

## **Adoption of Alternative Energy as a Cost Reduction Strategy for SME's in Nigeria**

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### **ABSTRACT**

This research evaluates cost of energy as a major factor impeding entrepreneurial activities and the how the adoption of alternative or other energy systems could help reduce the cost of doing business for SME's (small-scale and medium enterprises) across Nigeria. The research study also considers factors that could lead to the adoption of other sources of energy like off grid Solar systems by Small Business in Nigeria. The study makes a preliminary attempt at understanding the links between alternative energy systems as an innovation solution in relation to the socioeconomic situation of SME's through published documentary data and surveys.

The study highlights the major contribution of energy cost as a one of the major sources of hinderance to SME's in their ability to successfully carryout their business endeavours in Nigeria. Aside from the discovery of the impact of cost of energy on SME activity, the level of adaption of alternative sources of energy is noted to be quite low amongst SME's as small business owners appear to be more attuned to owning generators and stocking fuel (petrol & Diesel) as a preferred choice as opposed to investing in alternative energy choices such as solar energy systems.

The adaption of SME's to alternative sources of energy was noted to not be significantly influenced the socio-economic capacity of the small business enterprises. As the decision to go for alternative energy seemed to be more associated with issues like reliability of such systems (maintenance of batteries and solar panels), issues with access electricity for charging purposes, and the quantum of energy generated by such systems. In major observation, however, involves a lack of advocacy and awareness creation of the plausible environmental and financial gains, safety, application, capacity and durability of alternative energy sources and systems. As a further study, there could be need to explore the sustainability gains in relation to the future growth and survival of SME's if there is policy and enablement for the adaption by SME's of alternative energy systems in Nigeria.

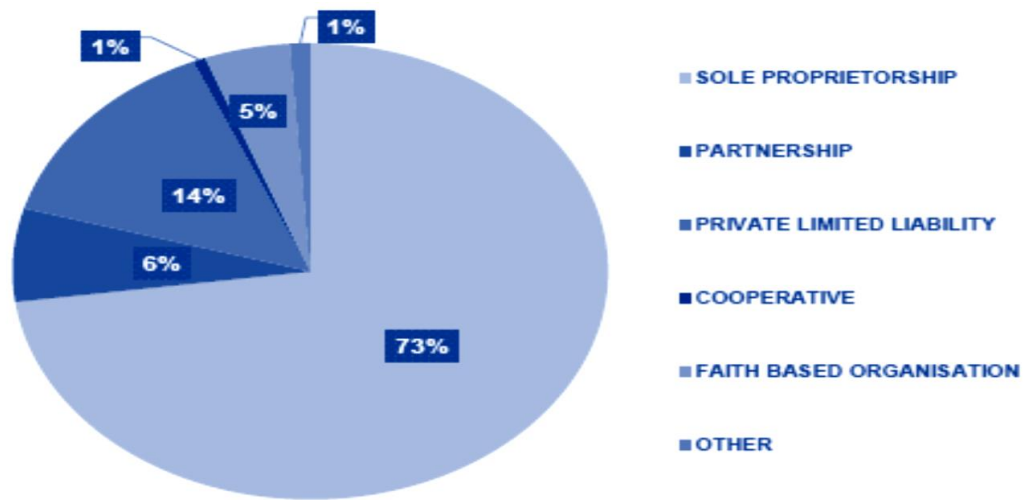
**KEYWORDS:** *Small and Medium Enterprises, SME's, Cost, Carbon Based Energy, Alternative Energy Systems and Sources*

## 1.0 INTRODUCTION

In terms of their Socioeconomic importance to the Nigerian Economy, the Nigeria Bureau of Statistics (2019) has stated that Small and Medium Enterprises are responsible for about 96% of the volume of business in Nigeria and SME's are also responsible for and contributes about 50% to the nation's Gross domestic Product or the equivalent of over \$200 Billion Dollars.

In the light of the research survey reports by National Bureau of Statistics (2019) and Pricewaterhouse (2020) the ownership structure of SME's in Nigeria consists of 73% sole proprietors, 14% Private Limited Liability Companies, 13% Partnerships, 6% Faith based organisations, 5% Cooperatives and others 1%. While with regards to gender, 23% of females own and operate registered SME's with most SME's being managed or owned by individuals within the age brackets of 20 - 60 years.

**Figure 1: Graphical layout of SME's Across Nigeria by Type & Ownership**



Source: NBS, SMEDAN, PwC analysis



**Figure 1: Graphical layout of SME's across Nigeria (Source: NBS & PWC Indicators)**

This study intends to evaluate the importance and impact of energy in the development of SME's. Internationally renowned institutions and think tanks like the International Energy Agency, (2008) have noted that the importance of energy cannot be second guessed and that the prospects of SME's ability to obtain cheap, affordable, clean and alternative energy sources may determine the ability of small-scale and medium businesses to survive in the long term.

The United Nations Global compact (2019) also contends, that obtaining and use of cleaner energy sources would significantly improve the prospects of achieving major aspects of the Sustainable Development Goals through the sustenance of SME's as growth and development engines.

Scholars like Smil (2003) have noted that while energy in its various forms has become the hallmark of modern-day life, its application and use has become a critical part of the modern production and manufacturing value chain. The value also consists of the access and cost Energy of energy as a determinant of economic growth and survival.

Aside from the environmental challenges with regards to climate issues as well as the adaptation issues linking it, access to energy, with particular reference to electrical output, is a critical challenge that continues to plague modern societies of which SME's are a prime component.

It has been noted by the likes of Mckinsey (2018), and the International Energy Agency (2018) that that challenges with energy availability and supply is most pronounced in emerging markets like Nigeria.

The international Energy Agency (2018) has noted in various studies that over 1.4 billion individuals are unable to gain access to power (electricity) with a significant portion within this highlighted population being SME's and Households in Nigeria.

As development yardstick, energy consumption generally tends to correlate with an increased level of population growth, manufacturing, and development. In other instances, this may not always be the case as weather and the nature of the demand (if it can be determined to be elastic or inelastic).

Scholars like Nguyen (2019) have noted that the nature of the demand for energy could influence consumption and ultimately the cost. Aside from the vagaries of the weather and demand the availability of government influenced interventions through subsidy or lack therefore also has its impact on energy consumption and its associated consequences for economic and overall industrial development.

It is of importance to understand that the adoption of other sources of energy in Nigeria could be considered as being in its budding stages in comparison to emerging market peers like south Africa, Rwanda and Kenya, Nigeria still leaves a lot to be desired.

Also, with a growing SME population, energy demand and consumption is tremendous coupled with heavy dependency on costly forms of traditional energy sources, leaving a high carbon footprint. This implies that there is need to look towards a cheaper alternative to address environment concerns, sustain economic growth and ensure the survival of SME's.

According to research by Goldthau and Sovacool 2012; Stirling and Smith 2007; and Meadowcroft 2011, the importance of energy and its political implications with regards to adaption of alternative energy sources needs to be further studied to provide insight on the need for SME's to make the choice and transition from traditional sources to alternative sources.

The impact of socioeconomic conditions in the adoption of alternative energy sources has been made clear in literature.

Though the need to balance the cost implications of adopting alternative energy sources like solar and electricity inverters still needs to be examined the light of the ability of SME's or small business entities being able make the required investment to achieve long term gains and the ability to solve the immediate energy challenges of SME's.

In other words, it is of essence to ascertain the socioeconomic conditions as well as other conditions that act as impediments in the adoption of alternative energy sources by SME's.

According to Baker, Newell, and Phillips (2014), alternative energy sources and forms by itself implies that there is need for a conscious choice by SME's to move from conventional sources and systems of energy while being willing to curb their patterns in consumption towards adapting to more modern practices and energy utilization patterns that could be termed as being consistent with the needs of the environment in which these SME's do business.

Therefore, it is imperative to consider the cost implications of using one energy source in comparison to the other and how the cost implications and/or the long term gains could influence the need to transition from an energy system to another.

## 2.0 LITERATURE REVIEW

According to scholars like Ogunleye (2017), the option of alternative energy is expected to be an attractive option for SME's in consideration of the challenges and growing cost implications of using traditional energy sources when and if available in relation to the various issues bedevilling the conventional power industry in Nigeria.

From the works of Cabraal, Martinot and Mathur (2001), Schultz and Doluweera (2011) and Wamukonya (2001), as well as Harish et al (2013), the ability of SME's to transition to alternative energy sources include apparent factors like high initial cost of acquisition of alternative systems like solar, finance (particularly where incentives to lend and access to credit by SME's is a major concern), also other factors include risks exposure to financial institutions, supply chain constraints, inadequate maintenance and after sales service structures.

Also worthy of note is the fact that when problems associated with alternative energy sources are addressed, there is still the issue of the depth of supply and longevity of alternative energy sources and these issues are tied to availability of maintenance which in turn could be considered a drawback to small businesses in their efforts at adoption of unconventional sources of energy like inverter and solar hybrid power systems. However, with the drawbacks of adoption a key incentive that makes alternative energy sources an interesting cost savings options is that alternatives like solar energy is that it is readily accessible and abundant and is also comparatively safer in view of the health and environmental benefits in comparison with fossil fuel systems and energy sources.

Where alternative sources are readily available with environmental benefits the systems on the other hand are expensive in Nigeria. The choice of SME's with regards to choice of utilization of energy is not only a matter of relevance and impact on the environmental but more so by ease of access or ready availability and most importantly affordability or financing capacity of SME's. It is noted that, where small businesses are readily open to using alternative sources of energy and systems, there may be constraints arising from issues relating access to credit or general lack of financial capacity.

According to Anugwom et al. (2020), the energy conditions and situation in Nigeria is expected to correlate with an increased demand and adoption of alternative energy systems. According to reports from National Bureau of Statistics (2020) and Pricewaterhouse Coopers (2020), Nigeria for some decades has been grappling with an energy crisis that continues to deteriorate in recent years. In respect of the public supply of energy from public utilities like the distribution companies and transmission companies, output is still at a very poor level.

Anugwom et al (2020), have also noted that the inability to meet the demand for electricity has been exacerbated by the increased need to manufacture and produce goods to meet the increased pressure coming from population pressure on energy demand and consumption levels. The National Bureau of Statics (2015) and Pricewaterhouse (2020) have noted that the demand for electricity has continue to widen and outstrip generation, transmission, and distribution in Nigeria.

The National Bureau of Statistics (2015) captures the state of energy availability in Nigeria when it noted that power generation in Nigeria suffers from a rampant case of excess capacity but with an inadequate supply resulting in increased demand that is mostly unmet due to unavailability of essential spare parts and lack of regular facility maintenance. According to the National Bureau of Statistics (2018) and Nigeria Economic Summit Group (2018), the core aspects of the issues to be addressed dwells on the capacity to generate adequate energy and the rising demand for environmentally acceptable sources of energy, especially for industrial and household utilization.

The inadequate attempts at privatizing the distribution channel by the federal government is yet to make record significant impact in terms of the prevailing deficit between what is generated for distribution and demand for utilization of electricity in Nigeria. In a bid to address the gap, SME's and small businesses in Nigeria have resorted to the use and importation of power generators that require fuel/diesel.

According to Nguyen (2019) increase in fossil fuel use and emissions has a negative impact on health which in turn impacts economic growth (a double whammy effect). This also holds true for Nigeria as noted by Anugwom (2020), the utilization of fossil or carbon based fuels and the resultant emissions has exacerbated health and environmental hazards in Nigeria with more

SME's and Households increasing their ownership of generators to ensure continued production and economic existence.

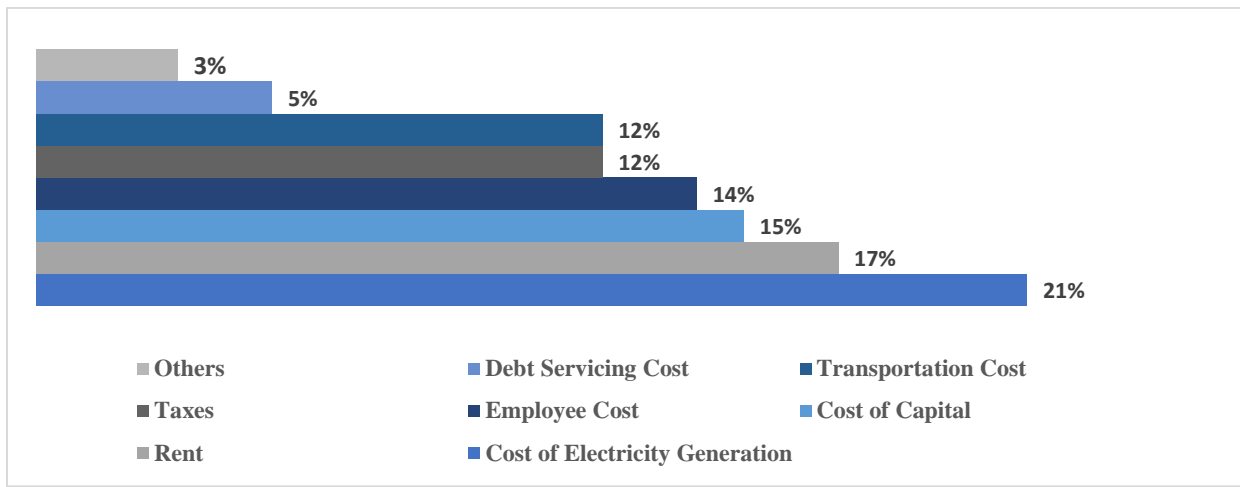
According to Anugwom et al (2020) alternative sources of energy like solar power systems possess a comparative advantage in terms of safety as well as health over carbon-based fuel sources especially for SME's and off-grid households. The immediate benefits include outright prevention or reduction in cases of acute health challenges, that are usually prevalent with respiratory disorders, as well as incidents and explosions occurring from adulterated carbon-based fuels. In view of the importance of Energy consumption and economic output of SME's scholars like Hampton (2019), Anugwom et al (2020 ) and think tanks like Pricewaterhouse have noted that Energy consumption by Small business and SME's is quite significant and with the existence of cheaper alternatives, the level of adoption of efficient alternatives has remained low.

The dependence of SME's on generators on account of the level of epileptic power supply in Nigeria continues to account for large economic losses. According to the World Bank (2020) the loss to SME's and the Nigerian economy is more than N10 trillion Naira (equivalent of \$27 Billion Dollars) on an annual basis. According to the World Bank (2020), in terms of ease of doing business Nigeria ranks 131st with access to electricity noted as being a major constraint.

In view of a recent research and survey by Pricewaterhouse and the Centre for Democracy development at the school for of African and Oriental studies at the University of London, it was noted that SME's and small business in Nigeria are only able to access 1-5 hours of electricity daily. Also, of note is the fact that 1 out of every 7 SME in Nigeria fails or stops doing business on account of the impact of low or virtually non-existent electricity supply shortfalls. The extent of cost of electricity generation to SME's in relation to other cost as indicated in figure 2 below.



**Figure 2: Analysis of SME Cost of Doing Business in Nigeria**



**Figure 2: Graphical analysis of SME Cost of Doing Business in Nigeria (Courtesy NBS & PWC, World Bank)**

### 3.0 METHODOLOGY

As part of the activities of this research involved the application of the systematic review of the issue with regards energy availability, demand, and consumption with reference to traditional electricity generation sources that included fossil fuel and hydro based methods of electricity generation, transmission and distribution alongside its impact was considered.

The extent possibility of adaption of alternative systems of electricity generation that included sources such as solar power generation systems, Inverters and battery storage systems as an effective and cheaper source of energy for manufacturing and production to reduce the cost of doing business by SME's was considered. This research applied the "systematic quantitative assessment technique" (SQAT) as proposed by Pickering and Byrne (2013). As part of the SQAT, the framework proposes five required processes to ensures the appropriate conduct of applicable systematic reviews. The procedural steps for SQAT application in respect of this research is highlighted and described in Table 1 below. The research required systemic review of Thirty articles from seven (7) peer reviewed databases;

Table 1: Description and application of SQAT for this Study Article

	Step	Application in the current study
1.	Topic Definition	Alternative Sources of energy for as cost saving means for SME's
2.	Formulate key research question(s)	<p>The critical research study question (s):</p> <p style="text-align: center;"><b><i>How Effective is the Adoption of Alternative Sources of Energy in Reducing the Cost of Doing Business for SME's in Nigeria?</i></b></p>
3.	Identify keywords	"Small and Medium Enterprises Energy Consumption", "Cost of Doing Business and SME's", "Alternative Energy Adoption by SME's"
4.	Identify and search databases	<p>1. 7 peer reviewed databases were utilised viz: Elsevier; Emerald; Springer; Taylor and Francis; Sage; JSTOR; and Wiley;</p> <p>2. "All in title" search using the following combinations:</p> <p>a. "SME's" + "Alternative Energy Adoption."</p> <p>b. "SME's" + "Cost of Doing Business."</p> <p>c. "Effectiveness of Alternative Energy Sources" + "Challenges in Adopting Alternative Sources of Energy by SME's."</p>

5.	Review and assess published articles	<p>1. Essential aspects of research articles including their abstracts was read and reviewed to ensure coverage of SME's and the impact of energy consumption on their ease of doing business, effectiveness of alternative energy sources and critical factors and challenges in adopting alternative sources of energy by SME's across Nigeria.</p> <p>2. No books, or reviewed conference articles, were included; only peer-reviewed articles, Professional research surveys, articles, empirical papers, and reports were identified, reviewed and utilized in the research.</p>
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The SQAT study approach that was applied in this research involved the systematic study, review and assessment of identified research papers towards ascertaining the importance and relevance towards selection in for further study in this research process.

The application of the SQAT procedure for this research required the evaluation of published peer review journals and scientific articles towards ascertaining their inclusion or otherwise for the research process. This was aimed at ensuring a qualitative research output is attained (Pickering & Byrne, 2013).

The SQAT research methodology forms the basis for this research study with regards to the identification of the critical and core themes while also providing plausible answers for the identified research questions, and the appropriate literature review exercise to identify gaps in the literature (Pickering & Byrne, 2013).

The SQAT application for this research study provides a logical, simple and assessable method that could be replicated and repeated as a critical method and prerequisite for systemic and scientific purposes.

As regards this research, the study sources is augmented with the evaluation of scientific and policy-focused research articles and based on the need to broadly evaluate the critical

research question in relations to alternative energy adoption and its effectiveness as a cost reduction strategy for SME's across Nigeria.

The identified research articles and data were instrumental in reaching additional and valuable insights of the issues with adopting alternative energy sources and their effectiveness in curbing energy cost implications in the context of adopting alternative energy sources for SME's doing business in Nigeria.

#### 4.0 DISCUSSIONS & FINDINGS

The evaluation of this research as already highlighted in the methodology will focus largely on the evaluation of qualitative research papers on the findings of energy consumption and adoption by SME's. As stated in their findings, Anugwom et al (2020), and Ngui et al (2011) and other scholars have noted that SME's in emerging markets including Nigeria combine traditional sources of energy with alternative sources.

In terms of other findings our evaluation and review of the literature also indicated that SME's and households in Nigeria in addition to depending on the national electricity grid for their source of energy also combine the use of inverters.

Also, Anugwom et al (2020) and National Bureau of Statics (2018) noted that SME's in a bid to ensure availability of power for manufacturing and production have been known to stockpile fossil fuels such petrol and diesel.

In terms of the economic significance, stockpiling of fossil fuel is to ensure availability and possibly manage any abrupt volatility in fuel prices as any sudden increase in cost of power due to fuel price volatility could negatively impact the ability of small business owners to deliver on their service or products, stockpiling fuel is a means of assurance of energy availability in addition to their purchase of generators.

In addition to the foregoing, findings from research by PricewaterhouseCoopers (2020) and the National Bureau of Statistics (2018) indicated that a major component of the cost of energy for SME's included the acquisition cost for generators dedicated powering storage and industrial level equipment like freezers.

In terms of generally findings on the challenges with widespread adoption of alternative energy sources the following important findings were noted;

- i) **Cost of Adoption:** Scholars like Anugwom et al (2020) , Schultz and Doluweera (2011) and other scholars, have noted in their assessments and studies that the initial higher cost of acquiring alternative energy sources like solar power systems in comparison to traditional fossil fuel and grid based or conventional energy generation constitutes critical barriers to the adoption and diffusion of alternative energy sources. However according to Anugwom et al (2020), this aversion is not borne from usage as long run evaluation indicates increased cost over time for fossil fuel and grid-based energy sources while alternative sources yields cost savings and cost reductions over time.
- ii) **Alternative energy is not a ready choice:** also it was noted that alternative energy sources like solar power systems is not consider an immediate choice for SME's and Households regardless of the ability to afford alternative energy, see Anugwom et al (2020).
- iii) **Perception of Unreliability:** The research also noted from the review that SME's and Households in Nigeria and other emerging markets tend to consider alternative sources of energy as a not so viable source of steady power supply and according to Anugwom et al (2020), this continues to be a major drawback and disincentive for SME's in Nigeria while adopting other energy sources as an alternative means to conventional grid based power supply (national grid).
- iv) **Association with vandalised Government Programmes:** Typical the installation of alternative energy sources like solar have been generally considered as government related installations as it is usually deployed by government agencies as a means of lighting streets and powering water pumps. According to Anugwom et al (2020), the ease with which alternative energy systems like solar panels are vandalised has also created an impression of inferiority and pessimism all adding to impression of

- unreliability. The failure of solar powered streetlights which has been more of a case of inferior materials on account poor contract handling has also continued to feed the narrative.
- v) **Inability to power a wide range of equipment:** in terms of manufacturing and production needs of SME's, part of the drawbacks for adoption of alternative sources of energy is the extent of electronic appliances and industrial level equipment that can be efficiently powered via alternative energy sources. Nguyen (2019) had noted that the level of power consumption correlates with economic growth and productivity and as such ability to generate significant levels of energy to drive productivity is an expected hallmark of an efficient energy source.
  - vi) **Alternative Energy as an Imperfect Science:** according to the World Council on Renewable Energy (2019), alternative energy adoption continues to face skepticism on account of its acceptance as reliable science as opposed to an ongoing experiment that is yet to be perfected or an ongoing experiment that is largely imperfect.
  - vii) **Widespread Unfamiliarity with Alternative Energy Systems:** A major drawback for adoption of alternative energy sources according to the World Council on Renewable Energy (2019) and Anugwom et al (2020) is the fact that most small business and households knew about alternative energy sources but were not conversant with is managed or maintained. In view of the research findings, it is logical to conclude that there exists some level of correlation in the knowledge level of alternative energy sources, its attendant benefits, its adoption and overall acceptance albeit loosely as there was no quantitative measure to determine the extent of correlation.

## 5.0 RECOMMENDATION & CONCLUSION

In view of scholars like Hampton (2019), Anugwom et al (2020) and think tanks like the United Nations Environmental Protection Programme (2017) the fact remains that adaption and transition of energy consumption from convention and fossil fuel-based sources to alternative sources remains a major challenge in emerging markets and Nigeria is not left out in that challenge.

However according to thinktanks like United Nations Environmental Protection Programme (2017) and the World Bank (2019) certain emerging market countries like South Africa, Rwanda, and Morocco are developing policy backed and government supported protocols that are encouraging and increasing the drive and shift towards alternative energy sources like solar powered systems.

It is noted that in Countries and Territories where alternative energy adoption and successful transitions have taken place there has been an established correlation with regards to the knowledge of alternative sources of energy and its benefits with willingness to transition and adapt according to Ogunleye (2017), Baker et al (2014) and the International Energy Agency (2018).

It was also noted by Anugwom et al (2020) and Baker et al (2014) that government policies and protocols in the form tax break and tax credit incentives were quite helpful in driving transition and this particularly important for Households and SME's and Small businesses that are already under pressure from the cost of doing business.

Also of note in the literature was that adaption and transition rates for alternative energy were boosted as successful alternative energy campaigns made their mark in successfully when prospective adopters were able to witness a practical installation of such systems, which in turn enabled witnesses push referrals via word of mouth according to Anugwom et al (2020). The practical insights of alternative energy systems were further reinforced through marketing

campaigns that involved highly placed and renowned individuals in society as champions, supporters, and agents for change for alternative energy innovations.

Since Nigeria's economic activity is driven largely by SME's, expectations would be for an increased level of alternative energy adoption for cost savings. However, transitioning from conventional sources to alternative sources is yet to fully find acceptance amongst SME's and Households in Nigeria. According to Ogunleye (2017), for successful energy transition to alternative energy adoption, it is important that identified factors currently impacting acceptance, long term adoption and transition are addressed from a policy and incentives standpoint to ensure increased economic growth through SME's in Nigeria.

In terms of government's role in promoting alternative energy transition for SME's and Household's is the exploration of impact and Sustainability measures and biofuel as emerging trends for adoption not just policy recommendations for a switch from carbon-based fuels to the increased utilization of alternative energy sources through assuaging the economic cost of adoption alongside structured and hands-on practical sensitization and marketing as opposed to traditional policy and mass media methods.

In the final analysis, the ability to address the identified trust issues tied to the reliability and durability of alternative energy systems could addressed through well-established technological use cases for alternative energy systems adoption with the aim of building trust and acceptance from SME's and Households in the transition to alternative energy in Nigeria.

## References

Antonakakis, N., et al (2017): "Energy consumption CO2 emissions and economic growth: an ethical dilemma", *Renewable and Sustainable Energy Reviews*, vol. 68, pp. 808-824, 2017.

Anugwom, E., et al (2020): Clean energy transition in a developing society: Perspectives on the socioeconomic determinants of Solar Home Systems adoption among urban households in south eastern Nigeria, *African Journal of Science, Technology, Innovation and Development*



Acker, R., and D. Kammen (1996): “The Quiet (Energy) Revolution: Analysing the Dissemination of Photovoltaic Power Systems in Kenya.” *Energy Policy* 24: 81–111.

Baker, L., et al. (2014): “The Political Economy of Energy Transitions: The Case of South Africa.” *New Political Economy* 19 (6): 791–818

Brohmann, B., Y., et al (2007): “Factors Influencing the Societal Acceptance of New, Renewable and Energy Efficiency Technologies: Meta-Analysis of Recent European Projects.” Paper presented at the European Roundtable for sustainable consumption and Production, Basel, June 20–22.

Doe, F., & Asamoah, E., S., (2014): The Effect of Electric Power Fluctuations on the Profitability and Competitiveness of SMEs: A Study of SMEs within the Accra Business District of Ghana, *Journal of Competitiveness* Vol. 6, Issue 3, pp. 32-48, September 2014 ISSN 1804-171X (Print), ISSN 1804-1728

Ekholm, T., et al. (2010): “Determinants of Household Energy Consumption in India.” *Energy Policy* 38: 5696–5707.

Eronini, N., (2014): “The Adoption of Solar Photovoltaic Systems among Industries and Residential Houses in Southern Nigeria.” Master’s Degree Thesis. Department of Ecotechnology and Sustainable Building Engineering. Ostersund: Mid Sweden University.

Gebreegiabher, Z., et el. (2012): “Urban Energy Transition and Technology Adoption: The Case of Tigray, Northern Ethiopia.” *Energy Economics* 34: 410–418.

Goldthau, A., & Sovacool, B.K., (2012): “The Uniqueness of the Energy Security, Justice and Governance Problem.” *Energy Policy* 41: 232–240

Hampton, S. (2017). An ethnography of energy demand and working from home: exploring the affective dimensions of social practice in the United Kingdom. *Energy Research & Social Science*, 28,1–10.

Hampton, S. (2018): It's the soft stuff that's hard': Investigating the role played by low carbon small- and medium-sized enterprise advisors in sustainability transitions. *Local Economy*, 33(4), 384–404.

Hampton, S., & Fawcett, T., (2017): Challenges of designing and delivering effective SME energy policy. In *ECEEE Summer Study Proceedings* (Vol. 1-353–17).

Harish, S., et al (2013): “Adoption of Solar House Lighting Systems in India: What might we Learn from Karnataka?” *Energy Policy* 62: 697–706.

International Energy Agency (2018): *World Energy Outlook 2018*. Paris: International Energy Agency.

International Energy Agency (2018): *Renewable Energy Services for Developing Countries: In Support of Sustainable Development Goals: Recommended Practice & Key Lessons*. Paris: International Energy Agency Photovoltaic Power Systems Program

Komatsu, S., S. Kaneko, R. Shrestha, and P. Ghosh (2011): “Non-income Factors Behind the Purchase Decisions of Solar Home Systems in Rural Bangladesh.” *Energy for Sustainable Development* 15: 284–292.

IFC world Bank (2018): *Lighting Africa: Solar Lighting for the Base of the Pyramid: Overview of an Emerging Market*. IFC/World Bank. Accessed June 20, 2020. <http://www.lightingafrica.org/htm>

Meadowcroft, J., (2009): “What About the Politics? Sustainable Development, Transition Management and Long-Term Energy Transitions.” *Policy Sciences* 42 (4): 323–340

Meadowcroft, J.,(2011):“Engaging with the Politics of Sustainability Transitions” *Environmental Innovation and Societal Transitions* 1 (1): 70–75

National Bureau of Statistics (2018): “Electricity Supply and Demand.” Accessed June 5, 2020. [www.nigeriastat.gov.ng/sectorstat/sectors/ElectricitySupply&Demand](http://www.nigeriastat.gov.ng/sectorstat/sectors/ElectricitySupply&Demand)

National Bureau of Statistics (2019): Nigeria's GDP Report. Archived from the original on September 2019. Accessed June 22 2020

Nguyen, A.T., (2019): The Relationship Between Economic Growth, Energy Consumption and Carbon Dioxide Emissions: Evidence from Central Asia. *Eurasian Journal of Business and Economics*, 2019, 12(24), 1-15.

Ngui, D., et al. (2011): "Household Energy Demand in Kenya: An Application of the Linear Approximate Almost Ideal Demand System (LA-AIDS)." *Energy Policy* 39: 7084–7094

Ogunleye, E. K. (2017): "Political Economy of Nigerian Power Sector Reforms." In *The Political Economy of Clean Energy Transitions*, edited by Douglas Arent, C. Arndt, M. Miller, and F. Tarp, 391–409. Oxford: Oxford University Press

Ondtaczek, J., & J., Stoever (2012): Renewables in the Energy Transition: Evidence on Solar Home Systems and Lighting – Fuel Choice in Kenya. Hamburg: GIGA – German Institute for Global and Area Studies. (Working Paper No. 198)

Pickering, C., & Byrne, J., (2013): The benefits of publishing systematic quantitative literature reviews for PhD candidates and other early-career researchers. *Higher Education Research & Development*. 33. 534-548

Price Water House Coopers (2020): *Global Economy Watch Predictions for 2020: globalization takes a backseat*. Economic Research Report

Price Water House Coopers (2020): MSME Survey 2020: Building to Last (Nigeria Report): Economic Research Report. Accessed 28 May 2020

Schultz, C., and G. Doluweera (2011): "Best Practices for Developing a Solar Home Lighting System Market." *Journal of African Business* 12 (3): 330–346

Smil, V.,(2003): *Energy at the Crossroads: Global Perspectives and Uncertainties*. Cambridge, MA: MIT Press.

Smith, A., and A. Stirling (2007): “Moving Outside or Inside? Objectification and Reflexivity in the Governance of Socio-Technical Systems.” *Journal of Environmental Policy and Planning* 9 (3–4): 351–373.

Standard Bank (2015): “Rise of the Middle Class in Sub-Saharan Africa.” Accessed June 7, 2020. [www.blog.standardbank.com/node/61428](http://www.blog.standardbank.com/node/61428)

United Nations Economic Commission for Africa. (2019). *African Regional Implementation Review for the 14th Session of the Commission on Sustainable Development (CSD – 14)* Accessed June 14, 2020 [https://usustainabledevelopment.un.org/content/documents/ecaRIM\\_bp.pdf](https://usustainabledevelopment.un.org/content/documents/ecaRIM_bp.pdf).

United Nations Environmental Programme (2017): *Energy Report: Renewable Energy and Energy Efficiency in Developing Countries: Contributions to Reducing Global Emissions*. Accessed June 14, 2020. <https://www.unenvironment.org>

UNCTAD (2018): *World investment report: Investing in the SDGs: An action plan*. New York and Geneva: United Nations Research Publication

World Bank Group (2018): *Atlas of Sustainable development Goals*. Research Publication Under World Development Indicators by the World Bank Group ([www.data.worldbank.org/wdi/sdgs](http://www.data.worldbank.org/wdi/sdgs))

World Bank (2018): *World Development Report – Development and Climate Change*. Washington, DC: World Bank. Accessed June 14, 2020

World Council for Renewable Energy (2019): “Energy Revolution Now.” Accessed June 15, 2020. <https://wcre.org>.

Wright, G., W., (2011): “The International Renewable Energy Agency: A Global Voice for the Renewable Energy Era?” *Renewable Energy Law and Policy* 4: 251–268.