

Adopting Green Energy for a Bright Tomorrow

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Adopting Green Energy for a Bright Tomorrow

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Abstract

The paper argues a case for the adoption of green energy for a bright tomorrow. It posits that access to clean and affordable energy is a fundamental human right as envisaged under the 2030 Agenda for Sustainable Development. The paper further asserts that green energy sources such as renewable energy are environmentally friendly and can aid in fostering Sustainable Development and promoting climate change mitigation and adaptation. It interrogates various attempts towards adopting green energy at the global, regional and national levels. It also highlights the concerns and challenges facing the adoption of green energy and offers proposals towards enhancing the adoption of green energy for a bright tomorrow.

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1.0 Introduction

Energy is a fundamental human need that has been described as a basic factor necessary to sustain life¹. Indeed, access to energy is so fundamental that some authors have argued that food and energy are the two essential resources to support the modern and civilized society of the mankind². Energy is a basic human need that has been equated to food, air and water³. It has been pointed out that energy can spur economic development and poverty eradication⁴. Energy has the potential of accelerating the attainment of socio-economic rights such as the right to food, the right to education, the right to health, the right to water among others⁵. Energy plays a critical role in economic growth and development, and future economic growth has been seen to be largely hinged on the long-term availability of energy which is to be derived from sources that are affordable, accessible and environmentally friendly⁶. Access to energy is thus a fundamental human right.

Energy plays an important role in the Sustainable Development agenda. It has the ability to stimulate development by connecting the Sustainable Development Goals (SDGs) and unlocking sustainable economic growth⁷. On this basis, it has been argued that Sustainable Development will not be achieved without the realization of the right of access to energy⁸. This fact is recognized under the United Nations 2030 Agenda for Sustainable Development which seeks to achieve universal access to affordable, reliable

¹ Goldthau. A & Sovacool. B., 'The Uniqueness of the Energy Security, Justice and Governance Problem' *Energy Policy*, 41 (2012) 232-240

² Tomabechei K, 'Energy Resources in the Future' *Energies* 2010, 3, 686-695, 686.

³ Goldthau. A & Sovacool. B., 'The Uniqueness of the Energy Security, Justice and Governance Problem' Op Cit

⁴ Muigua. K., 'Access to Energy as a Constitutional Right in Kenya', available at <http://kmco.co.ke/wp-content/uploads/2018/08/Access-to-Energy-as-a-Constitutional-Right-in-Kenya-NOVEMBER-2013.pdf> (Accessed on 26/06/2023)

⁵The World Bank, 'Sustainable Development Goal on Energy (SDG7) and the World Bank Group, available at <https://www.worldbank.org/en/topic/energy/brief/sustainable-development-goal-onenergy-sdg7-and-the-world-bank-group> (Accessed on 26/03/2023)

⁶ Muigua. K., Wamukoya. D & Kariuki. F., 'Natural Resources and Environmental Justice in Kenya.' Glenwood Publishers Limited, 2015

⁷ Goldthau. A & Sovacool. B., 'The Uniqueness of the Energy Security, Justice and Governance Problem' Op Cit

⁸ Muigua. K., 'Access to Energy as a Constitutional Right in Kenya' Op Cit

and modern energy services among other targets in the quest towards Sustainable Development⁹.

However, despite the importance of energy as basic human need, several challenges continue to be witnessed in the energy sector in Kenya and across the globe. It has been pointed out that many people across the world lack access to clean energy sources such as electricity and use polluting, inefficient fuels such as firewood for household chores such as cooking¹⁰. This challenge is especially prevalent in Sub-Saharan Africa where majority of the population lack access to clean and affordable energy and depend on traditional fuels¹¹. Access to energy represents one of Africa's greatest obstacles to social and economic development¹². Further, it has been pointed out that the energy sector is by far the main contributor to the global threat of climate change and accounts for approximately 73 percent of human caused greenhouse gases ¹³.

It is on this basis that the paper argues for adoption of green energy sources such as renewable energy to address the concerns raised above. The paper argues that green energy can promote the right of access to clean and affordable energy and foster Sustainable Development. It defines green energy and identifies its various sources. The paper then examines some of the global, regional and national initiatives towards the adoption of green energy and identifies the challenges thereof. It then suggests reforms and measures towards the adoption of green energy in Kenya and across the globe for a bright tomorrow.

⁹ United Nations., 'Transforming Our World: The 2030 Agenda for Sustainable Development.' Available at <https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf>

¹⁰ Muigua. K., 'Towards Energy Justice in Kenya.' Available at <http://kmco.co.ke/wp-content/uploads/2020/02/Towards-Energy-Justice-in-Kenya-00000005.pdf> (Accessed on 26/06/2023)

¹¹ Bildirici. M & Ozaksoy.F., 'Woody Biomass Energy Consumption and Economic Growth in Sub-Saharan Africa' *Procedia Economics and Finance* 38 (2016) 287 – 293.

¹² Hafner. M., 'The Challenge of Energy Access in Africa.' Available at https://link.springer.com/chapter/10.1007/978-3-319-92219-5_1 (Accessed on 26/06/2023)

¹³ United Nations Development Programme., 'Goal 7: Affordable and Clean Energy.' Available at https://www.undp.org/sustainable-development-goals/affordable-and-clean-energy?gclid=EAAlaIQobChMIxrfXsO3g_wIVDZhRCh1NqALvEAAYAiAAEgJwTvD_BwE (Accessed on 26/06/2023)

2.0 The Concept of Green Energy

Growing human populations and rising levels of consumption have elevated energy demands, placing increasing burdens on the environment, particularly on the global climate¹⁴. Conventional energy sources such as fossil fuels cause significant environmental impacts such as climate change¹⁵. This has necessitated the transition to green energy sources.

Green energy which is also referred to as clean, sustainable or renewable energy is energy that is derived from natural resources, such as sunlight, wind or water¹⁶. It has also been described as energy that comes from renewable sources of energy¹⁷. Such sources include solar power, wind power, hydropower, geothermal energy, biomass and biofuels¹⁸. Renewable energy has been defined as energy derived from natural sources that are replenished at a higher rate than they are consumed¹⁹. The Energy Act of Kenya defines renewable energy as non-fossil energy generated from natural non-depleting resources including but not limited to solar energy, wind energy, biomass energy, biological waste energy, hydro energy, geothermal energy and ocean and tidal energy²⁰.

Green energy sources such as renewable energy are environmentally friendly and can aid in fostering Sustainable Development and promoting climate change mitigation and adaptation²¹. Generating green energy from renewable energy sources creates far lower

¹⁴ Gibson. L et al., 'How Green is 'Green' Energy?' *Trends in Ecology & Evolution*, 2306

¹⁵ Ibid

¹⁶ TWI Global., 'What is Green Energy? (Definition, Types and Examples).' Available at <https://www.twi-global.com/technical-knowledge/faqs/what-is-green-energy> (Accessed on 26/06/2023)

¹⁷ Inspire Clean Energy., 'What is Green Energy? Types, Definitions and Examples.' <https://www.inspirecleanenergy.com/blog/clean-energy-101/what-is-green-energy> (Accessed on 26/06/2023)

¹⁸ Ibid

¹⁹ United Nations., 'What is Renewable Energy?' Available at <https://www.un.org/en/climatechange/what-is-renewable-energy> (Accessed on 26/06/2023)

²⁰ Energy Act, No. 1 of 2019, Laws of Kenya., S 2.

²¹ Mohtasham. J., 'Review Article: Renewable Energies' *Energy Procedia*, 74 (2015) 1289 – 1297

emissions than traditional sources such as burning fossil fuels²². Green energy has the potential of replacing the negative effects of fossil fuels with more environmentally-friendly alternatives²³. Since, it is derived from natural resources, green energy is also often renewable and clean, meaning that it emits no or few greenhouse gases and is often readily available²⁴. Transitioning from fossil fuels, which currently account for the lion's share of emissions, to green energy sources such as renewable energy is key to addressing the climate crisis²⁵. Green energy sources such as renewable energy can also enhance security of energy supply and promote energy justice by fostering the attainment of the right of access to clean and affordable energy²⁶.

Despite the viability of green energy sources such as renewable energy, these sources are yet to be widely embraced due to several challenges including inadequate funding and investment in green energy, lack of political goodwill and ignorance among consumers²⁷. There is need to adopt green energy in order to achieve energy justice, promote socio-economic development and foster Sustainable Development through climate change mitigation and adaptation²⁸.

²² Ibid

²³ TWI Global., 'What is Green Energy? (Definition, Types and Examples).' Op Cit

²⁴ Ibid

²⁵ United Nations., 'What is Renewable Energy?' Op Cit

²⁶ Nizic. M.K., 'The Advantages and Disadvantages of Renewable Energy in the Tourist Destination.' Available at

https://www.researchgate.net/publication/320584990_The_Advantages_and_Disadvantages_of_Renewable_Energy_in_the_Tourist_Destination (Accessed on 26/06/2023)

²⁷ Muigua. K., 'Nurturing Our Environment for Sustainable Development.' Glenwood Publishers Limited, 2016

²⁸ Ibid

3.0 The Journey towards Green Energy: Prospects and Challenges

There have been several attempts towards recognizing the right of access to clean and affordable energy as a fundamental human right at the global, regional and national levels. The *Energy Charter Treaty* is a multilateral framework for energy cooperation that is designed to promote energy security through the operation of more open and competitive energy markets, while respecting the principles of Sustainable Development and sovereignty over energy resources²⁹. Among the targets of the Treaty is the promotion of energy efficiency and minimising the environmental impact of energy production and use³⁰. The Treaty is one of the best available instruments for improving international energy security by promoting international energy investments and fair access to markets³¹. It also urges its member states to formulate clear policies for improving energy efficiency and reducing the energy cycle's negative environmental impacts³². However, membership of the Energy Charter Treaty is mostly drawn from European nations³³. The Treaty may thus not address energy concerns in most African countries.

The United Nations *2030 Agenda on Sustainable Development* also seeks to foster the adoption of green energy³⁴. Sustainable Development goal 7 is aimed at ensuring universal access to affordable, reliable and modern energy services³⁵. It further recognizes that investing in green energy including renewable sources of energy such as solar, wind and thermal power; improving energy productivity, and ensuring energy for all are vital

²⁹ The Energy Charter Treaty., Available at <https://www.energycharter.org/fileadmin/DocumentsMedia/Legal/ECTC-en.pdf> (Accessed on 26/06/2023)

³⁰ Ibid

³¹ Konoplyanik. A & Walde. T., 'Energy Charter Treaty and its Role in International Energy.' Available at http://konoplyanik.ru/ru/publications/articles/417_Energy_Charter_Treaty_and_its_Role_in_International_Energy.pdf (Accessed on 26/06/2023)

³² Ibid

³³ Energy Charter., 'Members and Observers to the Energy Charter Conference.' Available at <https://www.energycharter.org/who-we-are/members-observers/> (Accessed on 26/06/2023)

³⁴ United Nations., 'Transforming Our World: The 2030 Agenda for Sustainable Development.' Op Cit

³⁵ United Nations Development Programme., 'Goal 7: Affordable and Clean Energy.' Op Cit

in the attainment of the Sustainable Development agenda³⁶. Adopting green energy is thus vital in fostering Sustainable Development.

At the regional level, the *Treaty Establishing the East African Community*³⁷ recognizes the role of energy in the East African integration agenda. It urges member states to adopt policies and mechanisms to promote the efficient exploitation, development, joint research and utilisation of various energy resources available within the region³⁸. Further, the Treaty calls upon member states to promote the exploitation and utilisation of new and renewable sources of energy within the East African Community³⁹. The Treaty also implores member states to take measures towards supplying affordable energy to their citizens while taking cognisance of the protection of the environment⁴⁰.

In Kenya, it has been pointed that access to energy is a Constitutional right⁴¹. Although the Constitution does not expressly provide for the right to access to energy, it recognizes energy as part of the natural resources in Kenya⁴². To this extent, the Constitution provides that natural resources means the physical non-human factors and components, whether *renewable or non-renewable*, including inter alia rocks, minerals, fossil fuels and other sources of energy⁴³. The Constitution also enshrines the principle of Sustainable Development in Kenya⁴⁴. Enhancing universal access to affordable, reliable and modern energy services including green energy sources such as renewable energy is an essential part of the Sustainable Development agenda⁴⁵. The Constitution of Kenya thus envisages adoption of green energy.

³⁶ Ibid

³⁷ Treaty Establishing the East African Community., Available at <https://investmentpolicy.unctad.org/international-investment-agreements/treaty-files/2487/download> (Accessed on 26/06/2023)

³⁸ Ibid, Article 101 (1)

³⁹ Ibid, Article 101 (2) (a)

⁴⁰ Ibid, Article 101 (2) (f)

⁴¹ Muigua. K., 'Access to Energy as a Constitutional Right in Kenya' Op Cit

⁴² Constitution of Kenya, 2010., Article 260, Government Printer, Nairobi

⁴³ Ibid

⁴⁴ Ibid, Article 10 (2) (d)

⁴⁵ United Nations Development Programme., 'Goal 7: Affordable and Clean Energy.' Op Cit

Further, the *Energy Act*⁴⁶ embraces the concept of green energy by recognizing renewable sources of energy. The Act mandates the government to facilitate the provision of affordable energy services to all persons in Kenya⁴⁷. It also requires the government to promote the development and use of renewable energy technologies, including but not limited to biomass, biodiesel, bioethanol, charcoal, fuelwood, solar, wind, tidal waves, hydropower, biogas and municipal waste⁴⁸. Towards this end, the Act requires the government to undertake several measures including formulating a national strategy for coordinating research in renewable energy; promoting international co-operation on programs focusing on renewable energy sources and harnessing opportunities offered under clean development mechanism and other mechanisms including, but not limited to, carbon credit trading to promote the development and exploitation of renewable energy sources⁴⁹. Actualizing the vision of the Energy Act is paramount in enhancing the right of access to clean and affordable energy in Kenya and adopting green energy.

In addition, the *National Energy Policy* recognizes energy as a critical component in Kenya⁵⁰. The policy seeks to achieve which several objectives including improving access to affordable, competitive and reliable energy services, promoting energy efficiency and conservation and promoting diversification of energy supply sources in Kenya to ensure security of supply among others⁵¹. It contains several proposals towards the use, development and conservation of energy sources in the country such as coal resources, renewable energy and electricity⁵². The Policy also contains energy efficiency and conservation measures aimed at reducing energy consumption without sacrificing productivity or increasing costs⁵³. Effective implementation of the Policy is integral in

⁴⁶ Energy Act, No.1 of 2019, Government Printer, Nairobi

⁴⁷ Ibid, Article 7 (1)

⁴⁸ Ibid, S 75 (1)

⁴⁹ Ibid, S 75 (2)

⁵⁰ Ministry of Energy., 'National Energy Policy.' Available at

https://repository.kippra.or.ke/bitstream/handle/123456789/1947/BL4PdOqKtxFT_National%20Energy%20Policy%20October%20%202018.pdf?sequence=1&isAllowed=y (Accessed on 26/06/2023)

⁵¹ Ibid

⁵² Ibid, S 1.2

⁵³ Ibid, S 5.0

promoting green energy in Kenya and enhancing the right of access to clean and affordable energy.

The concept of green energy is thus well captured at the global, regional and national levels. The International Energy Agency notes that the rate of adoption of green energy sources such as renewable energy is expected to rise with the world set to add as much renewable power in the next 5 years as it did in the past 20 years⁵⁴. It further observes that renewables have grown rapidly in recent years, driven by policy support and sharp cost reductions for solar photovoltaics and wind power in particular⁵⁵. In addition, it has been asserted that the electricity sector remains the brightest spot for renewables with the strong growth of solar photovoltaics and wind in recent years, building on the already significant contribution of hydropower in the transition towards green energy⁵⁶. In Africa, the African Energy Forum is geared towards driving Africa's green energy transition⁵⁷. It notes that Africa's vast renewable resources give it a distinct advantage in the move towards a green hydrogen future⁵⁸. Among the key themes of its 2023 agenda is to increasing pace and scale of Africa's renewable energy projects towards adoption of green energy⁵⁹. Further in Kenya, the Rural Electrification and Renewable Energy Corporation is mandated to develop, promote and manage in collaboration with other agencies, the use of renewable energy and technologies⁶⁰. The Corporation has undertaken projects towards implementing this mandate including installation of solar power plants, electrification of public facilities and schools and transformer maximization projects to enhance electricity access and connectivity in areas with large

⁵⁴ International Energy Agency., 'Renewables.' Available at <https://www.iea.org/fuels-and-technologies/renewables> (Accessed on 27/06/2023)

⁵⁵ Ibid

⁵⁶ Ibid

⁵⁷ Africa Energy Forum., 'Held on 20-23 June 2023 in Nairobi, Kenya', Available at <https://www.africa-energy-forum.com/> (Accessed on 27/06/2023)

⁵⁸ Ibid

⁵⁹ Ibid

⁶⁰ Energy Act, No. 1 of 2019, S 44 (1) (j)

populations⁶¹. Thus, there are immense opportunities for adoption of green energy at the global, regional and national levels.

However, despite the viability of green energy sources including renewable energy, several concerns have hindered their effective adoption. These include inadequate funding, lack of political goodwill and ignorance among consumers⁶². Further, the threat of climate change can hinder adoption of green energy sources such as hydroelectricity due to the depletion of forests and water catchment areas which act as a source for water used in their generation⁶³. There is need to address these concerns in order to foster the adoption of green energy and fast track the transition to a less carbon-intensive and more sustainable energy system.

4.0 Way Forward

The economic, societal and environmental benefits of green energy sources such as renewable energy are numerous. It is available in abundance, cheaper and a healthier option for people and the planet⁶⁴. There is thus need to promote sustainability in the energy sector through the adoption and investing in the abundant renewable energy available all over the planet⁶⁵. This will be essential in enhancing access to clean and affordable energy which is a fundamental human right and a critical component of the Sustainable Development agenda⁶⁶. It has been pointed that in Kenya while notable progress has been made towards enhancing access to electricity through measures such as the rural electrification program, progress remains slow in promoting clean cooking facilities with bio-energy sources such as charcoal and wood fuel still being the most common source of energy in Kenya especially among the rural

⁶¹ Rural Electrification and Renewable Energy Corporation., Available at <https://www.rerec.co.ke/our-work.php> (Accessed on 27/06/2023)

⁶² Muigua. K., 'Nurturing Our Environment for Sustainable Development.' Op Cit

⁶³ Muigua. K., Wamukoya. D & Kariuki. F., 'Natural Resources and Environmental Justice in Kenya.' Op Cit

⁶⁴ United Nations., 'Climate Action.' Available at <https://www.un.org/en/climatechange/how-communities-are-embracing-renewable-energy> (Accessed on 27/06/2023)

⁶⁵ Ibid

⁶⁶ Ibid

population⁶⁷. However, the environmental concerns raised by these sources of energy such as climate change calls for the adoption of green sources of energy⁶⁸. Measures can be put in place to enhance access to clean energy sources for purposes of cooking such as reducing the cost of Liquefied Petroleum Gas (LPG) to promote its affordability⁶⁹. Further, costs related to electricity such as connection charges and billing costs should be made affordable for the benefit of all Kenyans especially those in rural areas⁷⁰. This will ensure adoption of green energy while also fostering the right of access to clean and affordable energy.

In addition, there is need for government support through funding and putting in place relevant programs and policy measures in order to ensure adequate investment and adoption of green energy⁷¹. In Kenya, there is need to realize the vision of the Energy Act in order to adopt green energy sources such as renewable energy⁷². Further, the Rural Electrification and Renewable Energy Corporation needs to effectively discharge its mandate in order to promote the adoption of green energy sources in Kenya⁷³. There is also need for governments to put in place appropriate measures such as tax incentives and appropriate laws and policies in order to encourage investments in green energy sources by entities such as multinational corporations⁷⁴. This will ensure green financing and investment in renewable energy projects and provide practical solutions for filling the green financing gap which is a key concern in adopting green energy especially in developing countries⁷⁵.

⁶⁷ Muchiri. L., 'Gender and Equity in Bioenergy Access and Delivery in Kenya' Practical Action East Africa, 2008, available at https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKEwiy2P29z6PnAhUEiFwKHQlyCLOQFjAAegQIBRAB&url=http%3A%2F%2Fwww.cas.ed.ac.uk%2F_data%2Fassets%2Fword_doc%2F0007%2F24793%2FGender_and_Equity_in_Bio_energy_Access_and_Delivery_in_Kenya_final.doc&usg=AOvVaw2AKp1mvTSC9tafkIKJ-36 (Accessed on 27/06/2023)

⁶⁸ Ibid

⁶⁹ Muigua. K., 'Towards Energy Justice in Kenya.' Op Cit

⁷⁰ Ibid

⁷¹ Muigua. K., 'Access to Energy as a Constitutional Right in Kenya' Op Cit

⁷² Centurion., 'Renewable Energy Growth in Kenya.' Available at <https://centurionlg.com/2022/02/01/renewable-energy-growth-in-kenya/> (Accessed on 27/06/2023)

⁷³ Ibid

⁷⁴ Taghizadeh-Hesary. F & Yoshino. N., 'Sustainable Solutions for Green Financing and Investment in Renewable Energy Projects.' Available at <https://www.mdpi.com/1996-1073/13/4/788> (Accessed on 27/06/2023)

⁷⁵ Ibid

It is also necessary promote public participation in the journey towards adopting green energy in order to guarantee energy justice. Sustainability in the energy sector also calls for the identification of the energy needs of consumers in a country and ensuring that the needs are met in a manner that is efficient⁷⁶. Thus in fostering investments in the energy sector, players such as the government and the private sector are required to ensure that they adopt measures towards promoting acceptability of green energy projects to local communities and that further, such projects are socially sustainable⁷⁷. Community consultation through meaningful public participation is important to ensure that there is public acceptance and cooperation in green energy projects⁷⁸. Public participation is an essential component of environmental governance including investments in green energy as envisaged under the Rio Declaration which acknowledges that environmental issues are best handled with the participation of all concerned citizens, at the relevant level⁷⁹. Public participation has also been enshrined as one of the national values and principles under the Constitution of Kenya⁸⁰. Public participation can thus promote energy justice in the quest towards adopting green energy.

Finally, there is need to promote sound environmental management in order to enhance adoption of green energy. Conservation of the environment ensures that certain renewable sources of energy such as water used for the generation of hydroelectricity is not exhausted due to the depletion of forests and other water catchment areas⁸¹. It is also imperative to combat climate change through appropriate mitigation and adaptation measures in order to ensure continued availability of green energy sources such as biomass and hydropower⁸².

⁷⁶ Muigua. K., Wamukoya. D & Kariuki. F., 'Natural Resources and Environmental Justice in Kenya.' Op Cit

⁷⁷ Ibid

⁷⁸ Muigua. K., 'Access to Energy as a Constitutional Right in Kenya' Op Cit

⁷⁹ United Nations General Assembly., 'Report of the United Nations Conference on Environment and Development: Rio Declaration on Environment and Development' 1992' A/CONF.151/26 (Vol. I)

⁸⁰ Constitution of Kenya, 2010., Article 10 (2) (a)

⁸¹ Muigua. K., Wamukoya. D & Kariuki. F., 'Natural Resources and Environmental Justice in Kenya.' Op Cit

⁸² Owusu. P. & Asumadu-Sarkodie. S., 'A Review of Renewable Energy Sources, Sustainability Issues and Climate Change Mitigation.' *Cogent Engineering* (2016).

Through these among other measures, adoption of green energy for a bright tomorrow will be realized.

5.0 Conclusion

Access to clean and affordable energy is an essential human right⁸³. In the wake of environmental concerns such as climate change, adoption of green energy is integral in enhancing access to clean and affordable energy and promoting Sustainable Development. Green energy sources such as renewable energy are environmentally friendly and can aid in fostering Sustainable Development and promoting climate change mitigation and adaptation⁸⁴. However, despite the viability of green energy, several concerns have hindered its adoption at the global, regional and national level. These include inadequate funding, lack of political goodwill and ignorance among consumers.⁸⁵ There is need to address these concerns through measures such embracing green energy sources such as renewable energy, adequate funding and investment in green energy, promoting public participation in green energy projects in order to guarantee energy justice and combating climate change in order to promote sustainability in the energy sector⁸⁶. Through these measures, the ideal of adopting green energy for a bright tomorrow will be realized at the global, regional and national levels.

⁸³ Muigua. K., 'Access to Energy as a Constitutional Right in Kenya' Op Cit

⁸⁴ Mohtasham. J., 'Review Article: Renewable Energies' Op Cit

⁸⁵ Muigua. K., 'Nurturing Our Environment for Sustainable Development.' Op Cit

⁸⁶ Owusu. P. & Asumadu-Sarkodie. S., 'A Review of Renewable Energy Sources, Sustainability Issues and Climate Change Mitigation.' Op Cit

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Ministry of Energy., 'National Energy Policy.' Available at https://repository.kippra.or.ke/bitstream/handle/123456789/1947/BL4PdOqKtxFT_National%20Energy%20Policy%20October%20%202018.pdf?sequence=1&isAllowed=y

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Muchiri. L., 'Gender and Equity in Bioenergy Access and Delivery in Kenya' *Practical Action East Africa*, 2008, available at <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKEwiy2P29z6PnAhUEiFwKHQlyCLOQFjAAegQIBRAB&url=http%3>

[A%2F%2Fwww.cas.ed.ac.uk%2F_data%2Fassets%2Fword_doc%2F0007%2F24793%2FGender_and_Equity_in_Bio_energy_Access_and_Delivery_in_Kenya_final.doc&usg=AOvVaw2AKp1mvTSC9tafkIKJ-36](http://www.cas.ed.ac.uk/data/assets/word_doc/0007/24793/Gender_and_Equity_in_Bio_energy_Access_and_Delivery_in_Kenya_final.doc&usg=AOvVaw2AKp1mvTSC9tafkIKJ-36)

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Owusu. P. & Asumadu-Sarkodie. S., 'A Review of Renewable Energy Sources, Sustainability Issues and Climate Change Mitigation.' *Cogent Engineering* (2016).

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