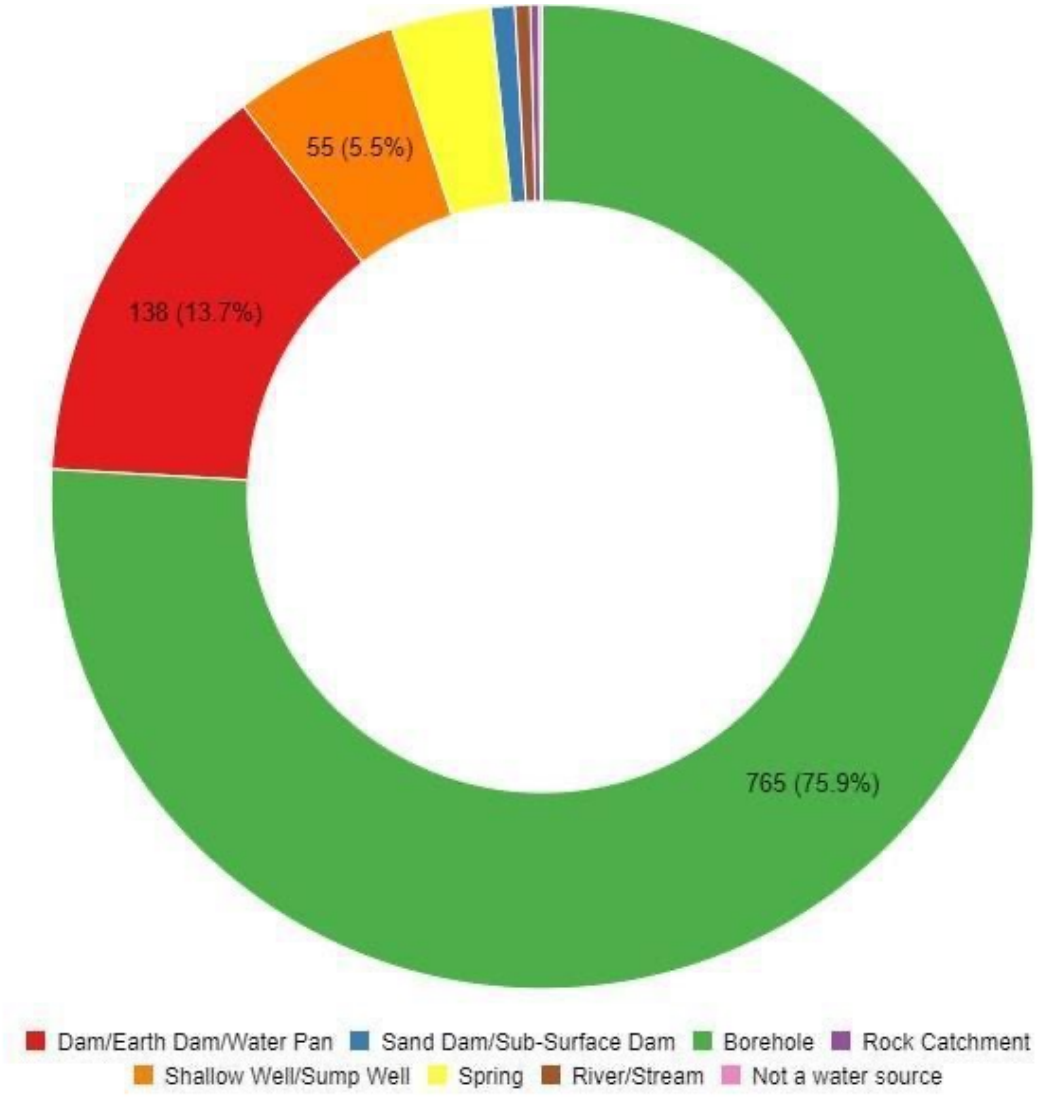
Name	Sublocation	Level
OLOSERIAN NUR	KUMPA	ECD/PRE-PRIMARY SCHOOL
OLOSHAIKI	IMBUKO	ECD/PRE-PRIMARY SCHOOL
OLOSHAIKI ECD	MOSIRO	ECD/PRE-PRIMARY SCHOOL
OLOSHORUA ECD	ENTASOPIA	ECD/PRE-PRIMARY SCHOOL
OLOYIAPASEI NUR SCH	NJUKINI	ECD/PRE-PRIMARY SCHOOL
OLPOLOSIE NUR SCH	OLGORRA	ECD/PRE-PRIMARY SCHOOL
OLSERIAN ECD	MAGADI	ECD/PRE-PRIMARY SCHOOL
OLTANKI PRE SCH	TOROKA	ECD/PRE-PRIMARY SCHOOL
OLTEPESI NUR SCH	NKOILE	ECD/PRE-PRIMARY SCHOOL
OLTEPESI PRI SCH	NKOILE	PRIMARY SCHOOL
OLTIASIKA B NUR SCH	OLORIKA	ECD/PRE-PRIMARY SCHOOL
OLTIASIKA PRE SCHOOL	OLORIKA	ECD/PRE-PRIMARY SCHOOL
OLTIASIKA PRI SCH	OLORIKA	PRIMARY SCHOOL
OLTIASIKA YOUTH POLYTECHNIC	OLORIKA	YOUTH POLYTECHNIC
OLTOME NUR SCH	AMBOSELI	ECD/PRE-PRIMARY SCHOOL
OMANGUNI NUR	BISSIL	ECD/PRE-PRIMARY SCHOOL
ORMANKEKI NUR	NAMANGA	ECD/PRE-PRIMARY SCHOOL
OSARAI NUR	OLTUROTO	ECD/PRE-PRIMARY SCHOOL
OSARAI PRI	OLTUROTO	PRIMARY SCHOOL
OSEKI NUR	OLTUROTO	ECD/PRE-PRIMARY SCHOOL
OSOIT NUR	ENTARARA	ECD/PRE-PRIMARY SCHOOL
OSOTUA NUR SCH	NKOILE	ECD/PRE-PRIMARY SCHOOL
OSOTUA PRE SCH	EMARTI	ECD/PRE-PRIMARY SCHOOL
OSUTUA ECD	ENTASOPIA	ECD/PRE-PRIMARY SCHOOL
OUR LADY OF MOUNT CARMEL ECD	ENTASOPIA	ECD/PRE-PRIMARY SCHOOL
OUR LADYOF MOUNT CARMEL PRI SCH	ENTASOPIA	PRIMARY SCHOOL

Name	Sublocation	Level
OYARATA NUR	KUKU	ECD/PRE-PRIMARY SCHOOL
OYARATA PRIMARY SCHOOL	KUKU	PRIMARY SCHOOL
PAKASE ECD	PAKASE	ECD/PRE-PRIMARY SCHOOL
PAKASE PRI SCH	PAKASE	PRIMARY SCHOOL
PARANAE ECD	OLKILORIT	ECD/PRE-PRIMARY SCHOOL
PARANAE PRI SCH	OLKILORIT	PRIMARY SCHOOL
PARSILET NUR	KUMPA	ECD/PRE-PRIMARY SCHOOL
PARSINTI NUR SCH	KILO	ECD/PRE-PRIMARY SCHOOL
PARSINTI PRI SCH	KILO	PRIMARY SCHOOL
PATTERSON MEMORIAL SEC SCH	OLKIRAMATIAN	SECONDARY SCHOOL
PILIWA PRE SCH	PELEWA	ECD/PRE-PRIMARY SCHOOL
PILIWA PRI SCH	PELEWA	PRIMARY SCHOOL
SAFENEST JUNIOR SCH	KIPETO	ECD/PRE-PRIMARY SCHOOL
SAIRASHIE NUR SCH	ENKORIKA	ECD/PRE-PRIMARY SCHOOL
SAIRASHIE PRI SCH	ENKORIKA	PRIMARY SCHOOL
SANARE NUR SCH	ARROI	ECD/PRE-PRIMARY SCHOOL
SANARE PRI SCH	ARROI	PRIMARY SCHOOL
SDA KETELE NUR SCH	SULTAN HAMUD	ECD/PRE-PRIMARY SCHOOL
SERE NUR SCH	ELUANATA	ECD/PRE-PRIMARY SCHOOL
SERE PRI SCH	ELUANATA	PRIMARY SCHOOL
SHILISHILI NABULAA NUR SCH	IMBIRIKANI	ECD/PRE-PRIMARY SCHOOL
SHILISHILI NUR SCH	IMBIRIKANI	ECD/PRE-PRIMARY SCHOOL
SHILISHILI PRI SCH	IMBIRIKANI	PRIMARY SCHOOL
SHINES ACADEMY	SAJILONI	ECD/PRE-PRIMARY SCHOOL
SHOMPOLE PRE SCH	SHOMPOLE	ECD/PRE-PRIMARY SCHOOL
SHOMPOLE PRI SCH	SHOMPOLE	PRIMARY SCHOOL
SHURIE EPISCOPAL NUR SCH	OLORIKA	ECD/PRE-PRIMARY SCHOOL

Name	Sublocation	Level
SILIGI SIDAI NUR	OLTUROTO	ECD/PRE-PRIMARY SCHOOL
SINGIRAINE ECD	SINGIRAINE	ECD/PRE-PRIMARY SCHOOL
SINGIRAINE PRI SCH	SINGIRAINE	PRIMARY SCHOOL
SINGOI PRE SCH	PELEWA	ECD/PRE-PRIMARY SCHOOL
SINGOI PRI SCH	PELEWA	PRIMARY SCHOOL
ST MARKS ACK NUR SCH	KITENKELA	ECD/PRE-PRIMARY SCHOOL
ST PETERS ENDUKUYA ORKEJU ECD	OLOYIANKALANI	ECD/PRE-PRIMARY SCHOOL
SUNDE NUR SCH	SULTAN HAMUD	ECD/PRE-PRIMARY SCHOOL
TIKOISHI ECD	OLOYIANKALANI	ECD/PRE-PRIMARY SCHOOL
TOROSEI PRE SCH	TOROSEI	ECD/PRE-PRIMARY SCHOOL
TOROSEI PRI SCH	TOROSEI	PRIMARY SCHOOL

Appendix 7: Borehole Water Sources in Kajiado

Kajiado Water Source Type. Borehole water sources (n-1324, borehole sources: 769)



Appendix 8: CEPC, CED, TC

County Energy Planning Committee (CEPC)

The County will establish County Energy Planning Committee (CEPC). The committee will be chaired by the County Executive Committee (CEC) member responsible for energy. The mandate of CEPC will include:

- Provide strategic leadership and governance oversight towards the realization of energy sector objectives.
- Deliberate and approve the recommendations submitted by the Technical Committee.
- Prepare CEP for approval at the County Assembly.
- Set out the county energy planning objectives and ensure they are aligned to the national energy planning objectives.
- Review periodic progress reports on the implementation of agreed targets in the County Energy Plan (CEP).
- Resource mobilization, with allocation and distribution of mobilized resources.
- Promote coordinated technical support and policy dialogue on strategic energy issues with national government,other county governments, development partners, Faith Based O ganizations, Non-governmental Organizations(NGOs) and Civil society and private sector partners.
- Ensure effective oversight through receiving and reviewing regular reports from the Technical Committee.

The membership of the CEPC shall constitute the following (Table1)

Sector	Institution Represented
County Government	CECM Energy
	CO Energy
	County Commissioner's Rep
	CECM Finance, Economic Planning
	CECM Education
	CECM Health
	CECM Agriculture
	CECM Environment, Natural Resources
	CECM Physical Planning
Key Stakeholders	Kenya Power
	REREC
	KFS
	Private Investors
	MCA-Committee on Energy
	Civil Society
To be co-opted on a need basis	KENGEN, EPRA, GDC, KETRACO, KEBS, CSOs, Private sector, Academia.

County Energy Directorate (CED)

Section 8.2.2 of INEP advises Counties to establish county energy coordination structures best suited to their needs. **Kajiado County will establish a fully-fledged energy directorate** for effective and efficient coordination of energy planning at the County level. The Directorate will provide the Secretariat services to the CEPC and will coordinate day to day function of energy planning at county level. The mandates of the Directorate as recommended under INEP are:

- Coordinate the development of CEP and thereafter submit the same to the CEPC for approval.
- Coordinate the review and update of the CEP every three (3) years while ensuring that each update takes into consideration changes in the economy, demography, technologies, and the global trends.
- Collect, collate and analyse data and information relevant for energy planning.
- Provide guidance on coordination and responsibilities on data collection, format, collation, analysis management, storage and sharing to support INEP at the national and county level.
- Develop guidance on coordination and roles/responsibilities on data access from non-energy datasets providers like KNBS, KFS.
- Undertake short-term and long-term forecasting, simulations and optimization of energy projects using appropriate tools.
- Consolidate the list of committed projects and their implementation timeframes.
- Develop screening mechanisms for their county energy projects identification based on least cost principles.
- Undertake monitoring and evaluation of the implementation of the CEP, and prepare and submit the progress report to the CEPC for publishing within three months after the end of each financial year.
- Collaborate with the Energy Planning and Coordination Unit at national level to develop a framework to guide the selection of the appropriate technology to meet energy demand.
- Provide technical data, statistics, and information to policy makers in the energy sector as may be appropriate from time to time.
- Initiate research in consultation with the relevant Agency to inform policy and decision making at the county level.
- Strengthen linkages and synergy with other sectors of the economy both at national and county level.
- Identify and propose capacity building areas relevant to energy planning in the county.
- Undertake any other tasks that may be assigned by the Chief Officer responsible for energy.
- Where necessary, identify and recommend to the Chief Officer for co-option, up to a maximum of five (5) members with specific technical skills necessary for the discharge of the CEPC mandate.

Technical Committee (TC)

The CEPC will establish a technical committee. The Technical Committee will be answerable to the Head of Energy Directorate. The mandates of the Technical Committee include:

- Collect, collate and analyse data relevant for county energy planning.
- Identify training needs and submit to the Head of Energy Department/ Directorate/ Unit for implementation.
- Prepare and evaluate the list of committed projects and their implementation.
- Prepare and update the CEP ensuring that each update takes into consideration changes in the economy, demography, technologies and the global trends as the case may be.
- Present the CEP to the Head of Energy Department/ Directorate/ Unit for guidance and endorsement.
- Undertake frequent monitoring and evaluation of ongoing projects, flagging out areas of concern whenever identified in a timely manner.
- Provide technical data, statistics, and information to the Head of Energy Directorate as may be appropriate from time to time.
- Any other assignment that may be given by the Head of Energy Department/ Directorate/ Unit or CEPC.

The technical committee will bring together representatives of key county partners to provide technical-level strategic leadership and direction and will have delegated authority of the Chief Officer for Energy to guide and contribute to the development and implementation of policy decisions, strategic directions and key interventions that will lead to the realization and attainment of energy objectives as given by CEPC. The members of the technical committee will be appointed by the Chief Officer responsible for Energy and its membership shall be drawn from the following organizations based on their competence and expertise. The Director responsible for energy will be the chair of the technical committee. For non-state actors they will be required to have provided the profile of their programmes/projects/activities to the county governments as per Annex 1. For effective engagement with the county governments, the non-state actors are advised to form associations:

- County Government
- National Government Ministries, Departments and Agencies relevant to energy
- Community Based Organizations (CBOs)
- Faith Based Organizations (FBOs)
- Civil Society Organizations (CSOs)
- Non-governmental organizations (NGOs)
- Private Sector
- Implementing partners

Practical ACTION

REPUBLIC OF KENYA

MINISTRY OF ENERGY AND PETROLEUM

From the People of Japan

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