

Review Article

Renewable Energies in Ghana in Relation to Market Condition, the Environment, and Food Security

Rogers Kipkoech, Mohammed Takase , and Ernest Kofi Amankwa Afrifa

Department of Environmental Science, School of Biological Sciences, College of Agriculture and Natural Sciences, University of Cape Coast, Cape Coast, Ghana

Correspondence should be addressed to Mohammed Takase; mohammed.takase@ucc.edu.gh

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Energy is essential to the development of a country, and several studies have been carried out on the production and use of energy by industrialised countries. However, little research and development has been carried out in developing countries on renewable energy. Also, the importance of traditional fuels such as biomass has not been emphasised in developing countries like Ghana, which rely on fossil fuels. Ghana relies heavily on imported petroleum fuel obtained from fossil fuels. However, fossil fuels are faced with many limitations including environmental pollution and an escalating price. Hydropower, biomass, biofuel, wind, and solar energy are the major renewable energy resources expected to be fully exploited in the future. This study, therefore, assesses the sources of the main renewable energy in relation to policy, the conditions of the market and food security. The government of Ghana has put in place a favourable business environment for the renewable energy sector by setting explicit feed-in tariffs (FITs). In addition, various acts and legislation have been passed and formulated by the relevant institutions (Renewable Energy Act (832) of 2011). The study revealed that there is an increase in the exploitation and use of energy from renewable resources when compared with the past decades. However, this exploitation is still limited due to barriers such as the cost of technologies, financing issues, and scientific and technical barriers.

1. Introduction

Energy is one of the resources for the development of a country. Even though substantial research has been carried out on the production and use of energy in various industrialised countries, the environmental impacts of fuels have not received much attention in developing countries [1]. However, research on renewable energy in the developing countries did not consider the importance and position of traditional fuel, such as biomass [2]. Thus, the limitations of energy and the possibility of having adverse economic, social, and political consequences make its planning the most crucial factor in developing countries. In respect to the proposal of transitioning to a lower-carbon energy market in the future, the role of energy sources will be dependent on many factors, including cost, potential technicality for capacity, good sites that are available, and the necessity for storage of energy or load matching [3, 4].

According to Arshad et al. [5], fossil fuels account for more than 80.3% of global basic energy consumption, but the transportation sector consumes 57.7%. Therefore, fossil fuel is the major contributor to the emission of greenhouse gases (GHG) in the atmosphere. Thus, massive extraction of fossil fuel for energy needs for different purposes over the years has led to a significant reduction in the reserve for fossil fuel, contributing to the possible exhaustion of fuels in the coming decades. As a result, prices are considerably increasing, in addition to aggression and conflicts, leading to some governments raising concern about energy security [4].

Ghana is located on the coast of the Gulf of Guinea in the western part of Africa. It shares borders with Burkina Faso to the north and border with Togo, the Atlantic Ocean to the south, and Ivory Coast to the west. Ghana is among the leading African countries in terms of wealth and was the first country in the south of Sub-Saharan Africa to gain

independence. The population of Ghana currently stands at 30 million [4]. The oil reserves in Ghana are very limited and hence the country relies heavily on imported petroleum fuel. The import of oil puts a strain on the country's economy. The dependence on fossil fuels makes energy security very fragile in supply. Hydropower, biomass, biofuel, and wind and solar energy are the leading renewable energy resources that are expected to be fully exploited in the future. This study assesses the sources of energy in terms of policy, conditions of the market, and food security.

2. Methodology

The review focuses on the market condition of renewable energy in Ghana, the environment, and food security. The method adopted for the study was a survey. This is because surveys aid in critically evaluating the appropriateness of study conclusions.

2.1. Data Collection and Analysis. The sources of the information were Science Direct and Emerald. The Web libraries also provide advanced search filters with keywords, type, research, and year fields by publications. The keywords related to the title were then searched. Search keywords were also formulated using Boolean OR/AND operators to confirm the search quality and fuse these search terms to upgrade the importance of the search process. Many papers showed up, but only papers of interest were selected, read, and analysed. Thus, the papers focusing on the title were eligible for inclusion.

3. Renewable Energy Policy

Energy is accepted as a vital element for a country's development. Energy accounts for major inputs for development, both socially and economically. Consumption of energy and the supply at minimum amount and the cost are the major concerns towards achieving sustainable development. Ghana's policy on energy is based on the Renewable Energy Act, 2011 (Act 832) of Ghana [4, 6]. The Act recognises renewable energy as a source of energy that cannot be depleted. Renewable energy include hydro, ocean energy, biofuel, landfill gas, biomass, wind, solar and geothermal. Renewable energy is available in abundance in Ghana and can be harnessed with the aim of attaining sustainability. The Act is based on the following premise: attaining long-term demand through public, private, and foreign investment; accelerating privatisation activities; and ensuring optimum and sustainable development and operation of all renewable energy sources. There should be rational use of overall energy sources with a minimum damage to the environment due to development programs [6–8].

In order to improve the domestic production of energy from renewable energy, the Government of Ghana has set clearly the definition of key targets for its energy sector. One of the targets is achieving 10% contribution of renewable energy (large hydro) in the electricity generation mix by 2025. The government is, therefore, increasing investment support to attain renewable energy targets. All these are

aimed at achieving the objectives of the Renewable Energy Act 2011 [6, 9].

4. Potential Assessment of Renewables

Renewable energy flows are enormous compared to fossil fuels. Notwithstanding, these fossil fuels are expensive, exhausting and contribute to environmental and health-related problems in the country. The energy needs in the country, both now and in the future, can be fulfilled by renewable energy. Renewable energy flows can be converted to modern energy carriers or straight into needed energy services using technology. Renewable energy today accounts for 80% of the total energy in the country and 20% of electricity. Yet, with all this enormous renewable energy, Ghana uses just few of them. Thus, renewable energy provides about 5% of the energy consumption, mostly traditional biomass, and about 20 percent of electricity, mostly large-scale hydropower. In addition, renewable energy sources can provide energy services with zero or almost zero emissions of both air pollutants and greenhouse gases [10].

There are enormous renewable energy sources that can be used for cooking and heating, especially in rural areas and urban areas of the country. Large-scale hydropower supplies about 80 percent of total electricity [6, 9]. However, the scope for its expansion is limited in the country since it has not been sufficient enough for the country to meet its all energy demands and reach economic capacity. The potential for the country to meet its energy demands still exists, but large hydropower projects often face financial, environmental, and social constraints. Renewable energy is experiencing a boom in investment in several countries worldwide. Other renewable energy technologies have also advanced significantly, with total annual biofuel output rising from 37 billion litres in 2005 to 128 billion litres in 2015. Most technologies have seen significant cost reductions as manufacturing levels have increased. The Ghanaian government has selected renewable energy as one of the choices that could contribute to the overall energy supply mix while reducing the negative environmental effects of energy production. Indeed, modern renewable energy projects and programs have also shown that renewable initiatives have significant potential to alleviate poverty and promote the country's socioeconomic development, particularly in rural communities. As of 2015, in the form of hydropower, renewable energy accounted for 43.2 percent of total installed electricity producing capacity [10].

Most renewable energy projects in the country are now being implemented as pilot projects or in short-term planning cycles. As a result, there is no clear, integrated roadmap for the long-term development and promotion of various renewable energy resources. The Renewable Energy Master Plan was created to address the consequences of such short-term planning for the overall development of the renewable energy sector and reduce adverse climate change effects [11]. Therefore, implementing renewables in Ghana will be an excellent opportunity to meet the energy needs.

5. Barriers to Implementation of Renewable Energy

There are many renewable energy resources in Ghana, running from sunlight, wind, etc. However, all these resources can be converted into energy for consumption. Meanwhile, due to some reasons, the conversion of renewable energy into consumable energy has not materialised well. (i) The growing problem of fossil fuel availability exacerbates energy security concerns. (ii) The high prices of installing renewable energy forms has limited the capacity of the country to implement this energy. (iii) Lack of enough funds and technical capacity. (iv) The renewable energy expenses are paid by households and investors who are sometimes unaware of the benefits because of market circumstances. (v) Lack of access to capital from the local market and indigenous investors. Thus, there is no access to ready-made at local markets, leading to high competition on the local markets and hence a low-rating of the local energy resources.

According to Plan [10], the Ghanaian government has shown strong policy commitments to the development and promotion of renewable energy, but investment in the industry has been limited due to a difficult capital market. There is ambiguity about the available resources for renewable energy. For example, while solar is receiving relatively high patronage, there exist some gaps for the development of wind, biomass, hydro, and tidal [12].

There is also an issue of a scarcity of qualified individuals to conduct technical and feasibility studies and build, run, and manage renewable energy projects [12]. Power sector bodies, regulators, financiers, domestic investors, and national technology and service providers appear to have inadequate understanding and experience with developing and deploying renewable energy technologies. There are difficulties getting equipment and spare parts for some technologies, and poor facility operations and maintenance. Because of the fear of the unknown, people tend to oppose change when new technologies and practices are introduced. The public also has a poor grasp of renewable energy technology and poor promotion from the media [13].

6. Conditions of Renewable Energy Market

There has been significant development in the Ghanaian economy within the last decade. In 2011, economic growth was at its peak, and this was attributed to the competitive environment for businesses and the private sector which was fast developing. The government of Ghana has put in place a favourable business environment for the renewable energy sector by setting up the following: explicit feed-in tariffs (FITs) for the energy generated through renewable sources. Also, the Ghana Investment Promotion Centre was set up as a one-stop shop for promoting renewable energy. Two major market conditions relate to the liberalisation of the economy and concern the supply of energy security, including competition of the industrial sector and the environment's protection [14, 15].

Less than 10% of the renewable sources of energy are being utilised currently in Ghana [9, 16]. By combining different approaches of introducing new and renewable sources, systematic measures are being applied to increase their efficiency and utilization. The percentage of renewable sources consumption in Ghana can be increased beyond the target of 10% as provided in the Renewable Energy Act of 2011 [9, 16].

7. Sources of Renewable Energy

7.1. Biofuels. In Ghana, biofuel is not yet popular as a substitute fuel for automobiles and industrial engines as compared to conventional diesel. The government has been promoting the development of biodiesel using the *Jatropha* plant [9]. Farmers are now into the cultivation of the plant instead of the usual cassava or maize crops. Initially, the results were not encouraging because of the effect of food security and the negative impact on the farmer's income. In 2010, the Government of Ghana put forward a draft on bioenergy that revised the policy target made in 2006. As per the new target, blended fuel with biofuel of 10% (E10, B10) was to be achieved by 2020 and 20% of both gasoline (E20) and biodiesel (B20) by 2030. It is also aimed at removing institutional barriers, developing the competitive market and regulatory support, and reduction of greenhouse gases. The objectives of the policy were to make Ghana a net exporter of biofuel in the medium-to-long term [9, 17].

7.2. Biomass. Biomass consists of wood used as fuel, charcoal, waste from agriculture, waste to energy, and burnt kernel shells from palm used for heating and cooking. Almost 40% of the households in Ghana are using wood for cooking, while close to 33.7% uses charcoal. Charcoal is produced in parts of Ghana, particularly in the middle and the north part of the country, where it is produced and sold within a far distance [18]. Ghana has relied on biomass energy sources for decades.

In comparison with electricity and petroleum, biomass consumption has been decreasing from 54% in 2005 to 43% in 2010. This indicates that Ghanaians are slowly adopting the other consumption of sustainable sources of energy such as liquified petroleum gas (LPG) and biogas. Apart from this, there is a huge potential in using organic waste material to produce charcoal sustainably in the large quantities [19]. Ghana Oil Development Company, for instance, has installed a 2.5 MW power generation capacity which uses part of their waste as feedstock for their factory to power their operations [9].

7.3. Waste-to-Energy and Biogas. The composition of the organic waste in streams in Ghana is viable for energy production. For example, the proportion of organic waste in Accra alone is greater than 60% [20]. This rendered it viable in using digesters and biomass gasification that are advanced in the production of biogas used in powering generators to produce electricity. Faecal matter and cow dung act as feedstock in certain applications. The project, named Safi

Sana, which is partly funded through Ghana WASH Window, has adopted an approach that creates a mixture of faecal matter and organic waste to generate biogas energy. Additionally, there are open dumps in Accra and other places with landfill gas that can be converted to useable energy form [20, 21].

7.4. Wind. Research by the Energy Commission of Ghana depicts sufficient capacity to generate energy from wind. Available data at the Ministry of Energy indicate that the yearly wind speed is at a point beyond the height of 50 m (some few excellent points having 8.4 to 9.9 m/s are also found). The best resources of wind are basically found within the narrow stretch of the eastern coastline of Ghana and within the hilltops in Volta Lake and the border to Togo. Presently, almost five companies have established farms for wind energy generation in Ghana. Among them is Upwind Akplabnya Ltd., which established a 225 MW wind farm located at Nigo Prampram within the Greater Accra Region. It was completed by the end of 2016 and was funded by Lekela and Actors. In addition, the Volta River Authority (VRA) developed 100–150 MW of wind power generating plants in the southern part of Ghana. Moreover, there is a partnership between NEK, a company from Sweden, and Accra-based Atlantic International Holding Co., Ghana, to develop a 50 MW project [22, 23].

7.5. Solar Energy. There is an abundance of solar resources in Ghana. Average solar radiation in a month ranges from 4.4 to 5.6 kWh/m²/day, with the duration of sunshine ranging between 1,800 and 3,000 hours annually. Little has been exploited in exploiting this resource until lately, when the solar market has not been tapped both for photovoltaic (PV) systems and solar water heaters. The Government of Ghana has recently started lighting the streets using solar energy (Accra-Nsawam Road). For instance, in Onyadze in Gomoa East, a solar PV farm of 20 MW was established to provide power services to the communities in these areas. Several companies with licenses have expressed interest in establishing solar farms in Ghana. VRA has established a 2 MW small solar PV grid-connected plant in the Upper East Region [7, 24].

7.6. Hydropower. The potential of the hydropower resources in Ghana is approximated at 2,000 MW. Both the Akosombo and Kpong plants of hydroelectricity, which are in the White Volta, and the Bui plant on the Black Volta, generate a capacity of 1,580 MW. Based on information from Ghana Sustainable Energy for All Action Plan, there are almost 22 sites which can be exploited for minihydro in Ghana. The capacities of these sites are approximated to be from 5.6 MW to 24.5 MW [25, 26].

There are 17 sites within the Black Volta, White Volta, Oti River, Pra River, and Ankobra Rivers where there are hydroelectric plants of more than 10 MW each. Akosombo, Kpong, and Bui dams are the only plants generating electricity to the national grid [27]. The major challenge that

restrains the development of this energy source is the lack of important data to choose a viable site. Through SECO, the government-initiated partnership programmes with donors such as the Swiss Government, which funds a Hydropower Sustainability Assessment Project (HSAP), six hydropower sites on the black and white Volta Rivers. This initiative can solve this challenge and generate up to 362 MW of capacity [27].

7.7. Tidal and Wave Energy. Ocean waves being harvested using various technologies were newly introduced to Ghana. Even though tidal and wave energy are emergent in Ghana, TC's Energy has started a project into tidal and wave energy [28, 29]. The company was given the permit for the construction in 2013 to build the facility in Ada Foah within the Greater Accra Region. 14 MW wave power facility was constructed by the TC Energy using submerged surge technology and it has been operational since 2016 [28, 29].

Ghana is accessible to all local and foreign investors in the renewable energy sector. To increase the efficiency of energy, the energy commission (EC) was empowered to pass the Renewable Energy Act 2011, which is considered an all-encompassing act. As per the Act, the EC has the power to carry out authorisation, certification, and licensing of every procedure leading to the production and transmission of renewable energy. The energy commission is involved in overseeing the whole process [27, 30].

The commission is the technical part of the Ministry of Energy. All the legislations for ministries are proposed by the EC and handed over by the ministries to the government for approval. The regional or local level agents representing the Commission do not exist nor is there any plan to establish suboffices at the local level [19].

8. Application Barriers of Renewable Energy in Ghana

The key challenge in using renewable energy is the low intensity of energy. There are main barriers to be addressed to raise the usage of renewable energy in the market. These barriers are the cost of the technologies, issues of financing, and scientific and technical barriers. The barriers are elaborated further in this study.

The cost of technologies—operation and maintenance costs of renewable energy are high. In addition, renewable energy has a high upfront capita cost for every capacity of unit installed. This huge capital investment is the main challenge in using renewable energy. The huge cost of production of renewable energy is due to two major aspects. To begin with, compared to fossil fuel systems, renewable energy has a huge capital cost. This is likely to result in lowering the accessibility of funds due to increased financial risk. Apart from that, the majority of the systems of tax usually impose a penalty on investment in renewable energy that is capital intensive. The cost of fossil fuels in relation to external environmental and social costs has been assumed in the markets. These costs consist of pollution through the release of greenhouse gases [27].

Issues of financing—it is an important factor during the development of renewable energy. While generating electricity using oil, a lot of the cost is attributed to the fuel cost. Therefore, the initial investment capital for renewable energy is huge while the recovery occurs slowly within a very long period, making it difficult to attract capital for investment [31].

Scientific and technical barriers cause large-scale projects which lead to renewable energy technologies to stall.

8.1. Biomass Energy and the Environment. A majority of Ghanaian families are faced with poverty. The households that use biomass such as wood, grass, charcoal, and animal dung are regarded as poor in terms of energy. Besides that, families use energy from clean sources such as electricity and LPG. According to the International Energy Agency statistics, in 2018 there was an indication that clean energy, especially for cooking, was accessible to exactly 25% of the households in Ghana. Many urban households in Ghana; thus, about 60% depend on biomass sources of fuel, specifically charcoal and wood [32, 33].

Henceforth, biomass is the major energy source for many households in Ghana. Currently, the Government of Ghana is encouraging active investment in biofuel development to achieve environmental sustainability, security in energy, and independence. Biomass energy investments are the effective means in combating encroachment of desert in addition to the significant effects of climate change globally. Typically, Ghana has the capacity to increase the production of cassava and palm oil for the introduction of liquid biofuel in its energy mix within three years. In addition, the improved cultivation means of these feedstocks can increase production [34].

8.2. Biomass Energy and Food Security. The problem of environmental degradation has been contributed by poverty in rural places. However, there is a substantial increase in the production of food globally. According to the World Food Summit (WFS) meeting held in Rome in 1992, more than 180 countries pledged to reduce by half the number of undernourished people globally by 2015. Ten years later, the outcome has been unsatisfactory as per the analysis [4]. Between 2001 and 2003, there were 854 million people globally who were undernourished and from which 820 million were living in the least developed countries. 25 million lived in countries that were in transition to middle-income economies and 9 million in the countries that were industrialised. There was, however, a reduction of 3 million people in the developing countries in 2006 compared to 2017 and 2020 in the number of undernourished people [4].

Natural disasters and wars render the proposed aims of WFS unachievable. In the absence of conflicts in certain countries such as Ghana, there is a possibility of monitoring poor performance in agriculture. Cereals are a valuable source of nourishment on Earth which are consumed directly by humans or fed to livestock indirectly. Thus, fluctuations in supply and the cost of cereals are important in the global production of food. Using farmland

and human-edible grains to produce biodiesel is becoming a threat to food security in certain parts of the world [35].

About 70% of corn produced and exported globally is from USA [36]. There is a rising concern from the manufacturers of food that depend on corn and other grains and the countries that import corn and oil at the same time because of the rise in the number of distilleries that are being put up for the production of ethanol. Due to the rising cost of petroleum fuel, producing biofuel is beneficial using agricultural produce, especially in countries where a particular crop being used is in surplus. Thus, it jeopardises the cost of raw materials for producing biofuel above the price sold by the food industry and hence converting the raw material to fuel. For instance, in Europe, producing biodiesel from vegetable oil results in margarine manufacturers requesting assistance from the European Union Parliament because of the inequalities in prices. They competed with biodiesel producers [36, 37].

Over the past 15 years, the cost of food has been rising, and the World Food Programme has been expressing concern. Some of the causes related to the rise include climatic conditions affecting crops in some areas; a decrease in the amount of wheat while there is an increase in the demand for food in countries such as India and China; and the rising use of corn and sugarcane to produce biofuel [38].

In relation to this matter, the experts in the UN stated that biofuels like ethanol can assist in reducing global warming and creating jobs in the rural areas among the people involved in the biofuel sector, thus alleviating poverty [39].

9. Implications of Biomass Energy Use on the Environment

The exploitation and consumption of biomass in Ghana contribute to forest degradation and soil degradation, loss of biodiversity, atmospheric pollution and indoor air pollution. It also contributes to the loss of nutrients due to the combustion of cattle dung and crop residues [40]. According to Al-Hamamre et al. [40], deforestation leads to soil erosion, risks of floods, and desertification on account of clearing forests and woodlands for agriculture and livestock, which are the common concerns of environmentalists at macro levels. Smoke from biomass fuels in rural kitchens, wood fires, and the resulting pollution are all regular occurrences in most developing nations. Cooking in a smoke-filled kitchen is inconvenient for women and causes drudgery. Smoke from low-quality biofuels such as farm residues and animal wastes, according to the World Health Organization (WHO), can cause severe bronchitis and pneumonia in newborns and women [41].

Also, agricultural residues for energy becomes an issue when used to increase soil fertility. The agricultural residues thus have an impact on the environment. Therefore, residues such as rice husks and coconut shells do not decompose quickly and have potential energy sources. Cattle dung, similarly, though it is a fertiliser, loses its value as fertiliser if burnt or left under the sun for a few days. Moreover, the combustion of fuelwood and other biomass fuels leads to

CO_2 emissions, as nearly 50% of wood is carbon. About 2.8% of CO_2 emissions are attributed to fuelwood combustion [3]. In addition to CO_2 emissions, combustion of fuelwood and agroresidues leads to the emission of products of incomplete combustion. These products are even more powerful GHGs per gram in carbon emitted than CO_2 [40].

10. Outlook on Biomass Energy Use

Energy from biomass plays a large and critical role in the global energy system. Energy from biomass can reduce carbon emissions, but land constraints have led to formulating unusual policies and incentives that encourage the misappropriation of environmental and health-related energy sources. According to Duku et al. [42], producing energy from renewables will help produce safe fuels, reducing carbon emissions due to fuel displacement for thermal generation. Also, Al-Hamamre et al. [40] added that when Ghanaians install a renewable energy power capacity of 1363.63 MW in 2030, it will help save carbon emissions of nearly 11 million tonnes and reduce any health and related environmental issues associated with biomass fuels.

Also, the Renewable Energy Act (RE Act) in 2011 enabled the regulatory of the environment to attract private sector involvement in the development, management, and utilization of renewable energy in an efficient and environmentally sustainable manner. One of the Act's objectives was to design a biofuel blend as a petroleum product. However, Präger et al. [34] have noted that there should be a Renewable Energy Fund to provide incentives for promoting, developing, and utilising renewable energy resources and a Renewable Energy Authority in the country. Furthermore, in 2014, the Sustainable Energy for All (SEforALL) initiative as a global one was developed to ensure universal access to modern energy services by 2030 [34].

11. Conclusion

Energy is one of the main resources for a country to develop and achieve economic growth. In Ghana, more than 80.3% of the basic energy used globally is from fossil fuels, but 57.7% of it is used in the transport sector. The huge extraction of fossil fuel to supply the energy needs for different purposes globally for more than a century has led to a significant reduction in the reserves. Regional development can be strengthened by embracing the use of renewable energy. The most common barriers for the penetration of higher renewable energy into the energy system are the high-up front cost and the cost related to insufficient effectiveness. Energy is accepted as the essential element for a country to develop. The government is increasing investment support to attain renewable energy targets. In 2011, economic growth was at its peak and was attributed to the competitive environment for businesses and the private sector that was rapidly growing [43]. The Government of Ghana has put in place a favourable business environment for the renewable energy sector by setting up the following: explicit feed-in tariffs (FITs) for the energy generated through renewable sources. Biomass energy consists of wood used for fuel,

residues from agricultural sources, wastes from animals, and other fuels obtained from biological materials. It is estimated to be used by half of the population globally for cooking or heating. In several developing countries, it is the major energy source, which supplies more than 90% of the energy [44]. Utilising renewable sources of energy in the overall consumption of energy in Ghana stands at less than 10%, which is against the renewable energy Act (832) of 2011. The Act (832) of 2011 was aimed at achieving 10% renewable energy in the energy mix by 2020. Removal of institutional barriers, developing a competitive market and regulatory support, and reducing greenhouse gases was another target. The objective of the policy is to make Ghana a net exporter of biofuel in the medium- to long term. It consists of wood used as fuel, charcoal, waste from agriculture materials to energy, burnt kernel shells from palm used for heating and cooking, and many others. Almost 40% of the households in Ghana are using wood for cooking, while close to 33.7% uses charcoal [44]. The composition of the organic waste in a stream in Ghana is viable for energy production. The proportion of organic waste in Accra is greater than 60% [34]. Research by the Energy Commission of Ghana has depicted sufficient capacity to generate energy from wind. Solar resources are abundant in Ghana. Ocean waves being harvested using various technologies were newly introduced to Ghana. The main barriers to be addressed to raise the use of renewable energy in the market include the cost of the technologies, the issue of financing, and scientific and technical barriers.

Data Availability

The data used for research are included within the manuscript.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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