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Awareness and Adoption of Renewable Energy in Nigeria: The Case of Lagos and Ogun Residents

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***Abstract*:** Renewable energy literacy, use, and adoption are critical issues of discourse among scholars, corporate bodies and multilateral establishments in Nigeria. This work contributes to the debate by examining how the context relates to the residents of Lagos and Ogun states, two of the country's most viable political subdivisions, located in the south-western region. Using the multi-stage sampling method, residents respond to the items on the variables of awareness and adoption in five local government areas of each of the states. Results show that the knowledge and awareness of renewable energy and its characteristics are high. Unimpressively, however, these do not translate to a correspondingly high level of adoption or use among the residents – though with noticeable differentials among the two states. This situation puts on the media the responsibility of partnering with the government and private investors in developing aggressive campaign strategies to help transpose people's knowledge of renewable energy to that of use.

***Keywords*:** Renewable energy, awareness, adoption, Ogun, Lagos, Nigeria.

Introduction

At her independence in 1960, two of the things that made Nigeria stand out were her abundant energy and human resources. Paradoxically, since independence, the country has suffered energy crisis, exacerbated by poor leadership and management. As of 2018, an estimated 60 percent (about 95 million people) of the Nigerian population did not have access to electricity (Nnaji 2017; Asu, 2018). With an estimated population of between 180 and 200 million, Nigeria still has between 4,000 and 7,000mw of electricity, whereas South Africa, with 50 million people, produces about 50,000mw (Kane, 2017; Adenirokun, 2018). This is even though Nigeria has an electricity generation potential of 93, 950mw (UN Economic Commission for Africa, 2017; Sambo, 2010).

The energy crisis has affected the productivity and economy of the country with homes, banks and manufacturing firms relying endlessly on electricity generators. Between 2010 and 2014, Nigeria imported 75 - 750 KVA generating sets worth $145,550,088 to power its factories, telecom towers, offices, and homes (Akinnosun, 2017). In 2014, a dominant Nigerian daily newspaper, *Vanguard*, reported over 14,000 Nigerian deaths through generator fumes. In May 2017, a widow and her three children died in their sleep from generator fumes. Many such occurrences had prompted the Nigerian government in 2017 to halt the importation of a notorious power generator brand (Akinnosun, 2017).

The increase in generator use has added to the country's carbon emission, prompting the government's interest in other energy sources such as renewable energy. Agbongiarhuoyi (2015, para 1) explains renewable energy as:

> The energy that comes from resources which are naturally replenished on a human timescale such as sunlight, wind, rain, tides, waves, and geothermal heat. Renewable energy replaces conventional fuels in four distinct areas: electricity generation, air and water heating/cooling, motor fuels, and rural (off-grid) energy services.

With the increasing de-emphasis of fossil fuel and rising concerns about climate change, global attention is shifting to renewable energy sources, and Nigeria is touted to be a potential global renewable energy superpower. According to Owelle (2015, para 7):

> Nigeria is endowed with abundant free solar energy. Using the country's deserts and farmland and taking advantage of 320 to 350 sunny days a year, Nigeria could easily generate 5,000 trillion

> KWh of solar energy. In other words, Nigeria could easily install around 1,000 GW of solar generation — equivalent to 40 times the current peak power demand (about 25 GW) — using just 0.5 percent of its land. Also, Nigeria can produce over 100 GW from wind power.

Apart from Nigeria's great potential to produce alternative energy resources, renewable energy has been tied to climate change issues so far in the country (Zannawaziri, Konto & Abdulsalam, 2012; Ukonu, 2012). Tying renewable energy to climate change eclipses many more issues, other than a concern for climate change, which ought to be addressed. For instance, there are issues about cost and reliability which are the factors that stakeholders fear the most. There are issues about renewable energy potentials and marketability in Nigeria; how much can be generated, the best equipment to use, the social structure to coordinate renewable energy generation and ultimately renewable energy adoption, communication, and awareness (Asu, 2018; Owelle, 2015). Awareness problems are embedded within the above concerns.

This leads to the major question which prompted the study: What do ordinary individuals know about these critical issues in renewable energy? How does this awareness affect the use of renewable energy by an ordinary person? Surveys on renewable energy around the world have established problems of unawareness, illiteracy, and lack of understanding of renewable energy and key issues therein (Mercom Capital Group, 2011; Bamisile, Abbasoglu, Dagbasi, & Garba, 2016; Nadabo, 2010). Asu (2018, p.8) lists the challenges facing renewable energy in Nigeria to include the negative perception surrounding off-grid solutions and the limited awareness of the benefits of renewable energy. This study is premised on the awareness and adoption of renewable energy among the residents of Lagos and Ogun states, Nigeria.

Lagos and Ogun States as Nigeria's Industry Hubs

Lagos and Ogun States host 61.5 percent of industries in Nigeria. The Nigeria Industrial Directory of the Manufacturers Association of Nigeria, 2014, gives the number of companies in Nigeria to be 1,826 as at the end of December 2013. The directory is updated every four years and was due to be revised by 2018. Out of the total number of industries, 875 companies are in Lagos, while 248 are in Ogun State. Moreover, many companies in other industrial hubs such as Oyo,

Abia, Anambra, Abuja, Kano, Kaduna, and Delta have offices or headquarters in Lagos and/or Ogun States.

Figure 1: Map showing Lagos and Ogun States among other states of the southwest, Nigeria.

The demand for energy owing to the heavy presence of industries is the motivation for selecting Lagos and Ogun States for the study. This makes the power and energy situation in Nigeria a familiar topic among scholars, industry captains, residents and in the media in the two states. Both states are located in the south-western region of the country. Lagos is Nigeria's commercial hub. Ogun has many striking similarities in terms of industry and internal revenue generation activities (Ajayi 2018).

Objectives of the Study

The objectives of the study were to:

1. Ascertain the awareness status of the Nigerian residents of Lagos and Ogun States about renewable energy.
2. Ascertain the extent to which these residents adopt renewable energy.
3. Ascertain the factors affecting renewable energy awareness and use among the residents of Lagos and Ogun States.

Hypothesis

The study hypothesizes that the respondents will differ significantly on the factors affecting awareness of renewable energy.

Significance of the Study

The study should be of interest to governments, institutions of learning, investors, the media, researchers, and individuals. For government, institutions of learning

and researchers, the study calls attention to different aspects of renewable energy (e.g. cost, sustainability) which have been overlooked in previous studies. The media and investors would have better insight into the background issues that enhance investigative reporting and aid business decisions (Odiboh et al., 2017a; 2017b; Ike, Omojola & Aririguzoh, 2018). The study could help to strengthen the process towards renewable energy citizenship that enables people to fully understand the key issues involved in renewable energy adoption and use beyond the issue of power cuts. The data provided and findings could also enhance the efforts of Non-government organizations (NGOs) in galvanizing public support and action necessary to pressure the government for a run on the energy track.

Literature Review

Scholarship is visible concerning renewable energy and awareness of it. Some scholars put their focus on conceptual definitions (Barrow and Morrisey, 1987, 1989; Hanson, 1993; DeWaters & Powers, 2010). This study adds the dimension of energy literacy among people of different demographics (including students), in their homes and workplaces, implying it has a practical dimension to it. Some studies have focussed on energy literacy among people in their homes (Farhar, 1996; Bamisile, Abbasoglu, Dagbasi, and Garba, 2016; Akorede, Ibrahim, Amuda, & Olufeagba, 2017; Ikejemba, & Schurr, 2016; Nadabo, 2010; Zannawaziri, Konto, & Abdulsalam, 2012), but they concentrate mainly on the African continent. This study is widening the trajectory by expatiating on the dimensions of students, advocacy groups and so forth.

Bamisile, Abbasoglu, Dagbasi, and Garba (2016), in a study on energy literacy among Nigerian senior secondary students, found that majority of the students (64%) did not know the highest source of power in Nigeria, which they incorrectly said was hydropower instead of thermal power plants. The majority (75.1%), however, correctly pointed out that crude oil was the most abundant fossil fuel in Nigeria, with the remaining 24.9% giving a variety of responses such as coal, natural gas, tar sand, and wood distribution.

The knowledge of fossil fuel as the most abundant energy source in Nigeria did not extend to the knowledge of fossil fuel types. Tar sands were not identified as a fossil fuel by 46.2 percent while 11.6 and 2.7 percent thought that natural gas and coal respectively were not a fossil fuel. Similarly, though the

majority (66.7%) could tell the actual definition of renewable energy, only 24 percent identified the types of renewable energy sources. Findings indicated even lower knowledge levels in the areas of the cost and benefits of renewable energy as well as technologies used in the generation of energy from renewable sources.

Studies have found that knowledge of renewable energy in some advanced and developing countries was still very low. DeWaters and Powers (2010) reported in a study that, in the US, researchers found a critically low energy-related knowledge (Barrow and Morrisey, 1989; Farhar, 1996; Gambro and Switzky, 1999; NEETF, 2002). For instance, the National Environmental Education and Training Foundation (NEETF) found in a 2001 telephone survey among 1500 adults that while many Americans tended to overestimate their energy knowledge, only 12 percent could pass a basic energy quiz (NEETF, 2002, cited in DeWaters and Powers, 2010).

Mercom Capital Group (2011) in a study on India Renewable Energy Awareness Survey found a general lack of education and understanding about renewable energy in India, though the people surveyed were very enthusiastic about renewable energy concepts. The study also found that respondents were more aware of solar than other renewable energy technologies, due primarily to awareness of solar water heaters. Awareness of wind energy and energy efficiency were surprisingly low.

DeWaters and Powers (2010) report, however, that later findings (for example Shelton, 2008) did establish increasing levels of knowledge on renewable energy resources, although knowledge remained low in the areas of how electricity is generated in the US and the major areas of energy consumption within their homes and communities. A study done a year later showed the rising concern of respondents on the need for renewable energy to be developed to relieve US dependence on foreign oil. Other findings in the study did not show high cognitive levels in renewable energy knowledge and awareness.

According to Bitters (2010, cited in DeWaters & Powers, 2010), although the majority of respondents expressed a concern over energy prices and dependence on foreign oil, and most agreed that future solutions should involve development of renewable energy technologies, the study revealed persistently low energy-related knowledge: 40 percent could not

name a fossil fuel, and even more could not name a renewable energy source; 66 percent overestimated US dependence on Middle Eastern oil, and 56 percent incorrectly believed that nuclear energy contributes to global warming. The researchers noted that this lack of knowledge may be the greatest challenge the nation faces on energy, greater than the economic or technical problems.

The major effect of poor energy literacy then is that poor knowledge is affecting adoption, and by implication also affecting the development of renewable energy technology. If people do not patronize or support the production of such technologies, the manufacturers will not be encouraged to invest in research. Therefore, poor information about renewable energy leads to poor public support and affects renewable energy development more than technical factors (Sovacool, 2009a & 2009b, cited in DeWaters & Powers, 2010).

DeWaters & Powers, (2010) have called for more effective renewable energy education to alleviate the problems occasioned by lack of public support for rapid renewable energy resource technology development in the areas of wind and solar. They believe that renewable energy awareness from childhood will help to inculcate and uphold awareness and the right values.

Theoretical Framework

Diffusion of Innovations

The Diffusion of Innovations theory attempts to explain how new ideas and new technology diffuse or spread among people who try to use the new idea. The theory is attributed to Everett Rogers (1962). Rogers explains the role of communication in the process of diffusion of a new idea among people in a social system. The process, according to Rogers, involves the merits of innovation in itself, the channels of communication used in spreading the ideas, time and the social system in which a new idea is introduced.

Rogers lists the five stages that precede adoption to include awareness (knowledge), interest (persuasion), evaluation (decision), trial (implementation), and adoption (confirmation). Within the steps, one can still reject a new idea before or after adoption. The words in bracket were used in later versions of Rogers' seminal work (Rogers, 1983; 2003). However, their explanations remained essentially the same as the initial words before the brackets.

Rogers explains that human capital is needed to drive the four

processes of innovation diffusion and that the survival or self-sustenance of a new idea depends largely on how widely it is adopted. Every new idea has its rate of adoption, which climaxes at the point of critical mass. The categories of individuals in the adoption process are (1) innovators, who have resources, high social status and are willing to take risks (2) early adopters, which are like innovators, except in the level of shrewdness brought in the process of decision making on adoption of innovation, (3) early majority, which include individuals who have average social status, and take up an innovation after time long enough from the time taken by innovators and early adopters, (4) late majority, which are below-average individuals that adopt an innovation late, after the early majority. They consider risks too much in the process of adoption, and finally (5) laggards, who are averse to change, with very little tendency to opinion leaders.

How these categories of adopters buy into a new idea will be dependent on the type of adopters and the decisions made by the adopters in the process of adoption of an innovation. The innovativeness of an idea will also determine its rate of adoption, which is the degree to which people in a social system adopt a new idea. The social system includes physical and psychological components of society that can affect the decision to adopt an innovation. This usually includes various communication media and channels that help to spread information about a new idea.

In the process of adoption over time, potential adopters weigh an innovation in terms of perceived efficiencies, amenability with the current system, ease of learning, assurance of functionality, versatility of the idea in terms of usefulness in other areas and the effects of using the new idea. These ideas are examined as a whole by potential adopters, who might still adopt an idea based on different reasons and relative strengths of considerations made.

Innovations that promise less risk and disruptive innovations can record lower adoption rates, even if there are many advantages. Fear of instability or skill and literacy-related issues may discourage adoption. Innovations that increase efficiency and reduce boredom are more likely to be adopted. Rate of adoption may be impeded by the complexity in using innovation in addition to the knowledge and ability required to use it unless there is ready help from earlier adopters (Meyer, 2004; Radford, 2011). However, ability and

motivation have been seen as the most important attributes of adopters. Perceived usefulness and ease of use are motivation boosters (Mascia, Michael & Morena, 2018).

The attributes of the theory explain the literacy and awareness issues in renewable energy. The study considers how certain critical issues in renewable energy act as factors that affect awareness and adoption of renewable energy as a piece of a new idea in the realm of energy generation.

Research Design

The study adopted the survey research method. Members of the public were reached in their homes and tested primarily on their awareness, knowledge, experiences, and behavior towards key issues in renewable energy. The population of the study was derived from the residents of Lagos and Ogun States. The combined population of the five selected local government areas according to the National Population Commission of Nigeria and the National Bureau of Statistics were given as 6, 698, 949 (see the breakdown in Table 1). The sample size from a combined population of Lagos and Ogun States was 412. This size was considered suitable for the realization of the objectives.

1. Stratum sample sizes

Ogun State			Lagos State		
Local Government	2018 Population Estimate (3.36%/yr)	Stratum sample size	Local Government	2018 Population Estimate (+5.61%/yr)	Stratum sample size
Abeokuta North	394, 305	24	Lagos Mainland	639, 630	39
Abeokuta South	365, 505	22	Alimosho	1, 599, 624	98
Ado-Odo/Otta	749, 400	46	Surulere	825, 885	50
Ewekoro	86, 600	6	Ojo	919, 981	57
Ijebu East	163, 100	11	Mushin	954, 919	59
Total	1, 758, 910	109	Total	4, 940, 039	303

The study adopted the multi-stage sampling technique. At the first stage, Lagos and Ogun states were stratified into local governments, and the simple random sampling technique was used to select the

local governments studied. At the second stage, the local governments were in turn stratified into residential areas, and the areas studied were selected through simple random sampling technique. At stage three, the streets in the areas were selected using the systematic random sampling technique. In each house, all the adult members met were given the questionnaire. Table 1 also displays the selected five local government areas in each state.

The questionnaire contained items on demographic characteristics of the respondents in Section A. Section B contained items testing renewable energy awareness and literacy. Structured questions were used to test the dependent variable – renewable energy awareness. Some of the questionnaire items were guided by an Indian Renewable Energy Awareness Survey done by Mercom Capital Group (2011), a clean energy communication and consulting firm with offices in the US and India. The study adopted descriptive statistics of data distribution (frequency count, percentages and weighted mean). Inferential statistics in the form of chi-square were used to test the hypotheses.

The results of the analysis of the data collected from the respondents were presented using tables and charts in line with the objectives and hypothesis. The findings of the study were consequently summarized and discussed. The study involved the distribution of 412 copies of the questionnaire out of which 357 were returned. A total of six copies of the questionnaire were removed during collation and screening due to irregularities and inconsistencies observed in the completion of the questionnaires. The 357 returned copies of the questionnaire showed a return rate of 86.6 percent which was considered reasonable in achieving the objectives.

Descriptive Analysis

Data from the demographic variables indicated that three (representing 0.8%) of the respondents did not indicate their age range; 134 (representing 37.9 %) of the respondents are within the age range of 25 – 30 years and they form the majority of the respondents. A total of 55 (representing 15.5 %) of the respondents are within the age range of 31 – 35 years; 41 (representing 11.6 %) are within the age range of 36 – 40 years; 2 (representing 0.6 %) of the respondents are within 41 – 45 years; 69 (representing 19.5 %) of the respondents are within the age of 46 – 50 years while 53 (representing 15.0 %) of the

respondents are within the age range of more than 50 years.

The number of respondents who attained tertiary education level was 213 which represents 63.0 percent of the 338 respondents who indicated their educational level in the completed questionnaires. Only 27 (representing (8.0 %) of the respondents had primary education as their highest educational qualification; 46 (representing 13.6 %) of the respondents have secondary education while 52 (representing 15.4 % of the respondents had other qualifications. However, 19 of the respondents which represent 5.3 percent of the 357 respondents did not indicate their level of education and were not included in the computation of the valid percent for the factor.

On gender, 214 of the respondents were male, which represents 62.9 percent of the 340 who indicated their gender since 17 (representing 4.8 %) of the respondents did not indicate their gender. The remaining 126 (representing 37.1 %) of the respondents are female.

The occupational distribution of the respondents reveals that 24 (representing 6.7 %) of the respondents did not indicate their occupation in their questionnaire and therefore were excluded from further analysis in the valid percent column. Of the 333 respondents who indicated their occupation, 138 (representing 41.4 %) are in business. 47 (representing 14.1 %) are civil servants while 148 (representing 44.4 %) are into other occupations different from business and civil service.

Objective One: The awareness status of members of the public in Lagos and Ogun States about renewable energy.

The majority (322; 90.2 %) of the respondents had heard about renewable energy. More male than female respondents reported their awareness, while the older respondents (mainly 41 to 45 years) were more likely to have more awareness than the younger generation (25 to 30 years) who were more in number than the older group (37.5% and 19.3% respectively).

Table 2: Knowledge of alternative terms for renewable energy

		f	%	Valid %	Cumulative %
	Clean energy	84	23.5	24.2	24.2
	Solar energy	215	60.2	62.0	86.2
	Electricity	48	13.4	13.8	100.0
	Total	347	97.2	100.0	
Missing	System	10	2.8		
Total		357	100.0		

The depth of familiarity of the respondents about renewable energy was measured by ascertaining their knowledge of the alternative terms often used in conjunction with renewable energy. A shown on Table 2, 215 (representing 62.0 %) respondents identified solar energy as another term often used in conjunction with renewable energy while 84 (representing 24.2 %) chose clean energy, and only 48 (representing 13.8 %) of the respondents identified renewable energy as simply electricity.

Those who did not respond to the item in Table 2 were 10 in number, representing 2.8 percent of the respondents, and were excluded from the analysis in Table 3 below. The respondents were asked to rank renewable energy alternatives by their level of knowledge of each one. The results are presented in Table 3.

Table 3: Respondents' ranking of knowledge of types renewable energy options

Energy		*f*	%	Valid %	Cumulative %
Valid	Solar energy	246	68.9	74.1	74.1
	Wind energy	16	4.5	4.8	78.9
	Biomass energy	12	3.4	3.6	82.5
	Waste-to-energy	18	5.0	5.4	88.0
	Hydroelectricity	40	11.2	12.0	100.0
	Total	332	93.0	100.0	
Missing	System	25	7.0		
Total		357	100.0		

Solar energy was ranked the highest with 68.9 percent of the respondents indicating they have good knowledge of solar energy as renewable energy. Other types of renewable energy which include wind energy, biomass energy, waste-to-energy, and hydro-electricity were ranked very low, each of them receiving less than 12 percent rating from the respondents. Biomass energy was

the least rated with only 3.6 percent of the respondents indicating knowledge of the alternative source of energy. It could also be observed that 25 of the respondents, representing 7.0 percent, did not rank the item and were excluded from further analysis.

Further information was sought to ascertain the respondents' level of awareness of renewable energy. A question was asked in which the respondents were expected to identify the source of energy that does not belong to the renewable energy category. The summary analysis of their response is presented in Table 4. The results show that 95.8 percent identified nuclear energy as non-renewable energy.

Table 4: Frequency of responses to identifying non-renewable energy

Energy		*f*	%	Valid %	Cumulative %
Valid	Solar energy	1	0.3	0.3	0.3
	Wind energy	4	1.1	1.1	1.4
	Biomass energy	7	2.0	2.0	3.4
	Hydro-electricity	3	0.8	0.8	4.2
	Nuclear energy	342	95.8	95.8	100.0
Total		357	100.0		

The respondents were required to point out the benefits of renewable energy. The results were analyzed using multiple response procedures and presented in Table 5. Multiple response analysis was adopted because each respondent was expected to select as many benefits as s/he deemed necessary. This also implied that the total number of responses can exceed the total number of respondents.

Table 5: Multiple response analysis of benefits of renewable energy

Benefits		Responses N	Responses %	% of Cases
Benefits of renewable energy	Good for the environment	159	24.5	44.8
	Less dependence utility	87	13.4	24.5
	Good for business	113	17.4	31.8
	Lower energy bills	137	21.1	38.6
	Government subsidy	20	3.1	5.6
	No power cut	98	15.1	27.6
	No benefits	2	0.3	0.6
	Don't know	32	4.9	9.0
Total		648	100.0	182.5%

The last column (percentage of cases) was the most important in this case because it reflects the percentage of responses out of the 357 respondents that selected each of the options. The column, N, for the number of responses has the total number of responses as 648 which is greater than the total number of respondents. The 'percent' column accompanying the 'N' column is the percentage of responses out of the 648 responses. The benefit of renewable energy with the highest number of responses is that 'renewable energy is good for the environment' selected by 159 respondents which represents 44.8 percent of the 357 respondents. 'Lower energy bills' drew the second-highest number of responses from 137 respondents which represents 38.6 percent of the respondents. Those that indicated that renewable energy is good for business were 113 out of 357 (representing 31.8 %) of the respondents. The benefit with the least number of responses was 'government subsidy' with only responses (representing 5.6 %) of the respondents. Those who did not identify with any benefit of renewable energy were 2 in number which is merely 0.6 percent of the respondents.

The sources through which the respondents obtained information and awareness of renewable energy were also explored. The results are displayed in Table 6. The table reveals that about 60.9 percent of the respondent hear and receive information about renewable energy through the mass media. The remaining 39.1 percent receive information about renewable energy through informal communication with friends (22.0 %), place of worship (3.7 %) and place of work (13.4 %). Seven respondents which form 2.0 percent of the total respondents did not indicate their source of information on renewable energy and were excluded from further analysis.

Table 6: Frequency distribution of platforms respondents hear about renewable energy

Source		*f*	%	Valid %	Cumulative %
Valid	Mass media	213	59.7	60.9	60.9
	Informal communication with friends	77	21.6	22.0	82.9
	Place of worship	13	3.6	3.7	86.6
	Place of work	47	13.2	13.4	100.0
	Total	350	98.0	100.0	
Missing	System	7	2.0		
Total		357	100.0		

Table 7: Types of mass media as the highest source of information on renewable energy

Mass Media		*f*	%	Valid %	Cumulative %
Valid	Newspaper	74	20.7	22.6	22.6
	Magazine	21	5.9	6.4	29.0
	Radio	43	12.0	13.1	42.1
	TV	98	27.5	29.9	72.0
	Social media	92	25.8	28.0	100.0
	Total	328	91.9	100.0	
Missing	System	29	8.1		
Total		357	100.0		

From Table 7, television was ranked the highest source of information on renewable energy by 29.9 percent of the respondents. Social media with 28.0 percent was ranked second by the correspondents while newspaper is with 22.6 percent was ranked the third source of information on renewable energy. Radio and magazine were ranked fourth and fifth, respectively, with 13.1 and 6.4 percent. It was observed that 29 (representing 8.1%) of the respondents did not provide information on the type of mass media available to them and were excluded from the valid percentage analysis.

Objectives Two and Three: The extent of adoption and the factors affecting the adoption of renewable

energy among residents of Lagos and Ogun states

The study found a moderate rate of adoption of renewable energy in Lagos and Ogun States. A little over half of the respondents (201; 56.3%) reported using any form of renewable energy. Of this number, 92.3 percent reported using solar energy. Further questions relating to adoption and use are analyzed subsequently.

Table 8: Multiple response analysis of views of respondents on using renewable energy

		Responses		
		N	%	% of Cases
Perception of the use of renewable energy	I found it very efficient	142	14.7	39.8
	It is costly to acquire	274	28.5	76.8
	It is costly to maintain	252	26.2	70.6
	I did not understand what was involved before installing it	123	12.8	34.5
	I could not buy a new part of the device when it got bad	112	11.6	31.4
	I will continue using it in the future if my own gets bad	60	6.2	17.6
Total		963	100.0	270.7%

Table 8 shows the multiple response analysis. Each respondent was expected to indicate at least one of the available options based on their experiences. The results show that 39.8 percent of the respondents who use renewable energy found it very efficient. Also, 76.8 percent of the respondents indicate that renewable energy equipment was costly to acquire while 70.6 percent specify that the renewable energy equipment was costly to maintain. However, the 34.5 percent on the table reveals that they did not understand what was involved before installing the renewable energy equipment, while 31.4 percent reveals they could not buy a new part of the equipment when their own were faulty. On the other hand, only 17.6 percent indicated that they would continue to use renewable energy facilities in the future if their own were out of order.

Table 9: Reasons for not installing renewable energy equipment

		f	%	Valid %	Cumulative %
Valid	I'm not sure whether it will work	106	23.3	23.3	23.3
	My friends have had bad experiences	118	26	26	49.2
	I just want to continue with public power supply	124	27.3	27.3	76.5
	It's costly to acquire	107	23.5	23.5	172.5
Total		455	100.0		

The rest of the 156 respondents who had not installed renewable energy gave the reasons contained in Table 10. The response frequencies were above 156 because they were asked to select as many options as possible. Sticking with the status quo of continuing with the public power supply was the most cited reason for not adopting renewable energy. Remarkably, however, all the other options were cited by over 60% of the 156 respondents who had not used renewable energy. The reasons for which the respondents have an interest in renewable energy are displayed in Table 10.

Table 10: Reason for having an interest in renewable energy

Reason		*f*	%	Valid %	Cumulative %
Valid	Climate change	71	19.9	20.2	20.2
	Irregular public power supply	280	78.4	79.8	100.0
	Total	351	98.3	100.0	
Missing	System	6	1.7		
Total		357	100.0		

The irregular power supply was identified by 280 (representing 79.8 %) of the respondents as their reason for picking interest in renewable energy while the remaining 20.2 percent identified climate change as the reason for their interest in renewable energy. Therefore, the major reason for turning to renewable energy irregular power supply.

Hypothesis One

The factors affecting the adoption of renewable energy do not significantly depend on the respondents' state of residence.

Cross analysis was done based on the states of residence. The results of the factors according to state are presented in Table 11 while the results of the Chi-square test of independence are in Table 12.

Table 11: Cross-tabulation of factors affecting the adoption of renewable energy according to the state of residence

		State		
		Lagos	Ogun	Total
The reason why I have not installed any renewable energy equipment	I'm not sure whether it will work	6	20	26
	My friends have had bad experiences	5	8	13
	I just want to continue with public power supply	28	16	44
	It's costly to acquire	106	73	179
Total		145	117	262

Table 12: Chi-square test for Table 11

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	14.764[a]	3	.002
Likelihood Ratio	15.087	3	.002
Linear-by-Linear Association	10.981	1	.001
N of Valid Cases	262		

The results from Table 12 reveal that the Chi-square value was 14.764 with a p-value of 0.002 at 3 degrees of freedom. The p-value was less than the 0.05 level of significance at which the hypothesis was tested and indicates that the factors affecting adoption and installation of renewable energy equipment are significantly influenced by the state of residence of the respondents.

Summary of Findings

1. The majority of the respondents indicated a high awareness of renewable energy but incorrectly interchanged the term with renewable energy. High awareness, therefore, did not translate into high knowledge.
2. Solar was the most well-known renewable energy and the majority of respondents had access to solar energy information from the mass media, especially television and social media.
3. There was a moderate rate of adoption and use of renewable energy among the respondents and solar energy was almost the only renewable energy type in use
4. The major factors affecting the adoption of renewable energy include the cost of acquisition, cost of maintenance, availability of affordable parts and awareness on how the equipment function.

5. The irregularity of the public power supply was the highest reason while renewable energy was adopted. This was against the concerns about climate change.

Discussion of Findings

The study shows that a high number of respondents have heard about renewable energy previously. The most familiar type of renewable energy to the respondents is solar energy, which many incorrectly think is the same as renewable energy. High awareness, therefore, does not imply high knowledge. Some respondents, however, identify other forms of renewable energy such as biomass, hydroelectricity, wind, and waste-to-energy. The study by the Mercom Capital Group (2011) indicates a similar tendency of respondents to equate solar energy with the whole of renewable energy. DeWaters and Powers (2010) also report in a study that in the US researchers found a 'disparagingly low' energy-related knowledge (e.g., Barrow and Morrisey, 1989; Bittle et al., 2009; Curry et al., 2007; Farhar, 1996; Gambro and Switzky, 1999; NEETF, 2002).

The respondents can identify the following benefits of renewable energy: good for the environment, less dependence utility, good for business, lower energy bills and no power cut. However, it is not enough to just hear about renewable energy and its advantages. The uncertainties surrounding the technicalities, functionalities, and adoption of renewable energy still hangs like a cloud over many of the respondents, especially those who indicate interest in acquiring it. There is still a problem of awareness and knowledge of how the renewable energy equipment works, when and how to maintain it and possible dangers associated with it for safety purposes.

In line with the study by the Mercom Capital Group (2011), the respondents are more interested in renewable energy owing to power cuts than as a result of climate change. A little less than half of the respondents have not acquired any form of renewable energy, a situation related to uncertainties and fears about cost, functionality, maintenance, and negative reports from friends who own it. A cumulative 70.6 percent report that they find renewable energy resources costly to acquire, costly to maintain and do not understand what is involved with it.

Apart from showing the implications of low media influence on the audience, data also imply new directions for media campaigns on renewable energy. The advantages of renewable

energy are not just about having a steady and stable power supply, paying fewer bills and absence of power cuts. The audience ought to understand the links between Nigeria's interest in renewable energy, the general energy potentials and concerns about climate change. The major task is to let people understand the real reason why they need to switch over to renewable energy.

The media are the highest sources of information on renewable energy. However, newspapers are not the major sources of information on renewable energy for the respondents. The issues cited about the problem of sourcing information on renewable energy, government apathy, finance, and poor audience awareness and readership of renewable energy stories underlie the low influence of newspapers. Poor readership of newspapers generally may have affected knowledge of renewable energy. Newspapers are known to be the major general-interest mass media, if not the only, that carry information on renewable energy at least weekly, but in many cases daily.

The study reveals that the factors affecting the awareness and adoption of renewable energy include non-popularity of renewable energy, technical nature of renewable energy, readership by chance, high cost of acquisition, high cost of maintenance, unavailability of spare parts, uncertainty and lack of sensitization about how the equipment work before acquisition and installation. Also, the lack of competition and motivation is not helping the course of renewable energy development and adoption. Due to the benefits of renewable energy to the environment and the human race, it is expected that the government should have invested much in the project and provided incentives to attract users and private investors.

As noted by Sovacool (2009a & 2009b, cited in DeWaters & Powers, 2010), the major effect of poor energy literacy is that poor knowledge is affecting adoption, and by implication also affecting the development of renewable energy technology. If people do not patronize or support the production of such technology, the manufacturers will not be encouraged to invest in technology research. Therefore, poor information about renewable energy leads to poor public patronage and affects renewable energy development. Zografakis et al., (2008) and DeWaters and Powers (2010) have called for more effective renewable energy education to alleviate the problems occasioned by lack of public

support for rapid renewable energy resource technology development in the areas of wind and solar.

The study reveals that the state of residence of the respondents has a significant influence on the nature of the factors affecting the adoption of renewable energy in Nigeria. A close look at the data shows, for instance, that more people living in Ogun state are not sure whether the renewable energy equipment will work after spending heavily to acquire it. This uncertainty amounts to a lack of or poor level of awareness among the residents of Ogun state on how the equipment work. On the other hand, residents of Lagos do indicate more awareness of how renewable energy equipment work. Also, more residents in Lagos state view the equipment to be very costly to acquire than the residents of Ogun state possibly because of their proximity and access to renewable energy equipment. Those who do not have access may not know what it costs to acquire and install the equipment.

Conclusion

The difference between awareness and knowledge as shown in the study should be a pointer to media, government, and investors on the areas of need in renewable energy promotion. This is also the same about the issues affecting adoption and use such as fears and uncertainties surrounding the acquisition and installation of renewable energy equipment. The government particularly should give attention to incentives to attract investments and competition in the market. This would have helped largely in reducing the price of acquisition and maintenance of renewable energy equipment.

Recommendations

The study makes the following recommendations

1. Adequate awareness strategies on renewable energy have not been put in place yet. The media can start to drive the process to get government and private investors to partner the media in developing aggressive campaign strategies to promote renewable energy. Seminars, workshops, and conferences should be conducted to bring renewable energy awareness to the doorstep of every Nigerian.
2. The cost of acquisition and maintenance of renewable energy equipment was reportedly very high, thereby discouraging investors and individuals from adopting renewable energy. Also, inadequate and expensive spare parts are part of the problem. Appropriate incentives and competitions should be introduced in the renewable

energy market as research has shown that this could help to bring the cost of renewable energy affordable. The media can be used to publicize such incentives.

3. Adequate spare parts for the renewable energy equipment and technical professionals should be put in place and prompted through media campaigns to help make it easy for people who are having one problem or another with their equipment.
4. More sensitization needs to be undertaken by investors, government and the media on the main reason for alternative energy. This will help the country to prepare for the economic consequences of a major global shift from oil to renewable energy sources. This is important because Nigeria depends on oil for her revenue earnings.

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