Makueni County Energy Policy

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CHAPTER ONE: INTRODUCTION

This policy provides guidance to all the energy sector stakeholders and will be the basis for the development and implementation of the energy sector plans, strategies, legal, regulatory, institutional and fiscal frameworks. The Policy covers the entire energy sector value chain including energy resources, energy access (electricity & clean cooking solutions), productive use of energy, energy efficiency & conservation & and transport. It also covers cross-cutting issues like land environment, safety, health, climate change gender and social inclusion applies all aspects of the county's energy sector, including.

The Policy is structured into five chapters: Chapter 1 introduces the policy framework and context. Chapter 2 presents a situational analysis, detailing the present status, challenges, and opportunities within the energy sector. Chapter 3 outlines specific policy statements and interventions targeting multiple thematic areas. The policy statements are organised based on the policy objectives. Chapter 4 focuses on the implementation framework, specifying the governance structure, roles, timelines, and resources for policy implementation. Chapter 5 provides the monitoring, evaluation, and reporting mechanisms for accountability towards achieving policy goals

1.1 Background

Kenya continues to make significant strides towards the achievement of universal access to electricity and clean cooking technologies. By June 2021 Kenya had achieved a national electricity connectivity rate of 76.49%. The government has also developed clean energy initiatives which has resulted in the progressive increase in the number of households using LPG.[1] However much remains to be done. As at 2022 12.9 million Kenyans still lack access to electricity2 while 39 million lack access to clean fuels and clean technologies for cooking.3 Even for those with access to the grid, affordability remains a challenge. The average cost of electricity rose from US$ 0.17 (approx. KShs. 21.95) in 2020 to US$0.24 (approx. KShs.30.99) per kilowatt-hour (kWh) in 2024 for domestic users, and US$ 0.10 (approx. KShs. 12.91) to US$ 0.15 (approx. KShs. 19.37) for business users over the same period. Unreliable electricity supply and low energy efficiency compound these energy challenges across the country.

Within Makueni County, only 29% of households are connected to the grid despite good coverage in the county. Over 72% of households are dependent on solid biomass for cooking. These challenges are compounded by income poverty with just over half of the population spending more than 5% of their income on energy access. The lack of access to clean, affordable and reliable energy also hampers productive use of energy and impedes economic development within the County.

Within a legal framework which devolves several energy planning, regulatory and operational functions to county governments[4], this policy represents the Government of Makueni County's commitment to

[1] Against a target of 30% of households, an average of 30%, 40% 50% and 60% of households used LPG in the periods of 2018/2019, 2019/2020, 2020/2021 and 2021/2022, respectively. See MTP IV, p.62

2 IEA, IRENA, UNSD, World Bank, WHO, Tracking SDG 7: The Egergy Progress Report 2024, p. 31

3 Ibid, p. 54

[4] An overview of the legal and institutional framework appears at Annexure X of the Policy

promoting legal, regulatory and institutional reforms to ensure affordable, reliable and sustainable energy access for all.

1.2 Role of Energy in the County Development

In line with Fourth Medium Term Plan5 (MTP IV), 2023 – 2027, which recognises the role of energy as a lever for socio-economic transformation, the Government of Makueni County recognises the role of energy as an enabler for all economic sectors. While biomass (dominated by wood fuel and charcoal in particular) has been the predominant energy source within the county, there is a recognition that its extensive use has not been sustainable, exacerbating climate impacts and impeding local climate adaptation efforts. Green energy development and promotion is therefore included within the framework of the County Integrated Development Plan.

The promotion of productive use of (renewable) energy in agriculture holds the potential of enhancing agricultural value chains and unlocking increased yields while reducing post-harvest losses by facilitating irrigation, food_preservation through drying and cold storage within Makueni County. Solarization of health centers can significantly reduce electricity costs, unlocking savings which could support the establishment of additional model health centers across county wards. The proposed establishment of energy centers to support demonstration of energy technologies would not only create job opportunities but increase community awareness about energy solutions to meet their diverse needs and power rural development initiatives.

In keeping with the commitment for a just energy transition, the Government of Makueni County (GMC) is committed to renewable energy deployment undergirded by a strong policy regulatory and institutional framework. There is recognition that this holds potential for building a resilient energy sector providing energy access and security, and as an engine for job growth and shoring climate resilience in the community. As part of its policy commitments the GMC will facilitate creation of employment opportunities, incentivize deployment structured to facilitate landowner income and foster energy independence and cost saving through mini-grid and off-grid solutions. Recognizing the challenge of biomass dependence, the County is also committed to pursuing strategic partnerships to facilitate clean cooking adoption to reduce dependence on solid biomass.

5 The implementation of Kenya's Vision 2023 Agenda has been through successive five-year Medium-Term Plans (MTPSs). The MTP IV 2023 – 2027 is themed: "***Bottom-Up Economic Transformation Agenda for Inclusive Growth (BETA)".*** It implements the BETA which is geared towards economic turnaround and inclusive growth through a value chain approach. BETA targets sectors with high impact to drive economic recovery. BETA's objectives are bringing down the cost of living, eradicating hunger, creating jobs, expanding the tax base, improving foreign exchange balances and inclusive growth. This will be achieved through targeted investments in five core pillars, namely: Agriculture; Micro, Small and Medium Enterprise (MSME) Economy; Housing and Settlement; Healthcare; Digital Superhighway and Creative Economy. BETA will be implemented through five MTP IV sectors, namely: Finance and Production; Infrastructure; Social; Environment and Natural Resources; and Governance and Public Administration.

1.3. Rationale for Government Action

The formulation of this policy and the strategies proposed are anchored on the recognition of the important role of energy as a lever for socio-economic development. GMC's intervention proposed in this policy are informed by the recognition of the important role of energy as a lever for socio-economic development and the provisions of the Constitution of Kenya, 2010 and Energy Act, 2019 which set out national government and county government energy functions. Within this framework, County Governments are mandated to cascade national policies and regulations at county level to effectively develop and manage local energy resources to meet the energy needs of their constituents.

This policy represents a critical step towards this by setting out the overarching policy objectives and strategies for their achievement, as well as the guiding principles which will inform energy sector decision making within Makueni County. It is undertaken to provide a framework to guide strategic, transparent and inclusive decision making. In doing so the policy aims to encourage investment and creation of inclusive growth, job creation and economic empowerment of marginalized groups within Makueni County. These aims are underpinned by Kenya's commitments to the Sustainable Development Goals, African Union Agenda 2063, East Africa Community 2050 and Paris Agreement.

The achievement of these objectives is a function of intergovernmental cooperation between national and county government and different state agencies. The next two sections set out the division of energy functions and the key sector institutions.

1.4 Functions of County Governments

Articles 185(2), 186(1), and 187(2) of the Constitution of Kenya 2010 introduced significant changes in the country's governance structures concerning administrative, resource allocation, and service delivery functions. It has added two levels of government, i.e., the National and County Governments, and further provided for the distribution of functions and powers between the two levels, *inter alia*, under [12]

Part 1 of the Fourth Schedule of the Constitution provides that the National Government shall be responsible for: (a) the Protection of the environment and natural resources to establish a durable and sustainable system of development including water protection, securing sufficient residual water, hydraulic engineering and the safety of dams. (b) Energy policy, including electricity and gas reticulation and energy regulation; and (c) Public investment.

Part 2 of the Fourth Schedule provides that County Governments shall be responsible for county planning and development, including electricity, gas reticulation, and energy regulation.

The Fifth Schedule of the Energy Act 2019 distinguishes roles between County and National Governments. Accordingly, County Governments are mandated under the act to:

a. develop and submit a county energy plan which should incorporate petroleum, renewable energy and electricity master plans to be submitted to the Cabinet Secretary in respect of its energy requirements.

b. carry out feasibility studies for renewable energy in the counties aimed at providing relevant information for optimal exploitation of these resources and to aid in the development of county renewable energy master plans.

c. Physical planning relating to energy resource areas such as dams, solar and wind farms, municipal waste dumpsites, agricultural and animal waste, ocean energy, woodlots and plantations to produce bioenergy feedstocks.

d. Provision of land and rights of way for energy infrastructure.

e. Facilitation of energy demand by planning for industrial parks and other energy-consuming activities.
f. Preparation and implementation of disaster management plans

Additional roles include:

a. County energy regulation and licensing of:

    i. retail petroleum service stations.
    ii. County gas reticulation systems.
    iii. designated parking for petroleum tankers.
    iv. biomass production, transport and distribution.
    v. biogas systems.
    vi. charcoal production, transportation and distribution and

b. County regulation, licensing and supply of retail coal products for domestic use.
c. Customizing national codes for energy efficiency and conservation in buildings to local conditions.
d. County Operations and Development

    i. Electricity and gas reticulation.
    ii. Provide and maintain adequate street lighting.
    iii. Provision of designated parking for petroleum tankers.
    iv. Collect and maintain energy data.
    v. Implementation of County electrification projects.
    vi. Undertake feasibility studies and maintain data to avail the same to developers of energy resources and infrastructure.
    vii. Establishment of energy centres for promotion of renewable energy technologies, energy efficiency and conservation.
    viii. Protection of energy infrastructure including oil and gas fields and pipelines, refineries, power plants, control centres, electric.
    ix. Supply lines, substations and depots.
    x. Undertake energy efficiency and conservation within the County.

While the devolution of these energy functions is welcome, there remain several areas of concurrent responsibility shared by national and county governments. Where there are clear cut demarcations of function, national and county governments remain interconnected requiring significant coordination. This policy identifies some of these areas with recommendations on how they may be overcome.

1.5 Policy Issue(s) Identification

Makueni County has abundant energy sources mainly solar, wind, biomass and other renewable energy resources. Yet the use of these resources remains low leading to widespread energy poverty in the county. Energy poverty is compounded by income poverty with just over half of the county population spending more than 5% of their incomes on energy access.

Lack of access to clean affordable, reliable and sustainable energy has adverse health impacts for households which continue to rely on biomass for cooking. It is also a barrier to economic development through productive use of energy. It has specifically impeded development of the county's agricultural potential, denying many farmers electricity for irrigation and contributing to loss of produce due to lack of energy for refrigeration and storage. Even for those with access to the grid, affordability remains a challenge.

These challenges call for innovative solutions. The devolution of energy functions to the County presents several opportunities but equally requires policy, regulatory and institutional development. This policy represents the GMC's commitment to promoting legal, regulatory and institutional reforms including leveraging private sector investment, and support from donor partners to address these challenges through scaling of affordable reliable and energy access solutions for all.

The Policy covers the following **key thematic areas**

- Energy resources & development,
- Electricity & clean cooking access,
- Productive use of renewable energy (PURE),
- Energy efficiency & conservation including transport & street lighting,
- Energy financing and
- Emerging, and cross cutting issues

1.6. Policy Goal, Objectives and Guiding Principles

1.6.1 Policy Goal

To ensure access to sustainable, adequate, affordable, competitive, secure, and reliable to modern energy to meet the needs of the people of Makueni County.

1.6.2 Policy Objectives.

The objectives of this Policy are:

1. To formulate and strengthen legal and institutional frameworks that promote clean, sustainable energy infrastructure development.
2. To promote sustainable development and promotion of renewable energy resources and the associated infrastructure.
3. To achieve universal electricity and clean cooking access.
4. To support national government efforts towards development and operations of a sustainable energy sector and secure energy supply.

5. To promote growth of PUE with an emphasis on renewable energy for improved socio-economic transformation in Makueni County.
6. To promote adoption of Energy Efficiency and Conservation measures in Makueni County
7. To mobilize financing and other necessary resources towards the implementation of energy projects and programs in Makueni County
8. To mainstream environmental and social safeguards and climate resilient livelihoods in the energy sector

1.6.3 Guiding Principles

The guiding principles of this Policy are premised on Kenya's and county's laws, relevant regional and international laws and principles which are referenced in Annexure X (these laws will be added in the annex). This Policy will be guided by the following principles:

1. Good governance: upholding transparency, accountability, and efficient resource management and enhancing working procedures that fully comply with the principles of best governance practice.
2. Equity, inclusivity and proximity: Ensuring universal access to affordable and adequate energy while mainstreaming gender and empowering marginalized groups and those near energy projects.
3. Sustainability: Ensuring sustainable energy development, services delivery and utilization of energy resources including financial resources.
4. Stakeholder Engagement & Partnerships: Engagement and effective communication among all partners including the public in designing, implementing, monitoring and evaluating energy programmes.
5. Capacity building and employment creation: building human and institutional capacity within the County Government and community as well as facilitating employment opportunities for all including the marginalized.
6. Environment, healthy safety and climate change: Ensuring energy activities and projects are implemented in accordance to sound health and safety principles and aligned to sustainable management of the environment and natural resources while adhering to climate change mitigation objectives.

CHAPTER TWO: SITUATION ANALYSIS

This Chapter provides the status, challenges, and opportunities in the County's energy sector that form the foundation for the policy interventions outlined in Chapter 3, organized around the key thematic areas mentioned in Chapter 1 and highlighted below.

- Energy resources & development,
- Electricity & clean cooking access,
- Productive use of renewable energy (PURE),
- Energy efficiency & conservation
- Road transport & street lighting,
- Energy financing and
- Emerging, and cross cutting issues

2.1 Energy Resources & Development

This section will focus on the status of renewable energy resources such bioenergy, hydro, wind, solar, geothermal and waste to energy as well as other geo-energy energy resources like coal and natural gas.

2.1.1 Bioenergy

Makueni County is endowed with diverse natural resources, including sand deposits, forests, and conservation areas, which play a vital role in the region's environmental and economic sustainability. The County is also home to significant conservation sites such as the Chyulu Hills National Park, established in 1983. This park is part of the Tsavo conservation area and plays a crucial role in preserving local biodiversity and promoting tourism. However, increasing human activities such as sand harvesting, deforestation, and agricultural expansion pose significant challenges to resource conservation and energy sustainability.

As in other parts of Kenya, woody biomass is the dominant bioenergy for cooking in form of firewood and charcoal, particularly among rural and peri-urban households, cottage and/or MSMEs, and learning and correctional institutions. Other forms of biomass used as sources of bioenergy include crop residues or animal dung which provide energy needs for cooking, heating, drying or electricity production. Biomass energy resources are derived from forests - closed forests, woodlands, bush lands, grasslands, farmlands, and plantations, as well as from agricultural and industrial residues.

This section provides the status on bioenergy potential in Makueni County in the form of woody biomass (firewood and charcoal) as well as other forms of bioenergy such as crop residues or animal slurry, biogas etc. which provide energy needs for cooking, heating, drying or electricity production. The challenges and opportunities for bioenergy are highlighted after a brief background of each of the bioenergy resources in Makueni County.

Firewood and charcoal

The woody biomass resources of Makueni County include public forests, bushland and/ shrub land, and on-farm trees under agroforestry systems. The County's Spatial Plan indicates that forests account for 17% of the total land cover in Makueni County (136,590 ha) and bushlands cover 48% of the County (385,666 ha).[6] The total forest cover, spanning both protected and non-protected areas, including gazetted and non-gazetted lands, is recorded at 136,590 ha. The forestland reported in the County Spatial Plan is assumed to include forests managed by the national government (including those in protected areas like national parks), county government, or by private entities such as group ranches. The County Spatial Plan further indicates that there are five gazetted forests under the national government, managed by the Kenya Forest Service (Makuli, Nthangu, Mbooni, Kibwezi, Kilungu forests); 28 community forests, covering approximately 15,200 Ha, and managed by the County Government, as well as 3 non-gazetted forests covering 4,000 ha. [7] This forest cover includes protected and non-protected areas. However, the biomass resources in protected areas are not available for consumption.

Like the rest of Kenya, tree cover in Makueni County has been decimated substantially due to the expansion of settlement areas, agricultural activities, and charcoal and firewood harvesting. The county lost 2,092 ha between 2001 and 2021relative to a national average of 33ha[8]. Moreover, biomass

[6] Makueni County Spatial Plan (CSP) 2019-2029
[7] County Government of Makueni, 2019
8 Global Forest Watch: Forest Monitoring, Land Use. Available online: https://www.globalforestwatch.org. (Accessed on 8 May 2023)

available in Makueni County is used both for bioenergy and construction, with competition between the two uses occurring at an approximate ratio of 1:1 as per the county energy plan.

In view of the above factors, the net annual productivity of wood from farms and forests available for bioenergy purposes is estimated as 19,837 tons (equivalent to 377 TJ) in 2025. However, the demand for woody biomass (aggregating firewood and the wood used to produce charcoal) across all the demand segments (households, MSMEs & cottage industries and learning & correctional institutions and health facilities) in Makueni County is 681,314 tons (equivalent to 12,948 TJ) in 2025. A comparison of consumption and supply reveals that the county is experiencing a negative wood fuel balance. This is the main characteristic of the business-as-usual (BAU) scenario, excluding any policy intervention either to increase fuelwood supply or to influence fuelwood demand downward. Aggressive afforestation is therefore required to enhance sustainable supply of woody biomass.

Biogas production from livestock-based wastes

The county has a substantial population of livestock[9]. This policy aims to promote anaerobic digestion for biogas production particularly from beef and dairy cattle and small ruminants (sheep and goats). Pigs and rabbits are also reared but their respective populations are not substantial. From cattle, sheep and goats, the total biogas potential is about 1TJ in 2025. Biogas units can be constructed to meet daily energy demand of about 42 households annually, contributing to potentially saving 0.1 ha of forests. The potential of biogas is expected to increase as the livestock population increases.

Bioenergy production from crop residues (pellets and briquettes)

A large portion (63%) of Makueni County is considered arable. However, productivity is constrained by deficiency in soil moisture as the county is dry for most of the year. [2]. Residues from major crops such as maize, coffee, macadamia, sorghum, beans, pigeon peas, cow peas and green grams can be used to produce briquettes or pellets for local consumption. Bioenergy potential from the major crops that can be harnessed as briquettes and pellets is about 4 TJ in 2025. This could potentially save 0.2 ha of forests and meet daily energy demand of 160 households annually. This potential is expected to increase as production of these crops grows. Small and medium enterprises within the county can harness this potential and develop local industries that produce briquettes and pellets for local consumption. Aggregation of feedstock from small scale farmers will be necessary for the success of these industries.

Biogas production from industrial processing of sisal and mangos

Industrial processing of sisal and mangoes generates waste (substrates and wastewaters) that has potential for biogas production. Mangoes are generally grown in all the six Sub-Counties of Makueni County. The Makueni Fruit Processing Plant (MFPP) in Kalamba has been processing mangoes to puree since 2017[10]. Mangoes production is expected to increase.

Large sisal plantations are mainly in Kibwezi East sub-county and sisal processing is undertaken at Dwa Sisal Factory. The coverage of the sisal plantations is not expected to change in the foreseeable future. As of 2025, the potential biogas production from both mangoes and sisal processing is about 1 TJ. This could potentially save 0.2 ha of forests annually.

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9 [1] County Government of Makueni (2022). Makueni County Statistical Abstract 2022

10 County Government of Makueni (2022). Makueni County Statistical Abstract 2022

Biogas production from slaughterhouses/abattoirs

The meat industry produces large amounts of waste because a substantial amount of animal composition is considered unfit for human and animal consumption. Additionally, meat processing plants and slaughterhouses are known to consume huge volumes of water and big generators of wastewater[11]. In Makueni County, the animals that are slaughtered for consumption are mainly cattle and the small ruminants (sheep and goats). Potential biogas production from slaughterhouses/abattoirs as of 2025 is approximately 991 GJ. This could potentially save 0.1 ha of forests annually and is expected to increase proportionate to the projected increase of animals slaughtered.

This policy will aim to support harnessing of the bioenergy that can potentially be produced from slaughterhouses/abattoirs across Makueni County.

Biogas production from municipal wastes

Different waste-to-energy (WtE) technologies are applicable, including (i) incineration, (ii) co-processing, (iii) anaerobic digestion (AD), (iv) landfill gas collection, and (v) pyrolysis/gasification. AD (for production of biogas) is considered as the most viable technology, since most of the solid waste has the highest proportion of organic materials with high moisture content. The County is yet to develop adequate sewerage waste management facilities. From the solid wastes, biogas production potential is approximately 14 GJ. This could potentially save about 0.001 ha of forests and is projected to increase proportional to waste collected.

Challenges Facing Production and Use of Bioenergy

- High dispersal of feedstock, especially those from smallholders who are scattered across the county, coupled with poor supply infrastructure and high sourcing costs.
- Deficit of wood-fuel supply coupled with expansive areas of degraded land.
- Plastic wastes share a substantial proportion of urban solid waste composition. Plastics may potentially complicate the utilization of organic wastes due to challenges of sorting, making the cost of pre-treatment and conversion high.
- Limited enterprises engaging in alternative bioenergy
- Limited local capacity to pair available feedstock with suitable technology fit
- Lack of capacity to undertake operation and maintenance of bioenergy technologies, within communities.
- Lack of mature technologies for commercial packaging and distribution of biogas.
- Underdevelopment of business models that can support penetration of bioenergy technologies and fuels
- Limited community and institutional financing options to support households, institutions and entrepreneurs who wish to develop bioenergy technologies and fuels
- High initial cost and low availability of packaging equipment, especially for pellets and briquettes where the interest is to transport them from rural production centers to peri-urban areas.
- Unsustainable consumption of firewood in Makueni County,
- There is low adoption of clean cookstoves in Makueni County
- Low awareness on the benefits and potential of biogas technologies

11 Aleksić et al., 2020

Opportunities for bioenergy development and use

- The high reliability for woody biomass for bioenergy can offer incentives for afforestation to enhance sustainability of supply and for landscape restoration initiatives.
- The national government initiative aims to achieve 30 % tree cover across the country by 2032.
- Makueni County has a history of growing bioenergy crops, including castor between 1980s and 1990s, therefore indicating a high likelihood of smallholder farmers adopting such initiative. Moreover, the presence of Eni's Agri Hub in the county is an indication of a ready market for oil seed.
- The county also has youthful population and vibrant small and medium enterprises who would be willing to maximize the green opportunities and economically develop local supply chain to aggregate the feedstock from small-scale farmers.
- In Makueni County, large establishments like Kalaba Fruit Processing Factory, Dwa Sisal Processing Plant, Eni's Agri Hub offers opportunities for developing public-private partnership (PPP) related to bioenergy.

2.1.2 Hydro

Background

Makueni County has some water resources that are suitable for large-scale hydropower generation, however, most of the county and populations inadequately supplied with water[12]. The County is crossed by two permanent rivers; Athi river and Kibwezi river which could provide opportunities for hydropower development such as the ongoing construction of the Thwake Multipurpose Dam[13]. There are also some seasonal rivers in the county, including the Kaiti, Tyaa, Nguu, and Kambu rivers, which could provide opportunities for micro or small hydropower plants. Kibwezi West Sub - County has a potential of 0.16 MW and near the western border of Makueni along river Kiboko, there is a potential of 0.4 MW if exploited. This could potentially benefit populations in Makueni near that border hence illustrating the need for inter-county energy resource assessments and collaboration with regards to energy access projects.

Opportunities

1. The relatively hilly terrain offers opportunities for harnessing water flowing through streams and rivers, where small hydroelectric plants can be innovatively designed to tap the naturally occurring gravity-fed water ducts and built to serve local populations.[14]

[12] NEMA. (2025). Makueni County. Available at: https://www.nema.go.ke/index.php?option=com_content&view=article&id=257&catid=2&Itemid=410. (Accessed 28/03/2025)
[13] AFDB. (2024). A Race Against Time: The Thwake Dam Story. Available at: https://www.afdb.org/en/news-and-events/race-against-time-thwake-dam-story-75070#:~:text=It%20is%20a%20cornerstone%20of,irrigate%2040%2C000%20hectares%20of%20land. (Accessed 27/03/2025)

[14] Kitetu J, Thoruwa T, Omosa I. Energy needs within the rural community in Makueni County, Kenya. *Energy Sci Eng*. 2024; 12: 3540-3549. Available at: doi:10.1002/ese3.1839. (Accessed 28/03/2025)

2. Given Makueni's sunny climate, combining small-scale hydropower projects with solar energy systems could provide a more stable energy supply. Solar energy can complement hydropower during periods of low rainfall or dry seasons thus improving reliability[15].

3. With Kenya's commitment to renewable energy, there are opportunities for private investments in small hydropower projects, especially with government incentives or funding for clean energy solutions and FIT policy.

4. By leveraging community involvement, public-private partnerships, and integration with solar power, Makueni County could benefit significantly from hydropower projects, contributing to sustainable energy access and rural development.

Challenges

- The seasonality of rainfall and rivers in Makueni County can affect the consistency and reliability of water flow, which is crucial for hydroelectric power generation.
- Makueni does not have extensive bodies of water or large rivers suitable for large-scale hydropower stations.
- Encroachment on riparian areas, threatening long-term resource viability.
- Inadequate financial resources and technical capacity for feasibility studies and resource development.

2.1.3 Solar

Background

According to the Global Solar Atlas[16], the solar potential in Makueni is significant, particularly in the southern and north-western parts of the county. The solar potential is illustrated using the Global Horizontal Irradiation (GHI), measured in kilowatt hours per square metre (kWh/m2), which considers the long-term energy availability of solar resource at any location in the county. The County is endowed with GHI of about 2,008 kWh/m^2 per year. This illustrates very high solar potential which could be utilized to meet the demand for power in off-grid areas in Makueni through solutions such as solar home systems and solar mini grids. Solar energy is used for productive uses such as irrigation, water heating, refrigeration, lighting, and other commercial activities.

Challenges to Solar Power Development in Makueni

- The initial costs of solar equipment (panels, inverters, batteries) are higher in Kenya as compared to other developed countries[17], making it difficult for off-grid rural communities or small businesses to afford solar systems without financial assistance.

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[15] Z Dobrotková. World Bank Group, ESMAP. Hydro-connected solar in West Africa: theoretical framework. Available at: https://www.esmap.org/sites/default/files/events-files/6_Hydro-connected%20solar.pdf. (Accessed 28/03/2025)

[16] Global Solar Atlas - https://globalsolaratlas.info. Datasets are on long-term yearly average of global horizontal irradiation (GHI) in kWh/m2 and potential photovoltaic electricity production (PVOUT) in kWh/kWp, covering the period 1994-2018.

[17] IEA. (2025). How a high cost of capital is holding back energy development in Kenya and Senegal. Available at: https://www.iea.org/commentaries/how-a-high-cost-of-capital-is-holding-back-energy-development-in-kenya-and-senegal. (Accessed 31/03/2025)

- Poor installations, importation of sub-standard systems and poor maintenance services undermine market confidence in solar systems.
- Lack of an enabling framework for exporting and selling surplus captive power from solar PV self-generating facilities e.g the makueni Level 5 Hospital
- Limited awareness of solar thermal systems e.g solar water heating
- For large solar projects, challenges related to land acquisition, infrastructure development (such as universal coverage of transmission lines and inadequate road protection/maintenance and improvement), and logistical support such as adequate availability of solar systems components and replacement parts locally[18].

Opportunities

- The county's landscape consists of a mixture of plains and hills[19] providing a varied topography that could be well-suited for large-scale solar installations, including solar farms.
- Presence of business models such as pay-as-you-go (PAYG) systems can help accelerate adoption.
- There is a growing interest from both local and international investors in solar power projects in Kenya, and Makueni could attract such investments, particularly for decentralized solar solutions and solar farm developments.
- There is significant potential to scale up solar-powered irrigation systems, which can support Makueni's agricultural sector and help boost food production.

2.1.4 Wind

Background

According the Makueni County Energy Plan (2023 -2032), higher wind speeds of above 6m/s at a height of 100m are located towards the northern and south-western parts of the county within Kilome, Kaiti, Mbooni, Kibwezi West and Kibwezi East sub counties.

Challenges to Wind Power Development in Makueni

- Inadequate wind regime and resource potential data
- High initial costs and investment costs for installing wind turbines and associated infrastructure (such as wind measurement equipment, transmission lines, and energy storage)
- Environmental and land use concerns such as the impact on local wildlife, that need to be addressed in project planning[20]
- Limited public and investors awareness of wind energy resource potential, opportunities in the county.

Opportunities for Wind Power Development in Makueni

- Small-scale and micro wind power projects could be a feasible option for Makueni, particularly for rural electrification and agriculture.

[18] Government of Makueni County. (2022). Makueni County Transport Policy. Available at: https://makueni.go.ke/sandbox/site/files/2023/05/Makueni-County-Transport-Policy.pdf. (Accessed 28/03/2025)
[19] Government of Makueni County. (2025). About Makueni County. Available at: https://makueni.go.ke/about-2/. (Accessed 31/03/2025)
[20] WINDExchange. (2025). Wind Energy's Potential Effects on Wildlife and the Environment. Available at: https://windexchange.energy.gov/projects/wildlife. (Accessed 31/03/2025)

- Integrating wind power with other renewable energy sources like solar power can create hybrid systems that are more reliable and efficient.

2.1.5 Geo-energy Resources (Geothermal, Coal, Natural Gas)

The county has not established geo-energy resources exploitation yet. However, preliminary and detailed geoscientific studies and assessment of geothermal resource potential have been undertaken in areas such as Chyulu Hills where preliminary reconnaissance shows there exists potential for geothermal energy, however surface exploitation, wells siting, and drilling have not been done yet.

Challenges

- Limited funding for exploiting the geo-energy resources due environmental concerns such as soil erosion, deforestation to create access routes to the geothermal sites, livestock grazing land reduction, and potential contamination of water resources[21].
- Intensive capital for geo-energy resources exploration and development

Opportunities

- Availability of institutions in the country to support exploration of geo-energy resources
- Chyulu Hills has been identified as a potential site for geothermal resources

2.2 Electricity Access

This section covers the status of electricity access for households, community facilities such as education, health, trade centres, and productive activities (SMEs and agriculture). More on productive use is covered under section 2.4

Electricity access plays a critical role in the attainment of all SDGs, including poverty eradication, food security, health, education, and gender equality. However, according to Makueni CEP, the household electricity access in the County stood at 75% as of 2022 (solar systems-40.2%, grid-29.2%, and mini-grid-5.7%. The percentage of households connected to both grid and mini grids is 34.9%. Thus, only these households have access to sufficient electricity that can potentially undertake productive uses especially in the rural areas. The average electricity connectivity rate for educational institutions stood at 86% in 2022. Despite this high connectivity, 20% of these institutions are unable to use electricity due to incomplete wiring in the facilities, malfunctioning transformers, and meters that are still awaiting commissioning. As of 2022, about 16% of rural health care facilities (HCFs) were not connected to the electricity at all. In 2021, 96.5% of trade centers were connected to an electricity supply, primarily from the grid. The national grid provides electricity to an average of 80% of SMEs, while solar energy accounts for 10%. (Makueni CEP, 2024). This policy aims to accelerate the provision of adequate, reliable, affordable electricity services that can deliver basic electricity, or a minimum level of electricity consumption[22] across all demand locales in Makueni.

Challenges

1 Limited funding from the GMC and partners to implement electricity access programs

[21] LN Masikonte· (2020). Potential Environmental and Socio-Economic Effects of Geothermal Exploitation on the Local Community – A Case of Suswa Geothermal Plant. Available at: https://erepository.uonbi.ac.ke/bitstream/handle/11295/154486/Lydia%20Naneu%20Final%20Project%20.pdf?sequence=1. (Accessed 29/04/2025)

[22] Modern-Energy-Minimum-Sept30.pdf

2 The high initial cost of connection to the national grid since over 70% of households and not all public facilities are connected to it despite the good grid coverage.
3 Lack of adequate power to stimulate productive engagements due to low grid connectivity despite the good grid coverage.
4 Low incomes levels for households prohibiting affordability of energy services (more than half have an income of less than 10,000 per month)
5 High cost of electricity making it unaffordable to most households, MSMEs and community facilities. End-user prices in Kenya remain some of the highest on the continent, at 0.256 USD/kWh as of September 2023 (compared to 0.191 USD/kWh in Rwanda, 0.190 USD/kWh in South Africa, 0.173 USD/kWh in Uganda and 0.058 USD/kWh in the Democratic Republic of the Congo).[23]
6 Unreliability and unavailability of grid electricity services (only 24.3% have power available at least 8 hours per day while 35% experience at least one outage per week-(CEP,2024) making users to seek alternatives like generators further incurring additional fuel costs.
7 Limited granular data on access to electricity
8 Inconsistent component standards, faulty installations and importation of sub-standard products for standalone off-grid solar PV systems
9 Incomplete wiring of community facilities e.g education, malfunctioning transformers, and delayed commissioning of KPLC meters lead to electricity connections that are unutilized.
10 Overlapping mandates in rural distribution assets ownership especially with REREC.

Opportunities

i. Existence of Makueni County Energy Plan and productive use of renewable energy (PURE) Investment Prospectus which highlight key and priority projects and programs to support the achievement universal energy access
ii. Good grid coverage in Makueni County presenting opportunity to provide electricity access through grid densification and intensification
iii. Partnership with the international community places the county in a good position to access global climate and energy financing for energy projects.
iv. Availability of good governance, political will and community involvement in Makueni County regarding energy and related projects
v. Availability of geographic information systems like Energy Access Explorer (EAE) to inform policies, planning and investments.
vi. Presence of policies and regulatory frameworks like net meeting regulations can encourage the growth of C&I in Makueni

2.3 Clean Cooking Access (LPG, Electricity and Bioethanol)

This section shall cover status of cooking in the county across households, community facilities and MSMEs as well as clean cooking solutions including traditional, transitional and modern cooking technologies (or cookstoves) and fuels. Technologies using natural gas, liquefied petroleum gas (LPG), electricity, bioethanol, and biogas are considered as clean cooking solutions. Improved biomass cookstoves (ICS) of ISO tier 3 rating for thermal efficiency are considered as a transitional technology while traditional as those using kerosene, firewood, traditional charcoal (KNCTS, 2024).[24] This policy aims to accelerate transition to cleaner cooking solutions to drive gender equality, reduce poverty, slow climate change and provide enormous health benefits.

[23] Kenya 2024 Accessed on April 17 2025
[24] Kenya National Cooking Transition Strategy.pdf

Firewood remains the primary cooking fuel for households in Makueni County at an average of 72.5% in 2022 (CEP, 2024). The burden of collecting firewood is primarily carried by women and children, thus disproportionately affects women and children, and is a major CO2-emitter. Access to clean cooking fuels was 17.9% in 2022, with LPG dominating the fuels at 17.6%. Although 29% of households in Makueni had access to grid electricity in 2022, only 0.3% used it to cook. In terms of cooking technologies, 67% of households in Makueni use inefficient three-stone open fire as the main technology for cooking, followed by metallic charcoal stoves (33%) and LPG (21%), stacking not taken into consideration. About 95 % of learning institutions in Makueni County use firewood as the primary cooking fuel. For HCFs, LPG is the main fuel for cooking, followed by charcoal and firewood, while for MSMEs firewood is the primary fuel, followed by charcoal, LPG, electricity, kerosene and biogas.

Challenges to Clean Cooking Access

i. High upfront cost of clean cooking technologies and equipment relative to traditional biomass methods.
ii. Price volatility and policy shifts due to reintroduction of VAT on LPG that caused some households de-transition to firewood
iii. Underdeveloped distribution networks for clean cooking fuels and technologies that limit distribution at the last mile.
iv. Insufficient awareness of the benefits of clean cooking technologies and fuels especially bioethanol and electric cooking
v. Limited funding for clean cooking solutions.
vi. Limited data availability on clean cooking solutions and programs has constrained the planning and resource mobilization for projects.
vii. Unavailability of dry firewood during the rainy season causing the communities to purchase firewood at high prices.
viii. There is limited capacity to manufacture/fabricate biomass improved cookstoves locally in Makueni.
ix. Low adoption of electric cooking by HHs with grid access mainly due to the cost of electric cookstoves and affordability & reliability of electricity supply.
x. Lack of adequate feedstock for biomass production especially for bioethanol

Opportunities

i. Increased global focus on clean cooking globally and nationally.
ii. Presence of CEP highlighting specific actions to stimulate clean cooking adoption
iii. Existence of the national strategies e.g bioenergy, LPG, e-cooking that the county can leverage on to promote respective clean cooking solutions
iv. Existence of established clean cooking distributors like KOKO Networks, Vivo Energy to leverage, BURN etc
v. The Presidential Directive to transition all public institutions from firewood to LPG for cooking
vi. Expanding access to grid-based electricity in Kenya especially in urban and peri-urban areas can help increase uptake of electric cooking.
vii. Availability of local manufacturers of clean cooking solutions e.g ICS
viii. Availability of clean cooking fuel resources e.g biogas in select areas
ix. Potential to leverage Carbon Finance and Green Bonds for clean cooking
x. Potential environment for cassava production in favour of food and bioethanol especially in Kibwezi subcounties

2.4 Productive Uses of Renewable Energy in Agriculture, Health and Light industries

There is no universally agreed definition of PURE. This policy however defines **Productive Uses of Renewable Energy (PURE)** as the application of energy (mainly electricity) generated from **renewable sources** (e.g. solar) either **directly or through energy efficient technologies** to improve livelihoods and increase **income or productivity**. Common PURE use cases include RE for water pumping for irrigation or other uses, cold storage and refrigeration, milling, drying, farm mechanization, transportation, SMEs, and light industries, among others.

Limited energy access especially for agriculture, healthcare, and small enterprises hinders productivity, innovation, and resilience against climate and economic shocks. Addressing these gaps through targeted investments in renewable energy infrastructure can unlock significant socio-economic benefits. This policy places specific focus on PURE across the agricultural value chain, health, and light industries/SMEs.

Background

Opportunities for PURE in Makueni County exist across **agriculture, healthcare, and businesses**. In agriculture, solar-powered irrigation, cold storage, and agro-processing can enhance yields, reduce post-harvest losses, and improve market access. In healthcare, solar energy can provide reliable and affordable power for medical facilities, ensuring uninterrupted services, reduced operational costs, and improved patient care. For SMEs and light industries, decentralized renewable energy solutions, such as mini-grids and Standalone systems Standalone solar systems, can provide access, lower energy costs, enhance productivity, and enable expansion. While challenges such as high initial costs, limited financing, and inadequate technical capacity remain, collaborative efforts among the government, private sector, and development partners can accelerate PURE adoption, driving sustainable economic development in Makueni County.

The county has made some initial steps to take advantage of PURE technologies by developing the Makueni County PURE Investment Prospectus, IP, highlighting opportunities in the agricultural value chains and health sector. Although the IP was limited to only 15 projects across few value chains and sectors, this is a first and important step. To realize these 15 opportunities, an estimated investment of approximately $4.9 million is required for the agriculture and livelihoods sectors, with an additional $1.2 million needed to expand solar PV and energy storage for the county's main healthcare facilities.

According to the Kenya National Bureau of Statistics (2023), Makueni County contributed 1.1% to Kenya’s GDP based on a five-year average (2018–2022), amounting to USD 902.26 million in 2022. Agriculture, forestry, and fishing accounted for 1.3% of the national output during the same period, translating to USD 251.1 million at current prices in 2022. Within the county's economy, agriculture alone contributed 27% of the total GDP. Additionally, agriculture and related activities serve as the primary source of livelihood, generating 78% of total household income in Makueni County (Kenya National Bureau of Statistics, 2023).

Given the county’s heavy reliance on agriculture, integrating **PURE** presents a significant opportunity to enhance productivity, reduce post-harvest losses, and drive value addition. Expanding access to renewable energy solutions—such as solar-powered irrigation, agro-processing, and cold storage can unlock new economic potential, improve rural livelihoods, and strengthen the county’s contribution to national economic growth.

Energy is a critical enabler of the agri-food value chain, supporting food production, transportation, storage, and market preparation. However, in Makueni County, only 34.9% of households have access to electricity that can drive productive uses, limiting farmers' ability to enhance productivity, reduce losses, and adapt to climate change. Challenges such as declining agricultural yields and profitability due to erratic rainfall can be mitigated through clean energy solutions like solar irrigation, cold storage, and value addition technologies. While these innovations offer socio-economic and environmental benefits, barriers to adoption remain, requiring a holistic approach that integrates all actors in the value chain—farmers, policymakers, private sector players, and financial institutions—to ensure widespread access to sustainable energy and a more resilient agri-food system.

In the healthcare sector access to reliable and affordable energy is crucial for quality healthcare delivery in Makueni County. However, a significant number of healthcare facilities face energy access challenges. According to the Makueni County Energy Plan 2023-2032, 44 healthcare facilities lack grid connection, impeding their ability to operate essential medical equipment and maintain services. For facilities connected to the grid, high electricity costs strain the county's budget, with the Makueni County Referral Hospital previously incurring monthly bills exceeding Ksh 1.8 million.

To address these challenges, the county is exploring renewable energy solutions, particularly solar photovoltaic (PV) systems. An analysis carried out during the development of the county CEP indicated that 73% of healthcare facilities could be electrified using stand-alone solar PV systems, while the remaining 27% would rely on grid power. A notable example is the recent installation of a 200-kilowatt peak solar energy system at the Makueni County Referral Hospital, projected to save approximately Ksh 7 million annually in electricity costs that also provides power reliability. Despite these advancements, challenges such as securing adequate funding, ensuring technical capacity for maintenance, and integrating renewable energy systems with existing infrastructure persist. Collaborative efforts involving the county government, development partners, and investors are essential to overcome these obstacles and achieve sustainable energy solutions for healthcare facilities in Makueni County.

PURE challenges and opportunities

PURE focused

i. Low consumer awareness - Limited knowledge and understanding of PURE technologies hinder their adoption, reducing the potential economic and social benefits of energy access.
ii. High upfront costs and limited financing - The capital-intensive nature of PURE technologies, combined with restricted access to affordable financing options, makes adoption difficult for smallholder farmers, businesses and rural enterprises.
iii. Inadequate innovation, research, and development - There is minimal investment in local R&D, resulting in a lack of context-specific solutions and over-reliance on imported technologies.
iv. Inadequate policy support- PURE is not well integrated into policies. The absence of well-structured incentives, such as tax breaks, subsidies, or concessional financing, discourages private sector investment in the PURE sub-sector.
v. Limited focus on transforming energy access into socio-economic activities, with low productive use of energy constraining demand growth.
vi. Lack of adequate electricity inhabiting engagement in productive uses

vii. Lack of anchor loads in areas that are suitable for mini-grids to make them financially more viable

Opportunities

i. Makueni County can boost agro-processing by deploying solar-powered equipment for milling, drying, and chilling to enhance agricultural value chains.
ii. Solar water pumping presents a key opportunity for expanding irrigation, improving food security, and increasing farming incomes year-round.
iii. Solar-powered cold storage and refrigeration can reduce post-harvest losses and support small-scale traders handling perishable goods.
iv. Establishing energy-powered digital hubs and microenterprises can create youth employment and expand local economic activities.
v. Promoting anchor loads such as schools or health centers can improve mini-grid viability and drive broader access to productive energy use.
vi. Enhancing and incentivizing private sector investments in the county
vii. Promoting skilling and upskilling eepecially of youth on renewable energy and PURE technologies

Demand Stimulation (Light Industries and Designated Areas)

9.2.1 Background

Makueni County has several designated areas - specific zones allocated for particular purposes to promote sustainable development. Key designated areas include industrial zones such as the fruit processing factory, a bio-diesel manufacturing plant, and several commercial agricultural farms e.g Athi River Agricultural Economic Zone. Other less intensive industries include: several coffee and dairy process plants, grain handling plants, a motorcycle assembly plant, and a horticultural product handling plant. Notably, Kibwezi town has been selected as a flagship agro-processing zone, focusing on processing plants for meat, leather, grain, fruit, sisal, and honey. Under the Makueni County Trade and Public Markets Bill, 2023, certain areas have been designated for specific types of trade, including specialized trade centers, grain markets, and markets for Jua-kali (informal sector) products. Additionally, Makueni County hosts part of Konza Technopolis, also known as Silicon Savannah- a technological development designated zone aimed to attract business process outsourcing, software development, data centers, and other tech industries. These designated areas are significant drivers of energy demand, as their operations depend on a consistent and sufficient energy supply. However, the availability of reliable energy, particularly from renewable sources, remains inadequate and the designated areas experience frequent grid power outages hindering the efficiency and sustainability of these zones and new investments into them. Future strategies for most of these zones include solar installations, with hybrid systems. This policy aims to promote energy investments into these zones to simulate industrial investments, job creation.

Challenges in Access to Energy within Makueni's Designated Areas

1. High cost of electricity.
2. Grid power failure and low voltage supply resulting in overreliance on diesel generators with low energy efficiency and high operational cost of fuel.
3. High capital cost in acquiring alternative energy technologies such as solar PVs. As such, funding assistance is required.

4. The designated areas often lack enough energy expertise to maintain and install energy efficient appliances.

2.5 Energy Efficiency and Conservation

Background

Energy Efficiency (EE) entails using less energy to perform an equivalent task, without affecting the quality of the products or services through adoption of energy efficient technologies and processes. Energy Conservation (EC), on the other hand, is associated with reducing energy consumption through the prevention of energy waste. The use of alternative renewable sources of energy also contributes to energy conservation efforts. The key objectives of EE&C are to reduce the cost of production and services at the energy supply end level and reduce the energy operational life cycle costs of buildings, processes and appliances at the end-user level. Additional objectives are to enhance sustainable energy resources and contribute to climate change mitigation through reduced GHG emission.

In energy-scarce counties such as Makueni, where heavy reliance on biomass energy to meet cooking energy persists and reliable electricity supply remains low and affordability presents a challenge, energy efficiency & conservation measures targeting households and institutional consumers are critical. This includes basic awareness of energy efficiency measures such as switching off lights when not in use, to knowledge dissemination on energy-efficient cookstoves or other heating, cooling or lighting appliances that are currently approved for distribution within the country.

Whereas the adoption rate for efficient lighting bulbs is relatively high at 80% in households, partly driven by LED light bulbs sold alongside solar home systems common in rural areas of the county, a much lower adoption rate is observed in learning institutions at only 16%, 17% for health centers (level 1 to 3) and 18% for MSME and cottage industries. Similarly, the adoption rate of improved biomass cook stoves is low with households at 26%, learning institutions at 49% and 15% for MSME. Health facilities had a higher adoption rate for LPG fired cook stoves whose efficiency is higher than biomass stoves.

For the case of county public buildings (offices and health facilities level 4 to 5), the adoption rate for efficient lighting was 52% of lighting points while 39% of installed air conditioning units and 15% of refrigerators met minimum thresholds of required minimum energy performance. It is however observed that most of the county buildings that employed cooking (largely health facilities and a few sub county offices) predominantly cooked with LPG and hence higher efficiency cook stoves. Only 27% of installed water appliances were energy efficient low flow technologies.[25]

As at 2023, only one designated facility had carried out an energy audit in the entire county and was implementing an organizational energy policy as provided in the Energy Management Regulations (EMR) of 2025.

Energy Efficiency in Affordable Housing

Affordable housing is a crucial element of Kenya's sustainable development agenda, especially within the Big Four Agenda and Vision 2030 framework. Makueni County has made significant progress in promoting affordable housing initiatives causing an increase in demand. However, an important factor that needs to be addressed is energy consumption within these housing developments. The

25 Makueni CEP 2024

integration of energy efficient solutions into affordable housing is crucial to reduce household energy costs, improve living standards, and contribute to Kenya's broader climate change mitigation goals.

Challenges in Buildings and Industries

The following section covers challenges implementing EE&C measures in buildings including affordable housing programs and industries. The buildings covered include residential single-family dwellings, commercial and multi-dwelling, public services, learning institutions and health facilities. The industries covered include manufacturing, agricultural and related services, commercial and hospitality, cottage and MSME and general services industries.

1. Lack of awareness and information of available appliances in the market on the energy performance, operating costs and product quality has led to low adoption rates in energy efficiency appliances such as lighting, electrical, cook stoves and water flow technologies in Makueni County.
2. High cost of high energy (and water) efficient technologies in comparison to standard efficiency technologies hindering affordability by consumers.
3. Lack of national or local EE&C building standards or regulations to compel building owners and designers to adopt efficient practice.
4. Inadequate data and information that could be used to develop effective plans and targets for measures in EE&C in buildings.
5. Inadequate technical expertise both in private and public sectors that can build rapid capacity building in EE&C.
6. Lack of adequate incentives and financing opportunities to scale up the uptake of energy-efficient products by households, social institutions and local enterprises due to higher cost of efficient structures and appliances.
7. High failure rate of substandard quality of supposedly efficient appliances discourages adoption rate
8. Poor enforcement of the Energy (Appliance Energy Performance and Labelling) Regulations of 2016 that mandates only appliances that meet the MEPS are to be retailed.
9. Lack of comprehensive energy audits of designated facilities as required by the EMR 2025 and the lack of knowledge on requirements of the EMR 2025

Opportunities in all sectors (Buildings and Industries)

The following opportunities exist in the County to mainstream and fast track adoption of EE&C

1. Facilities installed with high efficiency designs and appliances can be used as demonstration centers
2. TVET centers in partnership with County Government and development partners can be used in the training of professionals and champions in EE&C
3. There are existing National policies and strategies that can be cascaded to the County
4. The Energy Act 2019 provides for Counties to set up funds for EE&C and appoint inspection officers to carry out market surveillance for enhanced compliance to appliances MEPS.
5. County Government and Technical Officers in public facilities officers that have been capacitated on energy efficiency and carbon credit markets can support the cascading of EE&C programs and alternative sources of funding programs.
6. The EMR 2025 provides for Energy Services Companies (ESCO) that the county can partner with to fund EE&C projects

2.6 Energy, Road Transport and Street Lighting

The GMC recognizes that efficient transport network is central in facilitating the mobility of goods, services and people with the overall benefit of fostering the social economic development of Makueni County and enabling poverty reduction. Transportation activities are significant energy consumers. The current transport system for Makueni is dependent on fossil fuels, with road transport accounting for nearly 98% of the network[26], reliant mainly on petrol and diesel-powered internal combustion engines. For road transport, alternatives to fossil fuels include biofuels (e.g., bioethanol and biodiesel, either on their own or blended with fossil fuels), synthetic fuels (e.g., Fischer-Tropsch diesel), and electricity. Where the source of the electricity is renewable (e.g., solar, hydro, wind) there are significant benefits for an electro-mobility future. GMC is committed to delivering sustainable road systems that provide appropriate and equitable access to all levels of service for the betterment of Makueni Citizenry and the Country at large including adoption of alternative transport fuels and technologies. For instance, the GMC plans to develop three solar plants in collaboration with the private development partners to increase its power resources and to serve transportation power needs along Mombasa -Nairobi highway with the emerging electric powered vehicles.[27]

2.6.1 E-mobility & Biofuels

This section covers challenges and opportunities for e-mobility and biofuels adoption for road transport in Makueni.

1. Slow uptake of alternative fuels such as biofuels and electrified vehicles (EV) relative to fossil fuels
2. There is inadequate infrastructure to support rapid adoption of EV such as charging networks and enhanced electricity grid.
3. High electricity bills for street lighting
4. Deployment of electric vehicles will depend on consumer preferences
5. Low production of biofuels in the country
6. There is high competition for biofuels consumption with other sectors such as cooking
7. There is inadequate information, research and investment in biofuels
8. There is inadequate infrastructure such as parking zones to support fuel efficient high mass and cargo transport system
9. There is slow transformation of low to high mass transport systems such as high-capacity commuter bus

Opportunities

1. Electric motorcycles are already a viable transport mode due to rapid battery cost reductions and small battery size
2. Electric motorcycles are cost-competitive with internal combustion vehicles by the mid-2020s
3. Areas that can potentially support charging stations for e-bikes have already been identified.
4. The County has biofuels small scale farming and manufacturing facility. Expansion of the raw materials production and processing can provide cleaner fuels for transport and other residential/commercial use and will provide additional income to small scale farmers and employment opportunities to local communities.
5. The main Mombasa Nairobi highway transverses the County. Additional infrastructure such as parking zones will enhance fuel efficient mass and cargo transport.

[26] Makueni-County-Transport-Policy.pdf
[27] MAKUENI-COUNTY-INTEGRATED-DEVELOPMENT-PLAN-2023-2027.pdf

6. Makueni County Government operates several four- and two-wheel ICE vehicles that can be replaced with EV in future purchases. Pilot project on EV on County vehicles will encourage community private adoption rate of EV

2.6.2 Crude Oil and Liquid Petroleum products

Makueni County has no proven hydrocarbon resources. This section is therefore limited to downstream petroleum products. Increased availability diesel, petrol and LPG through improved petroleum supply chains will be essential in addressing the basic energy needs (transport, cooking etc) of many residents in the county.

Challenges

i. High cost of petroleum fuels due to low availability, high logistic costs and weak supply chains.
ii. Inadequate storage and distribution facilities for petroleum products
iii. Price fluctuations for petroleum products
iv. Negative environmental concerns are also other challenges affecting the sector.
v. Lack of adherence to safety standards and regulations especially in the retail sector leading to Substandard products
vi. Vandalism of petroleum pipelines

Opportunities

Makueni county enjoys the largest stretch of the Kenya pipeline infrastructure with a depot at Malili.

2.6.3 Street Lighting

The county recognizes that street lighting is an integral part of the road and footway infrastructure and is important to all users of these networks and that it is a devolved function. The benefits of street lighting include but not limited to improved security, increased economic activity after sunset, reduced night traffic accidents, etc leading to improved standards of living for the citizens including school going children. Makueni county has constructed about xx km out of the envisaged xxx of street lighting in the last xx years and intends to expand the construction of the street lights in the coming years.

Challenges

1. Lack of a comprehensive regulatory guidelines, standards and specifications for street lighting
2. Vandalism, damage, theft and cost of repairing vandalized items
3. High electricity bills after installation of street lighting
4. Inadequate personnel capacity and equipment for maintenance of streetlights
5. The rampant power outages sometimes go on for prolonged periods.
6. Inadequate budgetary allocation for installation of streetlights, maintenance, repair and payment of electricity bills.

Opportunities

- Availability of alternative street light solutions e.g solar
- Availability of efficient streetlights
- Consideration f street lighting special tariffs at the National level

2.7 Energy Financing

Background

The County Energy Plan 2023-2032 identifies key investment priorities including expanded electricity access, clean cooking solutions, productive use projects and renewable energy development. Currently, energy projects in Makueni County rely on funding from county budget allocations, National Government transfers through the equitable share, and conditional grants from development partners. The financing requirements for the identified energy projects collectively exceed the County's current investment capacity, creating a significant financing gap. This gap is further widened by the capital-intensive nature of energy infrastructure, which typically requires substantial upfront investment with extended payback periods.

Other than the traditional financing sources, climate finance presents a particularly promising avenue for addressing this funding shortfall, especially as numerous African countries embrace innovative financing approaches such as Nigeria's public issuance of green bonds. Kenya's high vulnerability to climate change, with a majority of its population dependent on climate-sensitive livelihoods, has elevated climate resilience to a priority agenda at both national and county levels. The National Treasury serves as the designated authority for key climate funds and maintains a specialized Climate Finance Unit, while the 2016 Climate Change Act mandates the establishment of dedicated Climate Change Units across all counties to mainstream climate considerations within planning and budgeting processes.

The Constitution of Kenya under Article 209 and 212 encourages County Governments to source their own funds for the implementation of projects within their mandate. This includes climate-resilient projects where renewable energies can be incorporated to complement adaptation efforts. Makueni County has strategically positioned itself to capitalize on climate finance opportunities through its established Climate Change Action Plan, Climate Change Policy, and the Makueni Climate Change Act of 2021. The County has committed to allocating 2% of its annual budget specifically to climate action initiatives and is a signatory to the Financing Locally-Led Climate Action Program (FLLOCA) participation agreement. This proactive stance enables the County to effectively lobby for and secure funding for climate-resilient energy projects. In addition, the Energy Act of 2019 provides for County Governments to establish County Energy Funds.

Challenges in Accessing Energy Finance in Makueni County

- Energy projects typically require significant upfront capital investment while local entrepreneurs, households, and small businesses in Makueni lack adequate financial resources
- Financial institutions are hesitant to extend financing due to perceived high risks among rural populations.
- The county's budget allocation for energy initiatives remains underfunded with competing priorities in other critical sectors such as healthcare and agriculture claiming larger shares of limited fiscal resources.
- The County Governments heavy reliance National government funding creates significant vulnerabilities in financing energy projects due to occasioned delayed disbursements
- Limited technical expertise within the county energy departments to develop comprehensive, bankable energy project proposals that meet the requirements of potential funders. .
- The absence of a county-level public-private partnership framework poses uncertainty on the guidelines of engagement with private investors who require guarantees for investment into energy projects

- Weak coordination mechanisms between national and county governments, as well as among various relevant county departments, impede effective resource mobilization for energy projects

Opportunities for Energy Financing in Makueni County

1. The existence of a guiding framework on integrated planning and budgeting in Makueni County will support the resolution of the coordination challenges and unlock more financing for clean energy.
2. Makueni County has vast renewable energy resources offering high potential for generation of carbon credits
3. Availability of alternative financing sources such as green bonds and carbon markets which have not been adequately utilized
4. The opportunity to establish a public-private partnership guidelines that will provide the County with modalities of engaging private investors.
5. The mandate stipulated by the 2019 County Energy Act for counties to establish an Energy Fund presents an opportunity to mobilize financial resources for clean energy projects at scale.

2.8 Cross Cutting Issues

2.8.1 Land and Energy

Vision 2030 acknowledges that land is a basic factor for production and calls for sustainable management of land resources. As such, land is an important resource necessary for energy resources development. Due to competing interests in land utilization, the sector faces challenges in developing its infrastructure, especially in wayleave acquisition. Energy development projects have various impacts on communities where the projects are implemented. Key among these is economic and physical displacement.

Challenges faced by the county in securing these provisions are as follows:

- Inadequate review and update of physical plans and land use.
- Absence of a comprehensive and fair compensation mechanism.
- High costs due to variation from the preferred land use required for development.
- Absence of a National and County Resettlement Action Plan

2.8.2 Environment, Health, Safety and Climate Change

The constitution of Kenya provides for every person's right to a clean and healthy environment. The National Environment Management Authority (NEMA) enforces this by ensuring that projects are implemented in line with safety, health and environmental standards are met. Energy generation, transmission and consumption pose various dangers to human life and the environment. The challenge for players in the energy sector is the provision of affordable, competitive, reliable and sustainable energy whilst upholding people's rights to a safe, healthy and secure environment and mitigating climate change**.** The County Government also recognizes that tension and link between environmental conservation, climate change mitigation, social protection because of the high dependance on biomass

for cooking. The low income, marginalized and vulnerable community members depend on firewood for cooking. Additionally, these community members engage in charcoal production to generate income. While seeking to provide energy services, measures therefore need to be put in place to safeguard community to secure their well-being while preventing environmental degradation and climate change. Additional measures which can protect communities during and after the implementation of energy project include monitoring and evaluation which ensures that the required standards are adhered to. Further maintenance of energy installations serves to restore energy installations to required standards therefore preventing health and safety crisises

2.8.3 Gender Equality, Diversity and Social Inclusion on Energy (GEDSI)

Women and men have different roles, responsibilities and voices within households, markets, and their communities. Within the home, for instance, in majority of households women are tasked with the responsibility of acquiring firewood and cooking. This causes them to lose significant time with could be directed to other activities like work or leisure. Further, they are exposed to indoor air pollution which causes health challenges. Those who acquire improved cookstoves grapple with poor quality devices which fail before their expected lifetimes.

People with disability, particularly those with mobility challenges struggle to physically access clean energy resources because of poorly developed distribution chains. Further, because of challenges they spend large portions of time at home and as such are also significantly impacted by indoor air pollution caused by the use of dirty sources of energy. The youth on the other hand are significantly affected by high unemployment rates in the country limiting their financial capacity to access clean energy resources

2.8.4 Data Management and ICT

Data is instrumental in the continuous development of the energy sector because it describes energy needs and energy resources. Data can also describe the various investment opportunities in the energy sector.

Data describing energy demand, particularly that which describes investment priorities, is held in different departments across the county. Data describing current energy consumption levels is found in the community whilst data describing energy resources can be found in various global and national databases. Data collection and storage is therefore a necessary endeavor for development of energy strategies including the county energy plan. Further, sharing of data with key stakeholders including across county departments, development partners and private sector can support planning for and implementation of energy projects.

ICT technology can facilitate collection of data. Further, using this technology, data can be centrally stored and made accessible to various stakeholders. Development of frameworks and guidelines to facilitate data collection, sharing and storage is necessary to ensure data protection. Open source and open access data platforms like the Energy Access Explorer can be adopted as they are free and provide necessary data protection mechanisms.

CHAPTER THREE: ENERGY POLICY STATEMENTS

This chapter outlines the energy policy statements, which provide strategic direction and actionable measures to address the challenges identified in the situation analysis chapter and take advantage of the new and existing opportunities to **ensure access to inclusive, affordable, adequate, reliable, sustainable and modern energy for all in Makueni County**.

Note to the Reader: The **policy statements** focusing on **key thematic areas** covered in the previous chapter i.e renewable energy resources & development, electricity & clean cooking access, productive use of renewable energy (PURE), energy efficiency & conservation, energy and transport, emerging, and cross cutting issues **have been aligned to the seven (7) policy objectives** highlighted under the Chapter One. For instance, all policy statements across the thematic areas covering legal, institutional frameworks capacity building across the thematic areas have been bundled under policy objective 1.

Policy Objective 1: To strengthen legal and institutional frameworks and enhance capacity to promote clean, sustainable energy infrastructure in Makueni County.

Policy Statement 1: Create and maintain a conducive and enabling legal, regulatory, fiscal, political and infrastructural environment to facilitate investment in and development of clean and sustainable energy infrastructure, ensuring efficiency, inclusivity, and resilience across the energy value chain.

1. Enact necessary legislation to establish the Makueni County Energy Fund including provisions for an emergency fund supported by clear governance structures, operational guidelines, and transparent investment criteria.
2. Advocate and lobby for a predictable and stable national and county policy environment including tax incentives to promote access to clean cooking fuels and energy efficient technologies.
3. Develop a comprehensive county-level bioenergy policy and legal framework to stimulate the bioenergy feedstock supply chains, encourage adoption of clean cooking solutions, promote productive use of renewable energy solution and drive energy efficiency and conservation measures.
4. Enact legislation for the structured recruitment, registration and licensing of charcoal producers in designated zones.
5. Champion Develop guidelines to enable and encourage rural businesses, cooperatives, and public institutions to generate, consume and distribute clean energy within the grid.
6. Formulate a county-level public-private-partnership framework and an investment blueprint to streamline land acquisition, legal processes, and the issuing of permits, licenses or any other regulatory documentation requirements for energy project implementation.
7. Institute county legislation that bans the use of traditional forms of cooking in all public institutions to ensure a transition to, modern and clean alternatives such as electricity, bioethanol, LPG, and renewable solid biomass (pellets and briquettes) options, and biogas.
8. Develop and enforce laws to prevent and curb theft and vandalism of energy infrastructure which includes solar systems, streetlight systems and other clean energy installations.
9. Develop legislation on fair land acquisition and resettlement that ensures public participation, adequate compensation, and recognition of indigenous communities as central in energy infrastructure development including renewable energy resources, power plants, electricity distribution and transmission, parking of petroleum tankers, energy centres.
10. Create and implement county cross-departmental guidelines ~~on~~ for energy data collection, sharing and centralization enabling collaboration with the private sector, development partners and financiers support informed energy planning and project implementation.

Policy Statement 2: Strengthen institutional capacity to effectively deliver on the devolved energy functions

1. Strengthen the human resource capacity in the energy department/ directorate by recruiting additional skilled staff to spearhead the implementation of the CEP and investment prospectus and other energy related activities.
2. Develop the technical capacity of the energy directorate and affiliated departments to effectively coordinate energy stakeholders, mobilize projects financing, ensure tracking, monitoring, evaluation and reporting of energy projects and engagements.
3. Strengthen the Strategic Partnerships Department under the Office of the Governor by integrating personnel with energy sector expertise to support investor engagements.
4. Establish and operationalize the necessary institutional and infrastructural capacity to stimulate the development and harnessing of bioenergy feedstock supply chains.

Policy Statement 3: Strengthen awareness programs and capacity-building initiatives for public and individuals across the energy sector value chain.

1. Enhance advocacy, public awareness, sensitization and capacity to accelerate the adoption of clean cooking solutions, PURE energy value chains, energy efficiency and conservation, including afforestation practices to support sustainable utilization of charcoal and firewood.
2. Collaborate with CTTIs and partners to design and implement customized training curriculums on energy solutions which would include offering technical and business energy-related training and skills development such as bioenergy, solar system installations & maintenance, PURE and EE&C focusing on youth, women and PWDs.
3. Develop and maintain a database of skilled technicians across the energy value chains to support private sector, community initiatives and government programs.
4. Provide subsidized tuition costs and scholarships for youth who are studying energy-related courses at CTTIs with a focus on ensuring gender and social inclusion.
5. Establish energy centres for demonstration of renewable energy technologies, energy efficiency and conservation innovations, clean cooking solutions, and PURE technologies.
6. Support youth and women-led start-ups/SMEs engaged in energy value chains through technical assistance, mentorship, and access to finance and markets.
7. Partner with the Rural Electrification and Renewable Energy Corporation towards the development of a Makueni Energy Centre.

Policy Objective 2: To promote sustainable development of energy resources and the associated infrastructure.

Policy Statement 1: Promote sustainable exploitation and utilization of bioenergy resources including wastes and bioenergy crops

1. Develop partnerships with private sector and development partners to conduct feasibility studies for commercial bioenergy potential including biogas, biofuels and waste to energy.
2. Develop incentives to allow the private sector to establish alternative bioenergy fuel production plants in Makueni.

3. Promote development and use of alternative biofuels to reduce pressure on the natural world and increase access to low-cost fuel
4. Establish bioenergy-aggregation centers in key production areas at sub- County level.
5. Promote the effective collection, transportation and processing of municipal waste streams and well as wastes from large industrial establishments as alternative energy sources.
6. Promote public and private sector investment in waste-to-energy generation urban centers and industrial establishments.
7. Provide and disseminate annual updates of woody biomass stock, annual net increase and demand for wood fuel in the county.
8. Promote sustainable charcoal production through recruitment, registration and licensing charcoal producers with defined targets of tree growing or restoration in delineated zones.

Policy statement 2: Promote (re)afforestation for sustainable supply of bioenergy

1. Partner with the National Government to increase the county tree cover to at least 30% by 2032.
2. Facilitate annual mapping of the woody biomass stock, annual net increase and demand for wood fuel in the county.
3. Develop County Restoration Opportunities Profile (CROP) for each Sub- County.
4. Engage private tree nurseries entrepreneurs and tree farmers and develop incentive mechanisms for tree growing.
5. Partner with key National Government agencies, to establish demonstration of professionally managed and site-specific woodlots of short-rotation trees and restoration in each Sub-County.
6. Partner with key National Government agencies, to customize JazamitiApp for tracking and monitoring progress in tree growing and harvesting in each Sub- County.

Policy Statement 3: Promote development of energy resources (solar, hydro, wind, geothermal) for electricity generation (grid and off-grid) and other applications like solar thermal technologies, wind water pumping

1. Facilitate mapping of solar, wind, hydro, geothermal energy resource potential and sites,
2. Invest in feasibility studies and data collection & compilation of renewable energy resources data for electricity generation and other applications.
3. Provide incentives and mechanisms to enhance private sector investment in renewable energy development
4. Increase government investment in the development of renewable systems through clean energy fund (see objective 6).
5. Establish county-led subsidies or guarantee funds, like an energy fund, to de-risk investments in productive energy solutions.
6. Promote development of hybrid systems such as solar-hydro or wind-solar or wind-hydro or wind-solar-hydro power systems to mitigate climate risks and resources variability such as wind and solar.

7. Facilitate provision/acquisition of land and way leaves for energy infrastructure development
8. Promote other applications of the renewable energy resources e.g solar thermal, wind for pumping

Policy Objective 3: To achieve universal electricity and clean cooking access in Makueni County.

Policy Statement 1: Support provision of electricity access that is sufficient to meet all demand areas.

Strategies

1. Implement electricity access projects through least cost electrification options as guided by the Makueni CEP.
2. Integrate electricity access projects into county integrated development plans, annual development plans, and across other sector plans especially physical, agriculture, health, water, transport, infrastructure, municipal plans.
3. Collaborate with Kenya Power to strengthen grid infrastructure to improve the power reliability, availability and ability to handle the growing demand.
4. Promote greater community involvement and ownership of electricity access projects.
5. Strengthening electricity data collection and management to enable ease of access by investors and other development partners who wish to implement electricity supply projects.
6. Continually update and enforce quality standards for components, installation, maintenance and after-sales service of standalone energy technologies at county levels.
7. Coordinate with the national energy regulator to promote the licensing of fair but competitive electricity tariffs to private mini-grid developers operating in the county.

Policy Statement 2: Accelerate rapid transition to affordable cleaner cooking solutions for all Makueni citizens.

Strategies:

i. Promote increased adoption of LPG, bioethanol, Improved cookstoves, biogas, e-cooking and renewable solid biomass (pellets and briquettes) options, in households, MSMEs, learning institutions, healthcare facilities.
ii. Develop mechanisms for lowering the upfront cost of acquiring clean cooking solutions especially for low-income households and PWDs (see objective 6 on Clean Energy Fund)
iii. Integrate clean cooking solutions into county government development planning processes/ documents, that is the county integrated development plan, annual development plans, county energy plan and climate action plans.
iv. Collect clean cooking data to inform planning and resource mobilization for projects.
v. Leverage public institutions like educational, health, and correctional as anchor demand points for clean fuels to accelerate expansion of clean cooking fuels.
vi. Leverage partnerships with organizations supporting school cooking programs e.g. World Food Program to promote clean cooking in schools and communities.
vii. Leverage the existing clean cooking solutions distribution networks and create incentives for stove, appliance and fuel distributors to expand their distribution networks to last mile
viii. Promote local manufacturing and production of clean cooking equipment, fuels and accessories e.g by designating spaces for clean cooking stove and appliance assemblers and manufacturers in the SEZs and streamline the onboarding process.

Policy Objective 4: To promote growth of PUE with an emphasis on renewable energy for improved socio-economic transformation in Makueni County

Policy statement 1: To promote growth of PUE with an emphasis on renewable energy for improved socio-economic transformation in Makueni County

1. Integrate PURE projects as described in the CEP and Investment Prospectus in county development plans e.g CIDP, ADPs, county trade and industrial policies to ensure cross-sectoral synergy.
2. Collect and analyze data demonstrating PURE opportunities in the county to help investors with investment decisions.
3. Develop a county energy database to demonstrate opportunities, track demand, adoption trends, and impact of PURE interventions.
4. Support pilot projects that test locally designed PURE solutions tailored to Makueni's economic activities.
5. Develop and implement targeted incentives (e.g., reduced licensing fees) for businesses investing in PURE solutions.
6. Enforce quality standards for PURE technologies to protect consumers from substandard products.
7. Promote and attract energy-intensive industries (e.g., leather etc) and export sustainably produced products regionally and globally.
8. Provide support to existing cooperative societies to utilize renewable energy to enhance agricultural productivity, enhance energy reliability and reduce operational costs.
9. Integrate energy needs of designated areas within the County Planning frameworks e.g CIDP, CEP, Physical Plan etc.
10. Coordinate with the national government to implement infrastructure projects such as road networks to facilitate ease of access and product movement in off-grid communities.
11. Private sector supports scale up the provision of off-grid solar products, improved cookstoves and biofuels.

Policy Objective 5: To promote adoption of Energy Efficiency, Energy Conservation and Sustainable Transport including Street Lighting in Makueni County

Policy Statement 1: Enhance the adoption of EE&C measures in Makueni County in households, buildings, institutions and industries including designated areas.

Strategies

1. Localize applicable existing national energy efficiency policies, strategies, regulations and standards to enable implementation and creation awareness in sustainable energy consumption and water efficiency.
2. Enhance relevant data collection and sharing in EE&C to support planning and appraisal of EE&C activities.
3. Promote the development of on-site renewable energy generation at facilities for sustainable energy consumption.

4. Promote integration of EE&C into all projects design and public service provision (e.g., building design, agribusiness and industries, transportation infrastructure, water and wastewater, and energy distribution infrastructure)
5. Promote recognition and award campaigns in energy and water efficiency excellence for county facilities that achieve benchmark best practice efficiency levels.
6. Develop and implement (green) building codes for existing and new buildings covering energy efficiency in Makueni County.
7. Partner with National agencies such as Energy and Petroleum Regulatory Authority (EPRA) to promote compliance with national regulations that provide for EE&C guidelines and standards and market surveillance to promote compliance to MEPS and technical quality standards of energy and water appliances.

Policy Statement 2: Promote adoption of alternative transport fuels and technologies as a pathway towards a more sustainable, efficient, and equitable transportation.

Strategies

1. Undertake a county-level electric vehicles (two, three and four wheelers) demand assessment study
2. Promote development of infrastructure for e-mobility such as charging systems in public spaces and enhanced electricity grid
3. Integrate charging infrastructure with transport, housing and energy planning
4. Use County vehicle fleets as demonstration units for e-bikes that may also pilot development of e-mobility charging systems
5. Implement incentive mechanisms to ensure consumers shift to electric and fuel-cell vehicles when cost-competitive (e.g. trade-in programs, free parking)
6. Promote expansion of biofuels farm production and manufacture for use in transport

Policy Statement 3: To provide a sustainable and appropriate level of street lighting to the road network, markets and urban areas at the appropriate times and costs.

Strategies

- Provide and maintain adequate street lighting.
- Adopt energy efficient street light technologies and alternative energy sources like solar power for most street lighting in Makueni to reduce high monthly bills
- Lobby for special street lighting tariffs
- Design appropriate business models for streetlighting financing (see objective 6)
- Develop street light regulations and measures to reduce the rate of streetlights vandalism (see objective 1)

Policy Objective 6: To mobilize financing and other necessary resources towards the implementation of energy projects and programs in Makueni County

Policy Statement 1: Mobilize climate financing, and other financing mechanisms towards the implementation of various energy initiatives

1. Explore innovative approaches and avenues of domestic and international financing to support renewable energy projects and programs including energy resources development, electricity, clean cooking, PURE and energy efficiency projects.
2. Provide incentives for Public-Private Partnerships in development of renewable energy and energy efficiency projects
3. Leverage partnerships with development partners to mobilise funding for energy initiatives including energy efficiency
4. Collaborate with other counties through CoG and the National Government to develop and promote public-private partnerships (PPP) policies/guidelines that allows counties to mobilise resources for health care facilities, water utilities, and the productive uses of energy.
5. Partner with development partners to develop and maintain a centralized information database that can provide information on financing opportunities for energy projects. The database shall have up-to-date information on available avenues of financing, compliance, standards, existing projects, upcoming opportunities, and any other information relevant to stakeholders in the county.
6. Provide incentives for investors and financial institutions to develop affordable financial products to support local communities' access to credit facilities and acquisition of renewable energy products or equipment.
7. Adopt the framework on integrated planning and budgeting to unlock financing for clean energy projects identified in the County Energy Plan and Investment Prospectus.
8. Work with financial institutions to create low-interest loans and flexible repayment models for small businesses and cooperatives adopting PURE, clean cooking solutions.
9. Advocate for tax breaks or import duty exemptions for PURE technologies, clean cooking solution, EE solutions.

Policy statement 2: Tap into Carbon Credits for Renewable Energy Projects

1. Identify and build pipeline of energy projects with significant emission reduction potential, particularly in renewable energy, bioenergy, energy efficiency, and clean cooking sectors.
2. Build capacity to develop carbon assets, validation, registration and monitoring of emission reductions according to international carbon standards
3. Establish transparent benefit-sharing arrangements that ensure communities hosting carbon projects.
4. Forge partnerships with specialized carbon market intermediaries, development partners, and technical service providers to build requisite expertise.

Policy Statement 3: Establish Makueni County Energy Fund as envisioned in the Energy Act 2019 to finance programs and initiatives across the energy value chain.

1. Once established, develop comprehensive operational guidelines detailing application procedures, eligibility criteria, appraisal methodologies, disbursement mechanisms, and monitoring frameworks.

2. Allocate seed capital through the annual budget process and develop strategies to attract additional resources from development partners, private sector, and other stakeholders.
3. Build a pipeline of investment projects in covering renewable energy development, energy access for underserved communities, clean cooking solutions, energy efficiency initiatives, and productive uses of renewable energy.

Policy Objective 7: To mainstream environmental and social safeguards and climate resilient livelihoods in the energy sector

Policy Statement 1: Promoting energy-driven County landscape restoration initiative for sustainable wood fuel access

1 Partner with the National Government to increase the county tree cover to at least 30% by 2032.
2 Strengthen collaboration between the county's directorates of land & physical planning, environment, energy and natural resources and other multi-agency bodies, including but not limited to, conservation agencies, community forest associations, water resource user associations and civil society organizations.
3 Work with environmental agencies, relevant authorities and communities to ensure the effective management of the energy catchment areas e.g mini, micro and pico hydros, bioenergy etc in Makueni County.

Policy statement 2: Cross-Cutting Issues

1. Develop gender-inclusive tracking mechanisms to monitor the progress of energy access and productive use of energy for both men, women and people with disability in the county.

CHAPTER FOUR: FRAMEWORK FOR IMPLEMENTING THE ENERGY POLICY

4 Overview

4.1 Coordination Framework and Administrative Mechanisms

4.2 Legal and Regulatory Framework

4.3 Funding Arrangements

CHAPTER FIVE: MONITORING, EVALUATION, LEARNING AND REPORTING

Overview

This chapter outlines the process of tracking the progress and evaluating the impact of the actionable policy statements and strategies to ensure full implementation. It also contains the Key performance indicators (KPIs) to be tracked and set target, data source, frequency and person responsible.

Monitoring

The Department will ensure continuous tracking of progress and performance of policy statements and strategies outlined in the Makueni Energy Policy. This will be done through the existing M&E framework provided in the energy plan. Timely dissemination and sound feedback mechanisms for M&E report findings will aid in implementation of this policy to ensure the intended outcomes and

impacts are achieved. The monitoring process will be participatory, involving stakeholders at various levels to enhance transparency and accountability in the implementation.

Evaluation

The Directorate of Monitoring and Evaluation in collaboration with the Directorate of Energy will undertake Mid-term and End-term evaluations. To enhance objectivity and expertize, they may co-opt External Evaluator who has expertise in Energy area. However, in case of significant unexplained variation in performance in the critical performance area during the monitoring, either positive or negative, an Ad-hoc evaluation will be conducted to inform the decision for intervention.

Reporting

The County department responsible for Energy will provide data and information in periodic (bi-annual) reports aimed at identifying successes, gaps and areas for improvement, which will be made accessible to relevant actors.

Risk Management

The process will involve categorization and prioritization of the risks based on the likelihood of occurrence and expected impact with suggested actions for mitigation.

Risk Category	Risk	Impact	Likelihood	Mitigation
Financial	Inadequate resources	Medium	Medium	- Enhance resource mobilization - Collaboration and partnership.
	Poor linkages between plan and budget (supplementary budgets)	Medium	Medium	- Timely budget execution
Operational	- Electricity surges Unstable electricity voltage (both low and high in different places)	Medium	Medium	- Quality grid to be installed - Regular maintenance of existing power grids - Sensitization programmes on electricity safety
	- Inadequate human resource/capacity	Medium	Medium	- Recruit more staff - Capacity building of staff
Political	Changes and inconsistency in government priorities	High	High	- Align development strategies to the government aspirations
Social	Land disputes	High	High	-Install solar projects where there is clear land ownership, consent/agreement
	Vandalism	High	Medium	-Enhance security surveillance -Community awareness to create ownership -Enforcement of existing laws on vandalism
Environment	Poor disposal of Solar batteries & panels	High	High	-Ensure proper waste disposal in adherence with legal provisions
	Occupational health hazards during installation and maintenance	High	High	-Ensure all staff involved have appropriate Personal Protective Equipment's (PPEs)

	Loss of biodervisity during projects implementation	Medium	Medium	-Limiting clearance of vegetation to required size -Landscaping and re-vegetation with site matching species

Learning

Learning will be integrated into every aspect of the Policy implementation. The information generated from M&E will be analyzed and shared with all actors. This will include the information on what worked and what needs adjustment during the implementation process to improve on the subsequent processes thus enhance effectiveness. The reports will identify and document best practices. This will be disseminated for replication and scaling up in other areas by stakeholders.

Policy Review

The policy shall be reviewed after 5 years or on need basis with approval of the County Executive Committee Members upon request from the Department responsible for energy. The review will ensure among others, that the policy remains relevant and addresses the emerging issues and trends at international, national and county level. It shall involve all key stakeholders.