

The State of Energy in Ghana and The Need for International Cooperation for Its Potential Resource Development

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Abstract. A steady and inexpensive energy supply is the essential basis for the successful development of countries in Africa. Ghana currently suffers from an energy crisis. Ghana is no longer able to meet the rising demand for electricity due to increasing economic growth, urbanization, and industrial activities. This energy crisis has been a significant challenge for the Ghanaian economy, affecting various sectors and hindering economic growth. This review paper aims to analyze the impact of the energy crisis on the Ghanaian economy and propose strategies to overcome it. By examining relevant literature, government reports, and case studies, this paper identifies the causes and consequences of the energy crisis and provides recommendations to mitigate its effects. The findings suggest that a comprehensive approach involving diversification of energy sources, improved infrastructure, policy reforms, and sustainable energy practices can alleviate the energy crisis and foster economic development in Ghana.

Keywords: Energy, International partnership, energy crises, environmental impact economic growth

1 Introduction

The increasing cost of generating energy through conventional sources coupled with environmental pollution concerns has led to the need to find more sustainable, clean, and cheaper sources of energy generation in Ghana. The rapid demand growth and periodic hydrological shocks leave the country increasingly reliant on expensive oil and gas-based generation power plants, draining the national economy. This paper provides an analysis of the impact of the energy crisis on the Ghanaian economy and ways of overcoming these challenges. The paper also presents the potential of renewable energy resources as a sort-after solution to the energy crisis. Studies have shown that Ghana has several renewable energy resources, such as wind, solar PV, mini-hydro, and modern biomass that can be

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exploited for electricity production. While their exploitation for electricity generation is currently very low, providing just 0.13% of the country's generation, the study revealed a great potential for renewable energy resource generation to increase substantially over the next decade [1]. The nation's possibilities for economic growth and development have been significantly hampered by the recent energy crisis that has engulfed Ghana. Frequently referred to as "dumsor," a phrase deriving from the regional Akan language and meaning "off and on," The energy crisis has been characterized by unstable power supply, frequent blackouts, and limited electrical producing capacity. This crisis was largely brought on by a slew of interrelated problems, such as insufficient investment in energy infrastructure, ineffective supply chains, excessive reliance on hydroelectric power, and rising demand brought on by a quickly expanding economy [2]. The energy crisis' effects on the Ghanaian economy have been widespread and profound in several different industries. Disrupting business and industrial operations has been one of the most direct effects. Manufacturing facilities have experienced repeated shutdowns as a result of the unstable power supply, which has reduced their production capacity and stunted economic growth. This impedes domestic industrialization and reduces the nation's ability to compete in the international market [3]. The energy crisis has also reduced investor confidence and discouraged foreign direct investment (FDI). Businesses need a steady and consistent energy supply to operate effectively. Ghana's lack of such a supply has deterred both domestic and foreign investors from setting up or growing enterprises there [4]. Figure 1 shows the Electrical energy Consumption per head in Ghana. Challenges in social and employment have been exacerbated by declining job creation and economic development [5]. Ghanaians' home life is also affected by the turmoil. Accessing important services, such as healthcare and education, has become more challenging due to inadequate electrical supply. While schools and colleges experience disruptions in teaching and learning activities, hospitals struggle to operate medical equipment, negatively compromising patient care [6]. Additionally, the energy crisis has raised living expenses as a result of businesses being obliged to use pricey alternative energy sources, notably in the retail and hospitality sectors. These costs are ultimately passed on to consumers ([7]. Availability of energy remains key to the socio-economic development and survival of humans. Traditional sources of energy such as petroleum, natural gas, and coal among others have all played key roles in human development over the years. However, the use of fossil fuels as a source of energy generation hurts the environment [8]. Ghana like other African countries is confronted with increasing electricity demand to achieve sound economic development as a result of industrialization and urbanization among others. As per [9] electricity is needed to maintain law and order, security, and stability. From an economic point of view, the production of all goods and services and the development of economic infrastructure all depend on a reliable and sustainable supply of electrical energy. Electricity generation in Ghana has gone through several phases: starting with diesel generators and stand-alone electricity supply systems owned by industrial mines and factories, to the hydro phase following the construction of the Akosombo dam, and now to a thermal complement phase powered by gas and/or light crude oil [10,11]. Electricity is also essential for quality healthcare delivery, education, transport, effective communication, mineral exploration, and many more; serving as the building block on which every sector of a nation's economy thrives [12]. Ghana's electricity sector dates back to the colonial days of the Gold Coast, where electricity supply was mostly from isolated diesel generator plants dispersed across the country. Industrial establishments such as mines and factories, municipalities, and other institutions including hospitals and schools owned most of these systems [12]. The Gold Coast Railway Administration established the first public electricity generation system in 1914, to supply electricity for the operations of the railway sector in Sekondi. Figure 2 sums up energy distribution by energy resource in Ghana. Renewable energy remains one of the major solutions to Ghana's energy problem since the

country is endowed with high potentials such as available rivers with great potentials for small and mini hydro development, as well as wind and solar potentials for development in the country. These sources could be developed by cooperating agencies, industrial companies, private partners, and the government to help reduce the high energy demand in the country. Several companies and industries have closed with others reducing their production due to low access to energy. This has affected the industry's income and production leading to the laying off of some workers and having a high impact on the national economy due to increased unemployment.

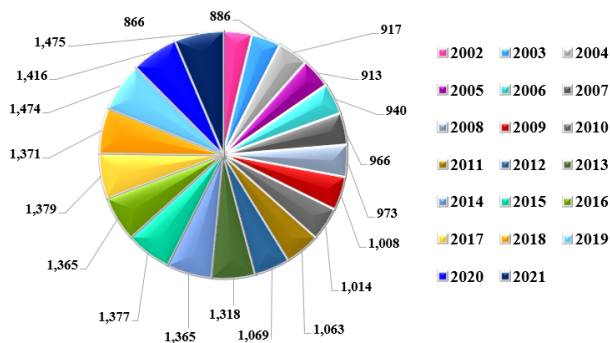


Figure 1. Electricity Consumption per capita in Ghana between 2002 and 2021 in (kWh).

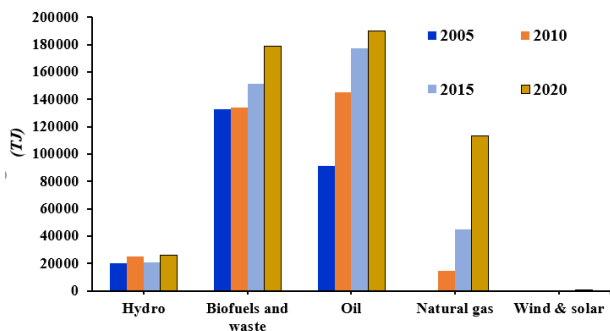


Figure 2. Total energy distribution by energy resource in Ghana between 2015-2020 in (TJ).

An electricity crisis has also become a perennial development challenge in Ghana, with an increasing severity that threatens the country's economic growth and transformation. The troubling rationing system, the slowdown in industrial activity, job and income losses, and disruptions in social life are telling reminders of what now seems a perennial drag on Ghana's development agenda. The Institute of Statistical, Social and Economic Research (ISSER) 2014 estimated Ghana to lose between \$320 million and \$924 million per annum in productivity and economic growth due to the current power/energy crisis [2, 11]. The country's electric power demand is estimated to be appreciating at a rate of 10% per annum [13]. However, existing power plants are unable to operate at full capacity as a result of fuel supply constraints for the thermal power plants and low rainfall patterns for the hydro dams as shown in figure 3. As a result of the prolonged power crisis the nation experienced from 2012 to 2016, it was christened "Dumsor" which means "off and on", which indicates the seriousness of the challenge [14]. The situation affected the Ghanaian people economically, socially, mentally, and academically, it is, therefore, expedient to diversify the country's

sources of energy to prevent such a crisis [8]. Challenging factors such as the overdependence on thermal and hydro sources for electricity generation and a poor tariff structure, which makes it difficult for utility companies to recover the cost of electricity production [10,12] are also some of the causes of our energy crisis. The government has sought to strengthen the electricity sector through international donors' support in response to this problem [15]. According to the World Bank, Africa lags globally when it comes to energy generation and supply [16].

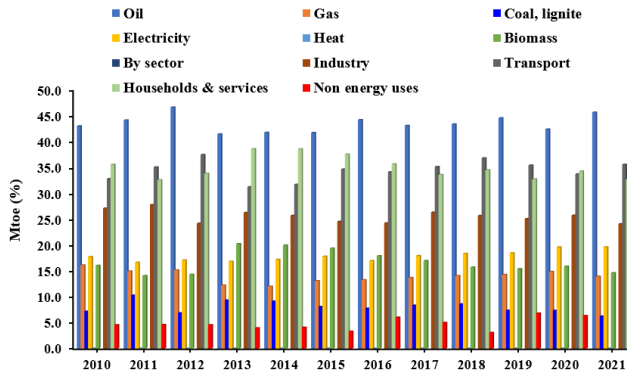


Figure 3. Final consumption in Ghana by source.

2 Inadequate investment in energy infrastructure

The historical underinvestment in energy infrastructure, notably in power production, transmission, and distribution, is one of Ghana's main contributory factors to the country's energy issue. The power demand has increased faster than the capacity of the current infrastructure as the economy and urbanization have expanded. The lack of timely improvements and expansions has resulted in a shortfall of supplies, which has caused frequent power outages and interruptions [17].

2.1 Over-reliance on hydroelectric power

Ghana depends significantly on hydroelectric energy, the majority of which is obtained from the Akosombo Dam on the Volta River. Hydroelectricity is a sustainable energy source, but it is incredibly reliant on favorable weather and water levels. Drought-related reductions in the hydroelectric plant's ability to produce energy have resulted in a considerable drop in the total power supply. The energy system is now more sensitive to climate change and changes in water supplies as a result of this over-reliance (Impact of climate change and variability on hydropower in Ghana, n.d).

2.2 Fuel supply and payment challenges

Ghana's energy crisis has also been made worse by difficulties in procuring a sufficient supply of fuel for the production of thermal electricity (2020 Electricity Supply Plan - Energy Commission, Ghana, n.d). The operating effectiveness of thermal power plants has been hampered by the erratic supply of natural gas and other fuels. Additionally, the energy sector's financial restrictions and payment problems, such as untimely supplier payments and insufficient revenue collection, have made it difficult to maintain and repair power-producing

equipment regularly, which has decreased capacity (The Electricity Situation in Ghana: Challenges and Opportunities, n.d).

2.3 Losses in power transmission and distribution

Power losses during the transport of electricity in Ghana have been attributed to inefficiencies in the transmission and distribution network. The available power supply has been steadily depleted owing to technical losses, including obsolete infrastructure, inadequate maintenance, commercial losses brought on by electricity theft, and inaccurate invoicing. These losses put pressure on the energy system and make the demand issues worse (2020 Electricity Supply Plan - Energy Com, n.d).

3 The need for intercontinental and industrial collaboration for energy generation

Intercontinental collaboration is essential to ensure support and progress in the development of a country for sustainable energy demand solutions as well as to create awareness and spread knowledge on the benefits of an integrated approach. Large energy projects represent global models that can be developed to serve customers in different countries. For example, electricity networks can help balance structural differences or short-term fluctuations in national and regional energy production, demand, and supply and enable participants to deliver energy resources that have been used in a sustainable and climate-friendly manner. Moreover, in a continent such as Africa, the relevant governments may establish local intergovernmental organizations, such as the West African, East African, North African, and Southern African regions, to relate development efforts together with the use of various available rivers in the region. These intergovernmental bodies are well positioned to undertake comprehensive development assessments and base them on forward-looking models of sectors, including interrelationships water-energy, to facilitate joint planning and decision-making processes and to manage potential competing uses of available water resources. International cooperation is needed to effectively implement an integrated and efficient approach to energy that will support resilient recovery from energy crises. More coordinated multilateral and multilateral efforts are needed to accelerate progress toward practical and integrated energy solutions.

4 Conclusion

In conclusion, Ghana's energy crisis has had a significant and far-reaching influence on the country's economy, highlighting the urgent need for all-encompassing measures to address these issues. The ongoing lack of accessible, dependable energy has hampered economic development, disturbed companies, and inconvenienced residents. However, Ghana can successfully manage its energy problem and pave the path for a more sustainable and prosperous future by implementing a mix of smart initiatives. Ghana can resolve its energy issue, promote economic growth, enhance livelihoods, and establish itself as a pioneer in sustainable energy practices by putting short-, medium--, and long-term plans into action. It is recommended that Ghana through international cooperation should come together and build the highly available renewable potentials such as small hydro, solar, and wind in the country. Also, developed countries such as China and others should invest in the country's energy sector to help overcome these energy challenges in Ghana. A body should also be set to check and bring to book all agencies, Departments, and individuals who own electricity companies.

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