
RENEWABLE ENERGY UTILIZATION FOR RURAL INDUSTRIALIZATION AND ECONOMIC IMPROVEMENT IN ABIA STATE

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ABSTRACT

The perplexing and inefficient energy generation and distribution in Nigeria may not enable the efforts on rural industrialization, and the few existing industries are suffocating, collapsing and closing down due to the high cost of running plants with gasoline, gas and petrol in order to remain in business. The paper investigated renewable energy utilization for rural industrialization and economic improvement in Abia state. The objectives of the study are to examine the need for energy efficiency policy implementation strategy for economic improvement, and to investigate the role of renewable energy in the advancement of rural industrialization in Abia state. The theory of planned behaviour and descriptive survey design were adopted. However, the study found that there is need for energy efficiency policy implementation strategy, and that renewable energy has a role to the advancement of rural industrialization in Abia state. Based on the findings, the study recommends that government should install wind energy farm facilities in potential rural industrial areas across Abia state through public private partnership investment to enable the efficiency of power/energy supply that is environmentally friendly, and government should review the energy policy of the state in order to strategically adopt workable approaches that can ensure the realization of the goal of building wind and solar energy farms in rural areas of the state to promote industrialization and economic growth.

Keywords: Renewable, Energy, Utilization, Economic, Rural, Industrialization, Improvement

Introduction

There is an increasing level of industrialization in the world. Developed countries in Europe, Asia, and America are experiencing rising levels of rural and urban industrial diversification as well as transformations due to the rapidly growing global population, increasing levels of energy utilization, and changes in lifestyle. Energy generation, distribution, and utilization in rural areas is on high demand for industrialization and economic growth. It becomes imperative for energy policy makers, legislators and government in collaboration with energy investors to set up renewable energy facilities in rural areas to aid the establishment of industries by local and foreign investors for return on investment and economic growth of the country. Furthermore, developing countries in Africa and Asia are currently struggling with energy supplies due to inefficient national electricity grid. This implies that the economy of these countries will also be struggling.

The perplexing energy generation and distribution in Nigeria as a developing country in Africa may not enable efficient rural industrialization, and even the few industries in existence are suffocating and collapsing because of the high cost of running plants with gasoline, gas and petrol in order to remain in business. This situation is seen to be worsening as the prices of these petroleum products keep soaring higher. As a result, the energy generation and distribution crises are currently affecting industrial improvement, development as well as economic growth in the country. More so, energy generation and distribution policies can be initiated and implemented to herald rural industrialization in the wake of the availability of sufficient human capital and enormous renewable energy sources. For any country to become an industrialized state, there is need to improve its energy sector in order to increase the growth of industrial and economic activities in such a country.

Industrialization brings a better transformation and civilization for good economic policies that promote more support for the development of a country as well as sustenance of economic growth. Energy innovation, technology as well as trade are all the product of good policies with the purpose to increasing the economic growth of any country. More so, the determining factor that offer a country the opportunity to advance its economy is not only reliant on its natural resources nor its geographical location, but also deeply on the utilization of its vast renewable energy sources for power to increase rural industrialization and economic activities within the country. However, for more advanced or improved productivity in economic activities of a country, the use of energy can be of greater importance. Hence, the energy sources can be classified as renewable and non-renewable energy. The non-renewable energy is mainly derived from fossil energy resources such as coal, natural gas, waste, and petroleum. The non-renewable energy are limited sources of energy, whereas, the renewable energy is an unlimited source with efficient capacity such as sun, water, wind, and others. Furthermore, the utilization of the non-renewable energy is common in developing countries in Africa, and for its efficiency in comparison to the use of the renewable energy source, it will require huge costs to make it available for utilization.

The government of Abia state has shown the desire to revamp the electricity sector in the state as it is poised to encourage the utilization of renewable energy sources domiciled in the state to rejuvenate more access to energy for industrial purposes. The government has laid emphasis for the need of stakeholder's full participation as well as the involvement of personnel from ministries, departments, and agencies within the state to make energy available in line with international standard requirement for constant energy consumption for industrial growth and economic improvement. The government has taken giant steps in electricity markets in Abia state as they are working on legislating more electricity laws that covers energy generation, transmission, distribution, and metering to boost the energy sector,

and to drive industrialization to untapped areas of the energy sector by the house of assembly. The effort made by the government is to see the establishment of electricity mini-grid in Abia state which also is proposed to be financed by international solar energy alliance from India as reported by Ogbonnaya Ikokwu, (Punch,2024).

The Abia state government through its energy policy provided Geometric power Aba limited the opportunity to construct over 141 MW, power generation, transmission and distribution facility in the state's commercial landscape of Aba. The geometric integrated power project is one and the only efficient electricity supply project in Nigeria situated in Aba, Abia state. The integrated power project is viewed as an energy catalyst for the economic growth, industrial sustainability as well as the social transformation of the city of Aba. It is meant to ensure the enhancement, efficiency and competitive advantage of available industries, create jobs as well as to empower youths. The rejuvenation of the industrial sector through the provision of efficient power generation and distribution for rural industrialization in Abia state is to improve the living standards of people in rural communities. The Geometric power project in recent time added 20 MW of electricity to Abia state at the Owerrinta axis as a potential industrial area in the state. The power project according to Abia state government is to enhance industrialization efforts, increase productivity among small and medium-scale enterprises, and expand local industries landscape. According to Geometric power, the integrated power project would create more than 370,000 indirect and direct employments during the initial phase of the power project (Punch, 2024).

The energy utilization nexus has been given greater attention among several researchers overtimes. In addition, renewable energy has been found as a right alternative for non-renewable energy due to the enormous sunshine duration that provides great potentials for the installation of solar energy facilities (Alnaser & Alnaser, 2011). Apart from solar energy, there are other energy sources like the nuclear energy, wind energy, and geothermal energy as Al-Maamary et. al., (2017) found that the Gulf countries are the countries with efficient energy supply and utilization. However, Kim & Heo (2012) found that a significant relationship exists between energy utilization and economic growth. Mercan & Karakaya (2015) found that inefficient energy utilization negatively affected economic growth among organization for economic co-operation and development (OECD) and other developing countries. A study by Hedayat et. al., (2017) on utilization of renewable energy such as wind energy and natural ventilation energy in Iran found that there is good performance of wind energy in provision of efficient energy for industrial utilization.

There is the importance of proper regulation of energy law in the utilization of energy for industrial and economic purposes, industrial and economic improvement as well as the sustenance of the environment. Furthermore, Shahbaz et. al., (2014) found that emphasis must be made on the importance and implementation of policies that encourage efficiency in energy supply, reduction of environment pollutants as well as the proper implementation of global environmentally friendly energy laws and regulations to initiate, sustain and enhance industrial development. Muhammad et. al., (2017) found that renewable energy utilization had positive and significant impact on economic growth. Ozcan & Ozturk (2019) found that a relationship exists between renewable energy utilization and economic growth among 17 developing countries. The findings revealed that energy-generation and energy saving or storage policies enabled economic growth rates. Furthermore, Eyuboglu & Uzar (2022) found that there is asymmetric causality between negative shocks in economic growth and renewable energy usage in South Africa, Turkey, and Thailand. The study found that economic growth inhibits renewable energy utilization. Anser et. al., (2021) also found in a study that renewable energy consumption has a significant impact on economic growth of

some Asian countries. Against these backdrops, the study seeks to investigate how renewable energy policy implementation and utilization can contribute to the advancement of rural industrialization, and also improve economic activities in Abia state.

Objectives of the study are thus:

1. To examine the need for energy efficiency policy implementation strategy for economic improvement in Abia state.
2. To investigate the role of renewable energy in the advancement of rural industrialization in Abia state.

Research questions include:

1. What is the need for energy efficiency policy implementation strategy for economic improvement in Abia state?
2. What is the role of renewable energy in the advancement of rural industrialization in Abia state?

Energy Efficiency Policy and Economic Activities

Energy efficiency policy is a public policy which guides government to take proactive and resilient action on ensuring that residents, industries, businesses, and other institutions utilizes energy to function for the economic growth of the country. Besides, it relates to a wider gesture that involves the collaboration of stakeholders who operate with the vision, philosophy, principle, decision and initiatives that are translated into critical programmes, actions and projects for the developing of an efficient energy sector. A policy refers to broad and bold written statement of potential goals and actions for the future as well as the strategies of achieving them. It is a design made by government to offer intervention in the energy sector through various activities. Public policy on energy matters can be defined as a well-meaning course of action by an independent actor or group of actors that combines efforts in dealing with a crucial matter of public concern Anderson (2010). It is further a set or pattern of actions to be taken by government or the decisions to tackle certain social problems bedeviling socio-economic activities in the country.

As policy making is important to government, so must its implementation be properly done for the public and industries to reap the benefits Stewart (2008), and its achievement can be positively in relation with the approach that is used to put it into action. Hence, the best of government policies might be worthless when it is either poorly or not implemented. An effervescent problem with policy making and implementation is how it is put into practical terms, and when it lacks proper guidelines and assessment. Some scholars have argued that policy implementation suffers from valid, viable, verifiable as well as universally acceptable outcomes Hill (2014). Overtime, effective policy implementation by government in developing countries seem to be severely overlooked in a broader perspective and in public administration, thereby restraining economic and industrial development. Furthermore, the implementation of any kind of policy is very contextual because it mainly depends on the political will of government, social factors, economic determinants, organizational or management priority, and attitudinal elements that can influence how good or poorly a programme can be implemented Hill (2014).

Implementation strategy is a critical aspect in policymaking process as the case maybe. Implementation process is the execution of policy statement plan, law, and guidelines that enable government, stakeholders, investors, and organizations to combine work efforts through the utilization of written procedures and proven strategies to put into policies for

effective attainment of appropriate goals. Implementation can also be considered as the process of ideological and practical input, viable output and verifiable outcome involving sets of actors, organizations and approaches for control. It is an interactive process of goal setting as well as the directed actions towards its achievement. However, the linkage between policymaking and policy implementation is the intent and potential outcomes it unfolds Smith & Larimer (2009). According to Goggin et. al., (1990) the outcome of policy implementation can usually be influenced by certain determinants at a central or local level.

On issues of policy implementation, its design may have a poor structure, or may be mis transmitted to receivers. Moreover, some policy executors may be non-cooperative with some stakeholders for proper implementation process Rossi (2004). In addition, effective implementation of policy can be interrupted due to insufficient resources, competent staff, lack of sufficient incentives, negative disposition or attitudes of implementers, absence of effective inter-organizational linkage, interaction or communication, inadequate professional and technical materials, non-compliance to official commitment to statutory decisions or objectives, non-delegation of personnel with authority and flexibility, inter-organizational conflict, internal complexity, the impact of potential socio-economic and socio-political conditions, a lack of specific technical know-how, lack of administrative capacities, persistence of self-serving goals of some bureaucrats, absence of personnel with organizational expertise, readiness, willingness, vagueness, ambiguous demands, conflicting objectives, uncoordinated expectations, potential challenges in goals achievement, as well as involuntary decision of clients Lipsky (2010).

Energy efficiency policy is viewed as an essential venture by most policymakers. In practical terms, it is the approach of making thoughtful decision on constant energy provision that is typical indicated by energy intense usage. Hence, there is no single accepted definition of energy efficiency. Besides, Bhattacharyya (2011) argue that some definitions may be based on useful energy output and input of the process. Therefore, the policies that are related with rural energy provision may consist of government energy policies with the aim of regulating the national energy supply and demand, energy regulations designed for rural areas, as well as rural development policies that are not tied at managing rural energy facilities but which affects the rural energy system. The energy policies can be designed specifically for rural areas, and it can be classified as rural energy policy, which deals with energy development process in rural areas. The series of energy policies, laws and regulations centers on reforestation, improvement in supply of efficient energy for rural industrialization, and the development through renewable energy sources.

According to Kostka & Hobbs (2012) the state policies that are lacking sufficient local support, investors support and legitimacy can be implemented strictly from top-bottom, that is, a direct and constant involvement from the central point of governance. More so, policy implementation results can directly or indirectly associate with the different priorities at the state level and availability of local incentives. Existing attempts may focus on the ways government practices as well as policymaking structures can shape policy implementation outcomes. Furthermore, local policy implementers can reorganize industrial areas and structures through the consolidation of production capacity of each efficient enterprise, and the promoting of existing industries, thereby turning energy efficiency policy implementation into a major cooperative activity that avoids adversarial tangling with vital local enterprises and stakeholders.

Renewable Energy and Rural Industrialization

The perplexing electricity supply to businesses in industrial areas is grossly declining the efforts of industrializing both the urban and rural areas. Rural communities are places that most raw materials are found, and manufacturing companies are expected to expand and build industries in these areas so they can access the raw materials. However, the lack of regular electricity has also greatly impacted on rural industrialization. Renewable energy is viewed as the alternative to efficient power supply for utilization. Renewable energy is acclaimed as the sustainable electricity source for economic activities and development (Ovwigbo et. al., 2020).

Rural industrialization is attributed to a set of economic, political as well as social processes that relate to modern ways of value creation in rural areas. It involves the discovery of more new and efficient methods for the creation of value among rural people (Simandan, 2009). However, the new efficient methods are lumped up together under the term industry. Industrialization on its own is a process, and not an event. A process connotes that it is a system in a country or region resulting from a related activity that share certain similarities that may unfold over a period of time than its component events (Simandan, 2009). It is a collection of events that achieves significant growth for the local economy. Industrialization changes the face of that local economy. Furthermore, the term industry can be deduced from industrialization, and it is broadly defined as the activities of manufacturing, mining and quarrying, electricity generation and distribution, oil and gas supply, steam and air conditioning supply, agriculture production, water supply, remediation activities, sewerage and waste management as well as construction United Republic of Tanzania (URT, 2016).

The manufacturing industry has been identified as the major aspect of the industrialization process for some reasons (UNIDO, 2012). It is seen as the sector that has been very important in fostering economic development, as a knowledge-intensive sector, recipient of modern technology for progress, performs higher in productivity and broader involvement for innovation, as well as the competitive determinant of sustainable economic growth (URT, 2016). It has also been observed that the challenges facing rural industrialization is the failure to site or establish industries in rural communities. Most industries are located in few urban areas to serve import-dependent elites, which appears to be capital intensive and export-laden, and have weak links with other parts of the economy of the country (URT, 2016). Establishing industries mainly in urban areas alienates the majority of poor individuals residing in the rural areas. This means that industrialization in urban areas can have economic growth while depriving the rural areas similar opportunities. If industrialization is to have major impact on the majority poor, it has to include industries in the rural areas as to employ most of the local people. Industries come with modern or new technology, soft skills training, competitiveness, and add value to the production of agriculture products. They also produce goods and services for residents' consumption and for foreign currency to generate revenue.

According to Nivrutti (2023) industrialization connotes the introduction, application of modern, sophisticated equipment and techniques that are new for the manufacturing of existing or new products and services (Sadorsky, 2013). More still, industrial activities involve maximal use of energy than the traditional manufacturing pattern. This implies further that industrialization requires energy intensity. Rural industrialization and energy utilization cannot be separated as a lot of equipment and machines uses energy to operate during production activities. Without energy intensity in the rural areas, industrialization goals cannot be attainable. The establishment of industries can increase when efficient power supply becomes realistic in rural areas Nivrutti (2023). Efficient energy can attract both local and foreign investors to rural areas. Localizing industries in the rural areas can provide

opportunities for residents to work in those industries. Energy efficiency can trigger some individuals to establish businesses, and the outcome would be the increasing of industries.

Modern manufacturing and industrial processes mostly rely on fossil fuels. However, the current industrial trend is heading toward the direction of the use of hybrid energy system that is viable and efficient in tackling industrial activity issues. Therefore, renewable energy sources have witnessed global development as a replacement for conventional or fossil fuel energy sources (Xu et. al., 2021). The current trend of renewable energy is obviously attracting more concerns for industrialization in rural and urban areas. Most scholars are struggling to address the linkage between renewable energy utilization and industrial expansion. Deng et. al., (2022) observed the connection between industrial development and energy consumption in India between 1950 and 1996, and discovered that there are both bidirectional and same-directional processes. To keep the industry sector on track, the non-renewable energy resources were massively used by both manufacturers and other general consumers in the past before the introduction of renewable energy to the industrial sector (Dogan, 2015).

The availability of renewable energy resources for industries at the local level has a critical role to play in growing and developing the economy of the country. Meanwhile, the fundamental requirement for economic growth and industrial expansion to rural communities suggest that the world is in dire need of efficient energy through the exploration of alternative renewable energy sources due to the scarcity and cost of non-renewable energy resources. In addition, the world's major suppliers of energy resources such as oil and coal are in the Middle East countries as well as countries of Sub-Saharan African (Akadiri et. al., 2019). Moreover, these regions are being exposed to greater sunlight as having the biggest opportunity for solar energy potentials, in addition to the abundant uranium deposits (Kebede et. al., 2010). Besides, the International Renewable Energy Agency (2018) reported that the world's renewable energy competence rapidly increased from the year 2016 to 2018 with a total of 2.012 million megawatts to 2.179 million megawatts, respectively. This further reveals that there are several opportunities as well as better incentives for investors to make investment toward increasing renewable energy production.

Investing in renewable energy will provide a cleaner, safer and efficient source of energy for industries on one side, and can as well create millions of job opportunities to individuals in the labour market on the other side. Therefore, industries and economic activities consumes more of renewable energy due to its potential need to overcome the differences between energy demand and supply (Shahbaz et. al., 2015). However, on maintaining the view of the essential position of energy requirement in boosting rural industrialization, and economic growth among developing economies, the UN has mobilized the establishment of seventeen sustainable development goals commonly referred to as SDGs. The goals entail global issues of concern, one of which is on the importance of affordable clean or renewable energy. The main purpose of adding this goal in SDGs is to have a clean infinite energy source that can make the world safe and better to attain a more enhanced and more efficient industries for a bright and smokeless atmosphere for the present and future generations (Word Bank, 2019).

Theoretical Framework

The theory of planned behaviour (TPB) was adopted to buttress the study further. TPB was founded by (Ajzen, 1991) which culminated to the extension of theory of reasoned action by (Ajzen & Fishbein, 1980). This theory predicts humans' behaviour. Furthermore, the belief of the theory is that an intention to take action is seen as the most powerful predictor of human behaviour. According to Ajzen (1991), such intentions measure the key motivational elements

that ascertain how difficult individuals are willing to try and show efforts that they have the desire and willingness to exert to certain behaviours. The intention is determined by individual's attitude and subjective norm (Ajzen, 1991). This theory can be extended or used in pro-industrial related studies. The incorporated variables can be industrial or have some environmental concerns (Yadav & Pathak, 2016), behavioural moral norms, risk propensity as well as perceived policy effectiveness (Wan et. al., 2014). TPB provide a better assimilation of human's behavioural industrial and environmental intention. TPB can accurately predict human intentions and behaviours in pro-industrial settings, such as green in having purchasing intention (Grilli & Notaro, 2019), low carbon consuming behaviour (Jiang et. al., 2020), waste separation behaviour and socially responsible investments bahviour (Adam & Shauki, 2014). In relation to conventional investments, the renewable energy sector investments are still perceived to be a new area of investment. However, potential investors may still be unfamiliar with the potential s of renewable energy investments, so it is more suitable to investigate their possible future behaviour than their past behaviour. Hence, the intention to invest in renewable energy investments depends on individual investors' willingness to invest in in collaboration with government through bonds and capital funds of the companies deeply involved in transactions of renewable energy businesses in recent times.

Materials and Method

The study adopted descriptive survey design approach, and 160 respondents were purposively selected which include, welders, footwear producers, textile designers, cloth makers and engine oil producers, and they were administered 160 copies of the questionnaires that were designed in four Likert format of strongly agree, agree, strongly disagree and disagree respectively, to elicit data from them. The questions were in line with the objectives of the study. However, 158 copies of the questionnaire were retrieved from the respondents, and analyzed in percentage and were also presented on tables in percentage.

Results and Discussion

Table 1: Gender of respondents

Variable	Frequency	Per cent
Male	102	64.6
Female	56	35.4
Total	158	100

Sources: Nworgu & Osarosee (2025)

Table 1 indicates that 102 (64.6%) respondents were male and 56 (35.4%) were female. Hence, the male respondents were more than their female counterparts during the time of survey.

Table 2: Summary of responses on the need for energy efficiency policy implementation strategy for economic improvement in Abia state

Variable	Frequency	Per cent
Strongly agree ⁸²	51.9	
Agree	66	41.8
Strongly disagree ⁴	2.5	
Disagree ⁶	3.8	
Total	158	100

Source: Nworgu & Osarosee (2025)

Table 2 reveals that 82 (51.9%) and 66 (41.8%) respondents strongly agree and agree respectively that there is need for energy efficiency policy implementation strategy in Abia state. While, 4 (2.5%) and 6 (3.8%) respondents strongly disagree and disagree respectively that there is need for energy efficiency policy implementation strategy in Abia state. Since a greater number of respondents agree to the stated opinion, the study found and retains that there is need for energy efficiency policy implementation strategy in Abia state.

Table 3: Summary of responses on the role of renewable energy in the advancement of rural industrialization in Abia state

Variable	Frequency	Per cent
Strongly agree	104	65.8
Agree	46	29.1
Strongly disagree	6	3.8
Disagree	2	1.3
Total	158	100

Source: Nworgu (2025)

Table 3 shows that 104 (65.8%) and 46 (29.1%) respondents strongly agree and agree respectively that renewable energy has a role in the advancement of rural industrialization in Abia state. However, 6 (3.8%) and 2 (1.3%) strongly disagree and disagree respectively that renewable energy has a role in the advancement of rural industrialization in Abia state. Therefore, a greater number of respondents agree to the stated opinion, the study found and stands to retain that renewable energy has a role in the advancement of rural industrialization in Abia state.

Conclusion

The study shows that there is need for the adoption of strategic energy efficiency policy as well as proper strategy on the implementation of renewable energy policy being a critical aspect toward rural industrialization in Abia state. Therefore, renewable energy has the capacity to advance rural industrialization in the state. Renewable energy entails wind, solar and heat energy sources. Industries such as manufacturing, production, packaging, service providing, information and communication rely on efficient energy supply to enable economic growth and improve productivity. The provision of renewable energy facilities in

key rural areas have the potential for rural industrialization that contribute to national economic growth and infrastructural development.

Recommendations

Base on the findings, the following are hereby recommended

1. Government should install wind energy farm facilities in potential rural industrial areas across Abia state through public private partnership investment to enable the efficiency of power/energy supply that is friendly to the environment and residents.
2. Government should review the energy policy of the state in order to strategically adopt workable approaches that can ensure the realization of the goal of building wind and solar energy farms in rural areas of the state to promote industrialization and economic growth.

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