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Realising Sustainable Use of Biomass Energy in Kenya: Appraising the Regulatory and Institutional Framework

By: ***Oseko Louis D Obure****

Abstract

Increasingly the world has been shifting toward cleaner and sustainable energy to ensure sustainable development in the energy industry. This calls on every country to ensure affordable, secure, and clean energy for its citizens. Achieving this s resource heavy and requires technical skills that most developing and third-world countries do not have. As developed countries rely on alternative energy sources such as electricity to power cars, cook, and for heating, developing countries rely on traditional bioenergy for cooking and heating, and Kenya is no exception. Kenya has experienced an exponential increase in the demand for biomass energy. This has been particularly so in light of the increasing human population, urbanization, and the high cost of alternative energy sources. In Kenya, most households rely on charcoal conversion kilns, charcoal stoves, and woodlots. It is worth noting that this demand has led to inefficient production and utilization mechanisms that pose a threat to the environment and the health of many. It is expected that with the increase in fuel prices by the introduction of the value-added tax of 8% on petroleum products, the cost of living and price of alternative sources of energy will equally soar; therefore, the demand for biomass will continue to increase. Ergo, ensuring safe and sustainable use of biomass is therefore important. This calls for an efficient regulatory and institutional framework over biomass. The object of this essay is to examine and appraise Kenya's

* ***Oseko Louis D Obure is a Final Year student at the University of Nairobi, Faculty of Law. He was the First Runners Up in the Inaugural Dr Kariuki Muigua Annual ADR Essay Award. He is the President of the Young Arbiter Society University of Nairobi Chapter, a trained Arbitrator with the Chartered Institute of Arbitrators, Associate Editor for the University of Nairobi Law Journal, and has worked with Dr Kariuki Muigua, Dr Wyne Mutuma, and Dr Wiflred Mutubwa on different projects on matters Alternative Dispute Resolution. Contacts: +254 796467738 Email; osekolouis1@gmail.com***

regulatory and institutional framework over biomass and proffer recommendations for the better and sustainable use of biomass.

1.0 Introduction

Energy sources can largely be grouped into renewables and non-renewables. Non-renewable sources of energy refer to energy sources that deplete when used and are not self-replenish. Examples include fossil fuels like coal, petroleum, and natural gas.[1] On the other hand, renewable energy comprises energy sources that cannot be depleted; that is, it is a source of energy that is self-replenishing.[2] Most renewable sources of energy come from natural sources. For example, solar and wind energy is derived from natural resources such as the sun and wind. Also, the sun and wind are the perfect examples of how renewable energy resources cannot be depleted because the sun will always shine just as the wind will always blow regardless of the weather of the day.[3] It is often argued that renewable and clean energy are terms that can be used interchangeably and are like Siamese twins.[4] This argument falls apart at its seams because other sources of renewable energy contribute to the global carbon footprint, like biomass.

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[1] National Geographic Society, 'Non-Renewable Energy', *National Geographic Society* (2013) <*http://www.nationalgeographic.org/encyclopedia/non-renewable-energy/*> accessed 9 March 2022.

[2]Phebe Asantewaa Owusu and Samuel Asumadu-Sarkodie, 'A Review of Renewable Energy Sources, Sustainability Issues and Climate Change Mitigation' (2016) 3 Cogent Engineering 1167990 <*https://doi.org/10.1080/23311916.2016.1167990*> accessed 9 March 2022.

[3] G Wu and others, 'Renewable Energy Zones for the Africa Clean Energy Corridor' <*https://escholarship.org/uc/item/74m5n78n*> accessed 10 February 2022.

[4] Muhammad Amer and Tugrul U Daim, 'Selection of Renewable Energy Technologies for a Developing County: A Case of Pakistan' (2011) 15 Energy for Sustainable Development 420 <https://www.sciencedirect.com/science/article/pii/S0973082611000767> accessed 10 February 2022.

Biomass is a renewable organic material containing chemical energy from the sun.[5] This chemical energy is heated or converted to a usable state like gas.[6] Biomass can be derived from plants and animals. Plants are the leading source of firewood, wood pellets, sawdust and agricultural crops and waste materials like maize cobs that are used for heating and cooking in Kenya's rural homes. Animals are also considered as a source of biomass because their waste can be fermented to produce gases and liquids such as methane and biodiesel, which is combustible. This is commonly referred to as biogas and can be used for cooking, heating, and lighting.[7]

The Energy Act also defines biomass. According to this act, biomass is "*non-fossilized and biodegradable organic material originating from plants, animals and micro-organisms and includes bio-ethanol, bio-diesel, biogas, charcoal, fuel-wood and agro-waste.*"[8] It is worth noting that this definition appears to have adopted the widely used biomass definition.

Arguably, biomass serves as the only source of energy for most people in developing countries. This is premised on the fact that to this class of persons, it is the only source of energy that they have access to and can afford. Unfortunately, this class makes up the largest percentage of the population. Consequently, the government must ensure sufficient and effective regulatory and institutional frameworks to ensure sustainable use of biomass energy.

In critiquing the regulatory and institutional framework for biomass energy use in Kenya, this paper shall adopt a quadruple approach. First, this paper will

[5] 'Biomass Explained - U.S. Energy Information Administration (EIA)' <https://www.eia.gov/energyexplained/biomass/> accessed 9 March 2022.
[6] 'Biomass Explained - U.S. Energy Information Administration (EIA)' <https://www.eia.gov/energyexplained/biomass/> accessed 10 February 2022.
[7] S Abanades and others, 'A Critical Review of Biogas Production and Usage with Legislations Framework Across the Globe' [2021] International Journal of Environmental Science and Technology 1 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8124099/> accessed 10 February 2022.
[8] Energy Act 2019, Section 2.

briefly assess the status of biomass energy use in Kenya. Secondly, this paper will examine the existing regulatory approach for the management of biomass energy. Thirdly, the discussion will focus on evaluating and critiquing the institutional framework. Lastly, this essay will give recommendations for better management and promotion of sustainable use of biomass energy in Kenya.

2.0 The Status of Biomass Energy Use in Kenya

Kenya's energy mix is diverse. It comprises bioenergy, oil products, and clean renewables such as solar and wind energy. Studies have shown that the leading and primary energy supply in Kenya is bioenergy which comprises about 64.6% of the total energy supply.[9] Oil products such as petroleum rank second, followed by solar, wind, and other sources such as coal and hydroelectric power.[10]

Bioenergy in Kenya is primarily derived from what is considered as 'traditional biomass.' This includes sources such as charcoal and firewood. Currently, about 80% of Kenyan households rely on firewood for cooking and heating.[11] This exerts pressure on forest resources and contributes to land degradation. Additionally, Kenya has been experiencing unsustainable biomass extraction in the recent past because of the weak policies and regulatory frameworks that are in place.[12]

It is noteworthy that the renewability of biomass cannot be compared to that of wind and solar. This is because, unlike wind and solar that will always blow and shine, uncontrolled extraction of biomass and inefficient utilization runs

[9] 'Data Overview' (*International Energy Agency*) <https://www.iea.org/data-and-statistics> accessed 10 February 2022.

[10] Dr Andrew Welfle, Salome Chingaira and Alisher Kassenov, 'Decarbonising Kenya's Domestic & Industry Sectors through Bioenergy: An Assessment of Biomass Resource Potential & GHG Performances' (2020) 142 Biomass and Bioenergy 105757 <https://www.sciencedirect.com/science/article/pii/S0961953420302919> accessed 10 February 2022.

[11] *Ibid.*

[12] F Mugo and T Gathui, 'Biomass Energy Use in Kenya' <http://erepository.uonbi.ac.ke/handle/11295/54948> accessed 10 February 2022.

the risk of making biomass a non-renewable source of energy.[13] This is why the enactment of regulations to ensure conservation and sustainability is imperative in any jurisdiction, whose population relies heavily on the use of biomass as a source of energy.

It is without a doubt that Kenya has made significant strides in formulating energy policies and regulations, that are necessary for the proper regulation of biomass energy in Kenya, and this will be discussed in this essay; however, there still remain some gaps and overlaps with these regulations and institutions.

3.0 Critiquing Kenya's Regulatory and Institutional Framework

3.1 Kenya's Regulatory Framework

The regulatory framework for the management of biomass comprises international, regional, and national instruments. These include treaties, legislations, and policies on the use of biomass energy.

3.1.1 International and Regional Regulatory Framework

Kenya has ratified a number of international instruments that regulate the use of biomass per the Constitution of Kenya, 2010.[14] To begin with, Kenya is a party to the United Nations Framework Convention on Climate Change (UNFCCC). One of the UNFCCC objects is to promote sustainability in the management of biomass and forests.[15] The need for effective, sustainable development is to ensure the conservation of forest resources which are a leading source of biomass. Secondly, there is the Convention on Biological Diversity which has among its core mandates, ensuring sustainable use of biomass through adaptive management, bearing in mind the continued increase of dry areas.[16] Importantly, there are World Trade Organization

[13] *Ibid.*
[14] Constitution of Kenya 2010, Article 2(4) & 2(5).
[15] United Nations Framework Convention on Climate Change 1999, Article 4.
[16] Convention sur la diversité biologique and others, *Handbook of the Convention on Biological Diversity* (Earthscan 2001).

Framework on the trade in bioenergy products.[17] This WTO framework is important in controlling the demand for biomass energy because this source of energy, although grouped as renewable, can be depleted when there are uncontrolled extractions and trade rules.

Although the international framework provides for an adequate framework for the sustainable use of bioenergy in the Member States, they have often been seen as aspirational and utopic. This is because, in most developing African countries, bioenergy is the most accessible and affordable source of energy; besides, most households even trade in biomass through the sales of firewood and charcoal in order to sustain themselves.[18] Therefore, the efficacy of these instruments can only be realized if they were alive to the realities of life in developing and third world countries.

At the regional level, The Africa Bioenergy Policy Framework and Guidelines strive to inform the National Bioenergy Policy formulation. There are two main purposes of this framework.[19] First, this framework was enacted to build consensus on the shared framework that provides guidance to individual countries and regions in developing bioenergy policies and regulations. Secondly, the policy bolsters awareness creation among African policymakers and civil society about the need for environmentally friendly and socially acceptable bioenergy development policies.[20]

This is a positive step towards achieving sustainable use of biomass energy in Africa. This policy wishes to achieve this through the harmonization of policies in the management of bioenergy. This is essential because the

[17] Bioenergy Strategy 2020-2027 2020.

[18]Leo C Zulu and Robert B Richardson, 'Charcoal, Livelihoods, and Poverty Reduction: Evidence from Sub-Saharan Africa' (2013) 17 Energy for Sustainable Development 127 <https://www.sciencedirect.com/science/article/pii/S0973082612000506> accessed 11 February 2022.

[19] Aubin Nzaou, '11. African Union' (2019) 30 Yearbook of International Environmental Law 530 <https://doi.org/10.1093/yiel/yvaa051> accessed 11 February 2022.

[20] *n 14.*

production, trade, and use of bioenergy transcend national boundaries, and so do the effects of its ineffective extraction and utilization. Additionally, this policy buttresses existing national policies because policies often become ineffective when they are not widely supported at the regional level. A harmonized approach sets the stage for a shared standard, code, and behaviour for an efficient and sustainable bioenergy market in African countries.

3.1.2 National Level Regulatory Framework

Kenya is alive to the important role that biomass or bioenergy plays in driving the economy as well as a source of energy for those who cannot afford alternative sources of energy. Consequently, Kenya has put in place a myriad of policy and legal instruments in an attempt to promote sustainable use and realize the great depths of untapped potential in the effective and sustainable use of biomass energy.

The leading instrument is the Constitution which begins by devolving the planning and development in energy regulation to the county governments.[21] This devolved system of government prompted the enactment of the Energy Act,[22] seeing as there was the need to streamline the statutory framework with the provisions of the constitution of Kenya.

3.1.2.1 The Energy Act, 2019

The primary role of this act in the management of biomass in energy is that it lays the foundation for the implementation of a framework for energy regulation. To begin with, this act empowers the Cabinet Secretary to develop, publish, and review energy plans relating to different forms of renewable energy, which includes bioenergy.[23] Additionally, due to the changes in technology and innovation that revolutionize energy sources, the Cabinet Secretary is required to ensure and, in consultation with others, review the existing energy policy plans.[24] This is key because technological advances have a broad effect on energy sources like biomass, particularly when it comes

[21] Constitution of Kenya 2010, Fourth Schedule.
[22] No 1 of 2019.
[23] The Energy Act 2019, Section 5(1).
[24] The Energy Act 2019, Section 4(1).

to their extraction and sustainable use like the creation of energy-saving stove,[25] which Kenya must be aware of and review its policies in a manner that embraces change.

Moreover, the Cabinet Secretary is under the duty to publish the Integrated National Energy Plan, which will guide the adoption of clean and affordable energy.[26] This means that there is a need to reduce the use of biomass such as firewood and charcoal because these forms of renewable energy are not clean energy sources. In the same breath, the County Government is obligated to develop and submit the County Energy Plan to the Cabinet Secretary.[27] Lastly, the CS is required to prepare an energy resource map in respect of the different renewable energy resource areas.[28] This section seems aspirational because the biomass rich areas are disintegrated across the country and are ever so often, informal that drawing such a map is quite complex for the office of the Cabinet Secretary for energy.

When the Energy Act 2019 was enacted, its main goal was to reconcile the multiplicity that existed on the regulation of energy as well as to streamline the legal framework of biomass energy under the new era of devolved governance. However, this act has failed to achieve this mandate because there is still duplicity in the provisions for biomass energy. These can still be found in various statutes like the Energy Act 2019 and the Forest Conservation and Management 2016, which provide for licensing and use of bioenergy. Also, there is role duplication in different institutions; for instance, licensing and permits for the use of biomass in Kenya may be granted and revoked by the Energy and Petroleum Regulatory Authority per the Energy Act[29] or the Kenya Forest Service[30] per the Forest Conservation and Management Act. Therefore,

[25] Manuel Odeny, 'Smokeless Jikos Cut Pollution, Fuel Costs' *The Star* <https://www.the-star.co.ke/news/big-read/2021-10-15-smokeless-jikos-cut-pollution-fuel-costs/> accessed 11 February 2022.
[26] The Energy Act 2019, Section 75(1).
[27] The Energy Act 2019, Section 5(3).
[28] The Energy Act 2019, Section 74(2).
[29] The Energy Act 2019, Section 11.
[30] The Forest Conservation and Management Act 2016, Section 7 & 8.

it is evident that the primary objectives of the energy act have not been met; instead, it promotes duplicities, making it a case of *much ado about nothing*.

3.1.2.2 The National Energy Policy, 2018

This policy was enacted in October 2018. It recognizes biomass as an organic matter that can be used for heating, fuel, and electricity generation.[31] This policy was enacted to realize the goal of achieving at least 10% forest cover, which is threatened by the continued and uncontrolled extraction of trees to provide charcoal and firewood. This policy mandates the government to take part in a study on the potential of biomass energy and to disseminate information on biomass energy resources.[32] Also, in order to promote the use of alternative sources of energy, this policy advocates for the provision of incentives for the participation of the private sector in the conversion of waste to energy initiatives to tame the overreliance on the use of biomass energy.[33] Importantly, the primary object of this policy is to bolster the efficient conversion and cleaner utilization of biomass energy.

The National Energy Policy 2018 has promises for better, cleaner and sustainable biomass energy. The policy not only lays a basis for the realization of this goal, but it is also aware of the popularity of biomass due to the high costs of using alternative sources of energy. The policy even provides for incentives for the shift to cleaner energy by the private sectors because biomass such as firewood and charcoal pose a threat to the environment and the health of its users. Often there have been calls for a shift towards cleaner energy in the realization of Sustainable Development Goals and, in particular, SDG number 7 on affordable and clean energy.[34] This paper adopts that the implementation of this policy is essential for the promotion of safe and sustainable use of biomass energy in Kenya.

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[31] The National Energy Policy 2018, Section 3.4.1.
[32] *Ibid n28.*
[33] *Ibid n28.*
[34] 'Goal 7: Affordable and Clean Energy | UNDP in Kenya' (*UNDP*) <https://www.ke.undp.org/content/kenya/en/home/sustainable-development-goals/goal-7-affordable-and-clean-energy.html> accessed 11 February 2022.

3.1.2.3 The Environmental Management and Coordination Act 1999

This act came into force in the early 2000s and is one of the oldest acts that deal with the regulation of biomass energy use in Kenya. The core mandate of this act is to promote environmental conservation. This mandate is intertwined with the use of biomass energy because biomass energy sources such as firewood are extracted from plants, including trees which are at the centre of environmental conservation campaigns. Therefore, this act serves to indirectly regulate the supply of firewood and charcoal.[35]

Section 49[36] of this act speaks on the conservation of energy and planting of trees or woodlots. This section confers power on the authority[37] to promote research on appropriate renewable sources of energy, create incentives for the promotion of renewable sources of energy, and adopt measures that encourage afforestation by individual land users, community groups and even institutions.[38]

EMCA has for a long time represented a progressive legislative agenda when it comes to the management of the environment and promotion of better and clean energy. This is reflected in the provision that incentivizes the growth of trees by farmers and even the community and the use of better alternative renewable energy sources, unlike firewood and charcoal.[39] However, despite this act being in force for over 20 years, its enforcement faces a number of challenges because it is both human and financial resource-heavy.[40] Besides, they have been tremendous innovations that have led to the adoption of alternative sources of energy, and this old act does not reflect these innovations and today's standard practices in the use of renewables.

[35] F Mugo and T Gathui, 'Biomass Energy Use in Kenya' <http://erepository.uonbi.ac.ke/handle/11295/54948> accessed 11 February 2022.
[36] The Environmental Management and Coordination Act 1999.
[37] National Environmental Management Authority (NEMA).
[38] *Ibid n33,* Section 49.
[39] The Environmental Management and Coordination Act 1999, Section 49.
[40] F Mugo and T Gathui, 'Biomass Energy Use in Kenya' <http://erepository.uonbi.ac.ke/handle/11295/54948> accessed 11 February 2022.

3.1.2.4 The National Climate Change Action Plan (NCCAP) 2018-2022

Carbon emissions have always been linked to the two main categories of energy sources (renewables and non-renewables). Ergo, the NCCAP was adopted. The primary objective of this policy is to identify the possible actions that can be taken to transform energy and its uses with emphasis on the adoption of renewable energy to bring Kenya closer to achieving a low-carbon development pathway.[41] The NCCAP lays emphasis on nine critical areas, including those touching on bioenergy.[42] NCCAP's role in biomass energy use in Kenya is to promote the use of clean cooking solutions like the use of energy-saving or improved charcoal stoves, reafforestation, and agroforestry.

This action plan is representative of the instruments needed to ensure the progressive realization of cleaner and sustainable use of biomass energy. Although the intention of this act is well premised on ensuring low carbon emission through improved stoves, more should be done to ensure everyone has not only access to these stoves but are also able to afford them. Today, the price of an improved stove stands at Kshs 3000, which most households cannot raise.[43] Admittedly, the NCCAP has promises; however, costs act as a hindrance to its full realization.

3.1.2.5 Feed-In-Tariffs Policy On Wind, Biomass, Small-Hydro, Geothermal, Biogas and Solar Resource Generated Electricity

A Feed-In-Tariff instruments act as incentives for persons who have the capacity to generate electricity from renewable sources of energy. Through FiT, the generator of electricity from this source is able to earn a living by selling the surplus energy to others at a pre-determined tariff.[44] This electricity

[41] Bioenergy Strategy 2020-2027 2020, Section 3.1.2.

[42] *Ibid.*

[43] Githinji Reuben, 'Smoke Chasing Embu Men from Home' *The Star* <https://www.the-star.co.ke/counties/eastern/2019-05-16-smoke-chasing-embu-men-from-home/> accessed 11 February 2022.

[44] Feed-In-Tariffs Policy for Wind, Biomass, Small Hydros, Geothermal, Biogas and Solar, 2nd Revision, December, 2012, Section 2(7).

can be derived from different sources, including biomass. FiT plays a crucial role in ensuring sustainability in the production of renewable sources because the private investor will always adopt an effective way of production in order to maximize returns.[45]

There are challenges that face the full implementation of FiT, and this is the low rate that the investors get in terms of returns. Besides, Kenya has smaller biogas plants that cannot sustain large scale production in a manner that will attract tangible returns for the producers.[46] These two challenges have served to greatly discourage private individuals and investors from producing electricity from renewables.

3.1.2.6 Bioenergy Strategy 2020 -2027 (Kenya)

This action plan was drafted and adopted to help achieve a sustainable bioenergy future. This strategy is premised upon international and regional trends in the production of bioenergy and its consumption. Although it mirrors these international strategies, it has been informed by Kenya's bioenergy industry status.[47] The Bioenergy Strategy seeks to achieve sustainable use of bioenergy by 2028 through the promotion of sustainable production and consumption of bioenergy. Also, this action plan intends to accelerate the adoption and transition to clean cooking since most households cook with open fire, which is unsustainable as it consumes a lot of firewood. Since information is key, the goal of this strategy is to provide the necessary information to investors on the viable opportunities for bioenergy in Kenya.[48]

This is a progressive strategy that will fast track the realization of Vision 2030 as well as the Sustainable Development Goals, particularly the adoption of clean and affordable energy by all countries. This strategy is alive to the fact that a majority of Kenyans use bioenergy,[49] as such, to reduce the strain on

[45] *Ibid*, Section 2(8).
[46] *Ibid* Section 2(12).
[47] Bioenergy Strategy 2020-2027 2020, Page 5.
[48] Bioenergy Strategy 2020-2027 2020, Section 1.0.
[49] *Ibid n44.*

forest resources, improved stoves must be promoted among these households. However, the price of improved stoves continues to be high, which slows down the shift towards sustainable use.[50]

3.1.2.7 Other National Regulatory Instruments

There are other instruments that play a valuable role in the management of biomass use in Kenya. These instruments include:

3.1.2.7.1 The Energy Regulations of 2013

There have been innovative ways of utilizing biomass energy for cooking. These innovations include improved biomass stoves. Today, the production of improved biomass cookstoves has increased, calling for better standardization of quality. In order to address these concerns, the Energy Regulations of 2013 were passed.[51] Their main objective was to set the classes and requirements necessary in licensing, maintenance, manufacture, importation, and distribution of cookstoves.

3.1.2.7.2 The Forest Conservation and Management Act 2016

This act establishes the Kenya Forest Services.[52] The main role of this body is to "*receive and consider applications for licenses or permits in relation to forest resources."*[53] This role makes them critical in biomass energy use management because forests are sources of biomass energy. For example, firewood is a forest produce. Additionally, they body is mandated to formulate rules that govern the trade of forest resources and forest produce.[54] Most importantly, this act governs the production, transportation, and marketing of forest produce such as charcoal.[55]

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[50] Githinji Reuben, 'Smoke Chasing Embu Men from Home' *The Star* <https://www.the-star.co.ke/counties/eastern/2019-05-16-smoke-chasing-embu-men-from-home/> accessed 11 February 2022.
[51] Bioenergy Strategy 2020 – 2027 2020, Section 3.1.2.
[52] The Forest Conservation and Management Act 2016, Section 7.
[53] *Ibid,* Section 8.
[54] *Ibid.*
[55] *Ibid,* Sections 67(1)(e) and 71 (2).

The main challenge that comes with this act is that the Energy Act[56] establishes the Energy and Petroleum Regulatory Authority which has the same roles as the Kenya Forest Service. EPRA has the authority to issue licenses and permits on matters energy, including bioenergy, while KFS also has the same role of issuing licenses and permits for the use of forest produces like firewood and charcoal, which fall under bioenergy.

3.2 Kenya's Institutional Framework

There are a number of institutions that play an essential role in promoting the sustainable use of biomass in Kenya. These institutions are both governmental, statutory, and non-governmental. This part focuses on critically examining the roles these institutions play in the promotion of sustainable use of biomass energy.

3.2.1 Government Ministries

There are a number of ministries that are relevant in promoting sustainability in the use of biomass energy. However, two main ministries stand out; that is, the Ministry of Energy and the Ministry of Environment and Forestry. Although having two or more ministries bring about a multi-institutional approach that strengthens the management of biomass energy, it comes with dangers as well. For instance, having different ministries or entities regulating and overseeing the use of biomass can lead to institutional overlaps that could breed conflicts on who has more powers, as was seen in the case of the National Land Commission and the Ministry of Land.[57]

The leading ministry in the management of biomass is the Ministry of Energy, particularly the office of the Cabinet Secretary, which is tasked with the overall role of spearheading the formulation of energy policy plans on renewable energy after consultation with the relevant stakeholders.[58]Owing to the innovation that takes place in the energy industry, the act requires that the Cabinet Secretary also spearheads the review of this policy plan.[59]

[56] No 1 of 2019, Section 11.
[57] Supreme Court Advisory Opinion Reference 2 of 2014.
[58] Energy Act 2019, Section 4.
[59] *Ibid n51.*

Additionally, there is the Office of the Cabinet Secretary for Environment and Forestry which has the mandate of formulating National Forest Policies on the sustainable use of forest resources and forest produce.[60] Biomass energy sources, particularly plant sources, come from forest resources, such as trees, which are under the purview of the Cabinet Secretary for Environment and Forestry. Admittedly, it is clear that this role is an overlap of the role of the office of the Cabinet Secretary under the Energy Act.

3.2.2 Energy and Petroleum Regulatory Authority (EPRA)

This body was created by the energy act.[61] EPRA's main role in the sustainable use of biomass is that it has the authority to "*regulate the production, conversion, distribution, supply, marketing and use of renewable energy.*"[62] Regulation of the market, particularly supply, is essential because uncontrolled supply may lead to the depletion of forest resources. This is because plant based biomass like firewood are considered as forest produces. It is prudent to note that how biomass is used may bear a negative environmental impact. This is owing to the fact that the use of charcoal and firewood for heating and cooking contribute to the global carbon footprint, which accelerates global warming.[63]

The use of biomass should be sustainable, but most people continue to cook with open fires. This has created a market for the sale of improved stoves. However, EPRA does not have the right technical expertise to ensure the standardization of these improved stoves; thus, they work in conjunction with the Kenya Bureau of Standards, which has the capacity to ensure the good

[60] Forest Conservation and Management Act 2016, Section 5(1).
[61] No 1 of 2019, Section 9.
[62] Energy Act 2019, Section 10.
[63] Abigael Okoko and others, 'The Carbon Footprints of Alternative Value Chains for Biomass Energy for Cooking in Kenya and Tanzania' (2017) 22 Sustainable Energy Technologies and Assessments 124 <https://www.sciencedirect.com/science/article/pii/S2213138817301261> accessed 12 February 2022.

quality standards are adhered to in the manufacturing of improved energy-saving stoves.[64]

Although the Energy Act goal was to create a sector specific regulator like EPRA, the National Environmental Authority may also be considered as a regulator of this sector because biomass extraction and utilization are closely related to environmental conservation. This overlap in roles may cause conflicts and impede the realization of the functions and objectives of these bodies.

3.2.3 Rural Electrification and Renewable Energy Corporation (REREC)

The Rural Electrification and Renewable Energy Corporation were created by the Energy Act.[65] The roles of this corporation as provided for under section 44 of this act. They include the sourcing of funds to aid in financing renewable energy. Also, REREC is obligated to promote, develop and manage the use of renewable sources of energy, including biomass, solar, and wind.[66] The promotion can be done through subsidization of prices and offering other incentives. For a long time, the funding of renewable energy sources has come from the Rural Electrification Programme Fund.[67] However, most of the funds have to be put towards increasing the accessibility and affordability of electrical power in rural areas. This is essential because rural areas make up the largest population that uses biomass. Rural households use biomass for cooking, heating and lighting, and this is mainly because these families cannot afford alternative cleaner sources of energy such as electrical energy. Therefore, by subsidizing the cost of electricity connection fees from Ksh 75,000 to a lesser affordable fee, the overreliance on biomass will reduce, thus reducing the pressure on forest resources such as trees for firewood and charcoal.

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[64] 'ISO/TC 285 - Clean Cookstoves and Clean Cooking Solutions' (*ISO*) <https://www.iso.org/cms/render/live/en/sites/isoorg/contents/data/committee/48/57/4857971.html> accessed 12 February 2022.
[65] No 1 of 2019, Section 43.
[66] Ibid, Section 44.
[67] Energy Act 2019, Section 143.

However, it is worth noting that this is a double-edged sword. That is to say that by the Cabinet Secretary prescribing a levy.[68] the cost of electricity to be borne by others will be higher, and thus it could discourage other users. For instance, Devki decided to put up its own electrical plant because of the quotation fee that KPLC had given them. The result is that Kenya Power and Lighting will now be losing 200 million Kenyan shilling that Devki would have paid in terms of power bills.[69] Also, the government has delayed paying KPLC the amount for the connection of electricity which threatens the continuation of this project.[70] Granted, although this corporation, through funding, has promises in promoting sustainable use of biomass by encouraging the shift to other alternative renewable sources of energy through price subsidization in electricity connections, it comes with the danger of making KPLC lose huge power consumers because of costs through levies for sourcing funds.

3.2.4 Renewable Energy Resource Advisory Committee (RERAC)

The Renewable Energy Resource Advisory Committee (RERAC) was established by the Energy Act.[71] This is an inter-ministerial committee comprising of a representative from the office of the Attorney General, the managing director of the Kenya Electricity Generating Company Limited, the principal secretary of the National Treasury, and the principal secretary for matters relating to natural resources.[72]

The main role of the committee is to advise the Cabinet Secretary for Energy on matters relating to the allocation of renewable energy resources, licensing

[68] Energy Act 2019, Section 144.
[69] Kamau John, 'Mystery of Devki Paying Less for Power Bills than Rivals | Nation' <https://nation.africa/kenya/business/mystery-of-devki-paying-less-for-power-bills-than-rivals-3577988> accessed 1 February 2022.
[70] 'Consumers to Pay More as Kenya Power Ends Connection Subsidies' (*Business Daily*, 12 December 2020) <https://www.businessdailyafrica.com/bd/corporate/companies/consumers-to-pay-more-as-kenya-power-ends-connection-subsidies--2110944> accessed 12 February 2022.
[71] Energy Act 2019, Section 76.
[72] Energy Act 2019, Section 76(2).

of renewable energy resource areas, and the management and development of renewable energy resources.[73] It is worth noting that this advisory committee may advise the County Government but only when honouring a request on matters relating to renewable energy like biomass.[74]

This advisory committee is important because it brings together different stakeholders ensuring decisions and policy initiative taken towards the management of renewables is all-inclusive, thus preventing future conflicts between all these bodies that are charged with the management of renewable energy like biomass. However, there are weaknesses stemming from the very fact that advisory opinions are often not binding; therefore, the Cabinet Secretary may choose to ignore the advice of the committee.

3.2.5 National Environmental Management Authority (NEMA)

This paper has established that there is a close relationship between the use of biomass as a source of energy and the environment. Biomass like charcoal and firewood are extracted from forest resources like trees which are the cornerstone of a clean environment because they help with the purification of the air that we breathe. Also, the burning of charcoal and the use of firewood contributes to the world's carbon footprint, which is an environmental hazard.[75] These effects that the use of biomass has on the environment make its regulation to a certain extent fall under the ambit of the National Environmental Management Authority. This is because NEMA has the power to supervise and coordinate over all matters relating to the environment and to be the principal government instrument in the implementation of all policies relating to the environment.[76] This means that all the other agencies are playing second fiddle to NEMA.

Moreover, NEMA is tasked with the promotion of the use of renewable sources of energy. They achieve this through promoting research and creating

[73] *Ibid*, Section 76(4).
[74] *Ibid*, Section 76(5).
[75] Bioenergy Strategy 2020-2027 2020, Section 3.1.2.
[76] Environmental Management and Coordination Act 1999, Section 9.

incentives for the promotion of renewable sources of energy. Also, NEMA is under the obligation to take measures to encourage the planting of trees and woodlots by individual land users, institutions and by community groups.[77] This role makes NEMA a progressive institution that realizes that unlike other renewables like solar, biomass from plants may be depleted if their extraction is not controlled and there are no reafforestation initiatives put in place. However, there are overlaps in the regulation of biomass use between NEMA and EPRA. NEMA has an overarching role on environmental matters, which by constructive definition means the regulation of plant based biomass while at the same time the Energy Petroleum and Regulatory Authority has the power to regulate and oversee the use of biomass in Kenya. This is an overlap that must be reconciled in order to curb the breeding of conflict of functions.

4.0 Conclusion

The promotion of sustainable use of biomass energy in Kenya has prompted the establishment of a number of institutions and the enactment of policies and statutes. However, from the foregoing discussion, it is evident that there are gaps, weaknesses, and challenges that hinder the shift towards sustainable use and clean energy. The biomass regulatory and institutional framework in Kenya is characterized by institutional overlaps between NEMA and EPRA. Also, there is a multiplicity of laws which is indicative of the failure of the Energy Act 2019, which was enacted to harmonize and streamline the regulatory framework for Kenya's energy sector. Therefore, initiatives ought to be taken to address these challenges and to ensure an effective regulatory and institutional framework that will spear the sustainable use of biomass energy in Kenya.

5.0 Recommendations

This essay has defined Kenya’s biomass status from a statistical, regulatory, and institutional framework perspective. Also, this essay has highlighted the various challenges that riddle and hinder the realization of sustainable use of biomass energy in Kenya. Consequently, this paper will proffer short term and

[77] *Ibid* Section 49.

medium term initiatives that must be taken to ensure Kenya achieves sustainability in the bioenergy sector.

5.1 Short-Term Initiatives

5.1.1 Enhancing Policy, Regulatory, and Institutional Frameworks

It is essential to strengthen institutions like the Renewable Energy Resource Advisory Committee, whose advice is not binding to the Cabinet Secretary for Energy. It is noteworthy that RERAC was established to ensure all-inclusive and informed decisions are made on renewable energy resources in Kenya, however by its advice not being binding, it is a weakened institution, and its existence does not add value because the CS may deliberately ignore the advisory.

A Collaboration Charter should be enacted so that it brings together all the stakeholders (both governmental and non-governmental) relevant in the management and promotion of sustainable use of biomass. Today, there are many statutes that create different statutory bodies with the task of managing, regulating, and promoting; however, there is no collaborative charter in place to ensure that these entities work together, leading to duplicity, which is expensive and ineffective.

Lastly, it is necessary that the various associations and alliances such as the Clean Cooking Association of Kenya and Charcoal Producers Associations, which comprise stakeholders who play a role in the promotion of clean cooking solutions that are important in ensuring the sustainability of biomass energy sources like firewood are recognized by statute and included in committees like RERAC as the primary institution in the bioenergy sector.

5.1.2 Promoting Feedstock Production to Enhance Sustainable Bioenergy

Biomass energy from plants runs the risk of depletion without sustainable extraction and use. Therefore, replenishing plant cover is imperative. It is best to encourage the on-farm growing of energy trees and crops not only in rural spaces but in urban and semi-urban places. By so doing, the pressure on the forest will reduce, which is a positive contribution to Kenya's climate change.

5.2 Mid-Term Initiatives

5.2.1 Research Capacity Building

Research is crucial before the formulation of policies touching on the use of biomass. This will ensure that the policies are informed, and the gaps and challenges that exist are remedied. It is also necessary that a database be created where all the information required on biomass use can be easily retrieved to see what the status of biomass energy in Kenya is, where it will be and where it ought to be. Lastly, research also encourages innovation, and the adaption of technology like improved stoves are the fruits of research and development.

5.2.2 Promoting Transition to Clean Cooking Fuels and Technology Through Financial Incentives

The transition towards clean energy continues to fall on the axe of costs. Improved stoves are still costly, and so are alternative sources of renewable energy such as electrical energy. Ergo, the government should ensure VAT and other fiscal incentives are given to investors. For instance, locally-made improved stoves can be listed as zero-rated, meaning that the input tax in the production will be refunded to the manufacturers, thus lowering the price of these stoves. Also, there could be financing options and solutions to help subsidize the cost of alternative sources of energy and cookstoves.

5.2.3 Promoting and Creating Awareness

Information on sustainable use of biomass is necessary. Many are times that the users do not have sufficient information on bioenergy or even the existence of improved cookstoves that reduce the energy lost when one cooks with an open fire. Also, awareness will help in positively impacting behavioural change within the society to promote sustainable uptake of various sources of bioenergy and not just those produced from forest resources.

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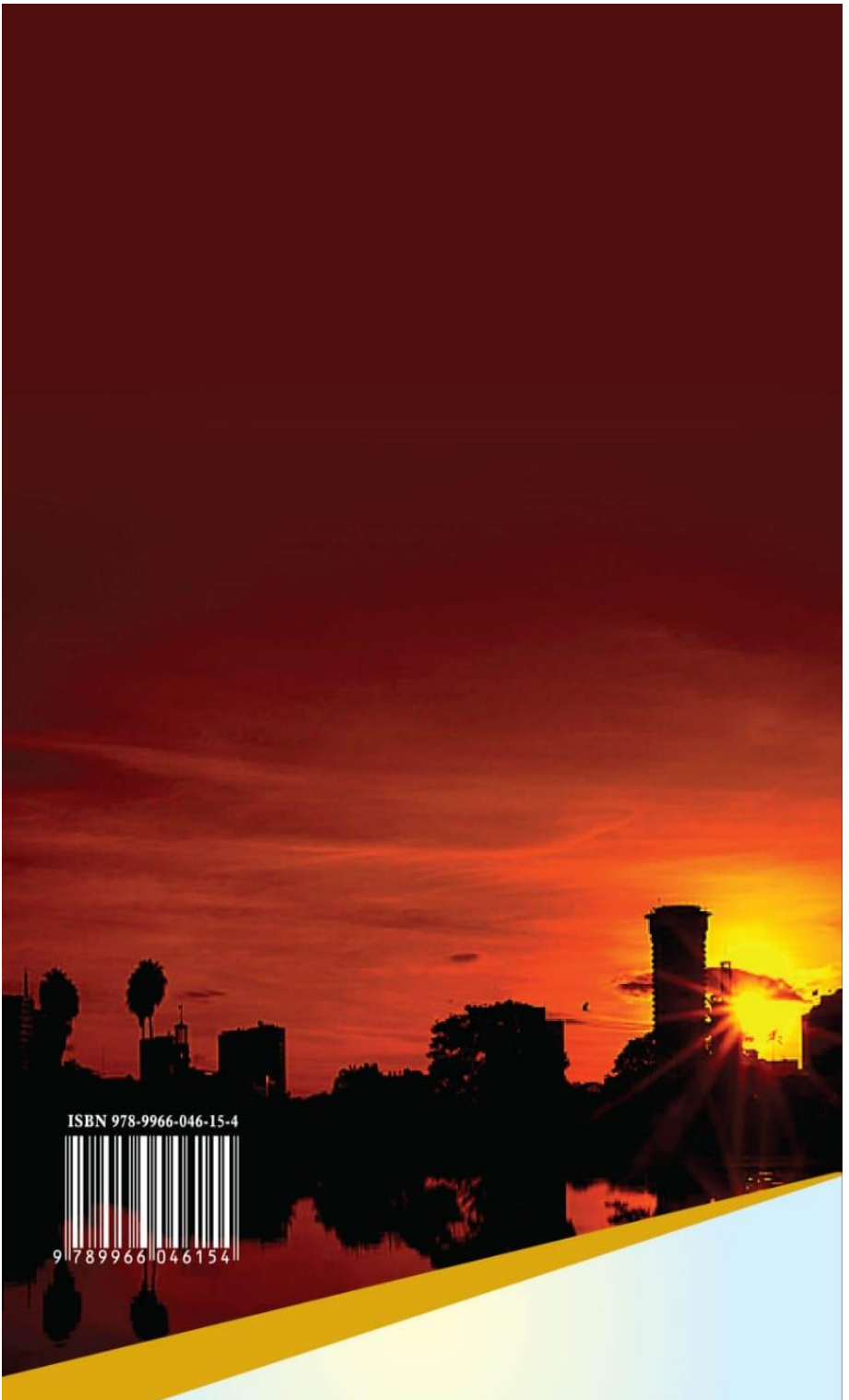
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