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Clean Energies for Ghana—An Empirical Study on the Level of Social Acceptance of Renewable Energy Development and Utilization

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Abstract: Despite the enormous renewable energy (RE) resources available in Ghana, the country has not seen much development and investments in the sector. Therefore, the government has committed to increasing the share of RE in the country's electricity generation mix to some 10% by 2030. However, this cannot be achieved without the Ghanaian people's support since the RE sector is capital intensive and requires both public and private sector participation. This study was conducted to evaluate RE's social acceptance among Ghanaian people using the ordered logit regression model. A total of 999 valid questionnaires out of 1020 distributed questionnaires were considered for the study. The five-point Likert scale was employed to rank their willingness to accept (WTA) RE. From the results, it was observed that there is a general sense of acceptance of renewable energy among Ghanaians. However, the level of acceptance varies from one respondent to another. The study observed that a majority of the respondents (i.e., approximately 45.65%) agree to their WTA renewable energy, while 36.04% strongly agree. The results also indicate that while 6.21% and 0.3% disagree and strongly disagree, 11.81% of the respondents were indifferent regarding their willingness to accept renewable energy development and utilization in Ghana.

Keywords: renewable energy; social acceptance; renewable energy in Ghana; ordered logit model; Likert scale

Citation: Agyekum, E.B.; Ali, E.B.; Kumar, N.M. Clean Energies for Ghana—An Empirical Study on the Level of Social Acceptance of Renewable Energy Development and Utilization. *Sustainability* **2021**, *13*, 3114. https://doi.org/10.3390/su13063114

Academic Editor: Maria P. Papadopoulou

Received: 22 January 2021
Accepted: 9 March 2021
Published: 12 March 2021

1. Introduction

The continuous upsurge in the anthropogenic release of greenhouse gases (GHG) makes the fight against climate change an important issue for sustainable development in the long-term. As a result, sustainable development that affects climate change mitigation and economic development has been a major topical issue on global leaders' agenda in recent years. To achieve this growth, a country must have economically viable, affordable, reliable, and socially accepted renewable energy (RE) service [1,2]. Public participation and social acceptance of new technologies would be key to the transition from the current fossil fuel technologies that have been the major source of energy generation globally [3]. This has become even more important because the residential sector in most countries is the majority in terms of energy consumption [4]. The residential sector also plays a crucial role in promoting the development and utilization of RE [5,6]. Researchers [7–9] have indicated that the lower acceptance of residents relative to the development and use of RE could have a dire consequence on its approval process and deployment by governments.

Extant literature has reported on the level of social acceptance of RE's development and utilization in several countries around the globe. Kim et al. [10] investigated the level of public acceptance in South Korea in relation to the development of large-scale offshore power plants. Jung et al. [11] assessed the level of social acceptance in the Helsinki Metropolitan Area of Finland on using RE technologies in buildings. Their study concluded that the respondents showed a strong readiness to invest in the sector to minimize the country's carbon footprint financially. Paravantis et al. [12] also examined the attitudes and willingness-to-pay for electricity produced from RE sources in Western Greece. Oluoch et al. [13] assessed the public awareness, acceptance, and attitude towards the development of RE in Kenya. Their findings indicated that both rural and urban dwellers approve of RE development technologies.

Most of the consulted respondents had adequate knowledge about RE technologies. Furthermore, Kim et al. [14] researched the level of local acceptance of RE's cost in South Korea. They employed contingent valuation to assess the willingness to accept the RE project. Schumacher et al. [15] performed a comparative study on public acceptance of RE and energy autonomy in Germany, France, and the Swiss Upper Rhine region. Their research's key findings indicate that the level of public acceptance is inter alia; it highly depends on the type of technology, previous experiences with RE technologies, and social acceptance dimensions. Also, Kim et al. [16] explored the extent of public perception about the use of RE by proposing a word network model. Their results showed that the word network model in the social network services, as well as the approaches, can extract both regularly stated and latent issues concerning RE. Botelho et al. [17] conducted a study on the public perspectives on RE technologies in Portugal. In order studies, Malaysia [18], China [19], Finland [20], Australia [21], and India [22] assessed the social acceptance of various RE technologies. Bertsch et al. [23] analyzed the acceptance for RE development in Germany and its grid expansion policy. Results from their study showed that RE acceptance at the national level was very high. They also identified that problems might arise at the local level for most considered technologies, for which landscape modification concerns were the main factor. The level of awareness in terms of RE energy in Qatar was also investigated by [24]. Finally, Firestone et al. [25] evaluated the extent of local acceptance among residents on developing two offshore wind power projects, i.e., Bluewater Wind off Delaware and Cape Wind off Massachusetts.

Studies as reviewed supra for countries are very important for RE companies because of the effect of factors such as social status [26], income [27], rural or urban [19,28], level of education, awareness, and personal exposure [29] on the development of RE. This is even more relevant in developing countries, where the private sector is expected to play a key role in RE's development. Most of these countries have much more rural communities without electricity, low literacy rates, high unemployment levels, and poverty levels. Therefore, a comprehensive study on the level of knowledge, acceptance, and willingness to use RE technologies in such countries will be key for decision making, either at the level of investments or policymaking.

Despite recent increases in the development of RE across the globe, its deployment and utilization have been on the lower side on the African continent despite the enormous RE resources scattered across the continent. Over half a billion people on the continent are without access to electricity [30]. Even though Ghana has about 83.24% of its population connected to electricity [31,32], fossil fuel-based power plants form the majority of the country's energy generation mix. The government of Ghana intends to increase RE's composition, excluding hydropower, to some 10% by the close of 2030 [33,34]. But the question is, can this be achieved without the general societal acceptance, knowing the impact of the private sector in the development of RE globally? This question is even more important to be answered because of the government's inability to meet its 2020 10% target, for which reason it has to be shifted to 2030 [35].

This study seeks to bridge the social gap that currently exists in the Ghanaian energy sector to help in the formulation of policies for the development of RE. The current study is novel in the following ways. For example, the study covers the entire country from the northern to the southern section; the study also includes all forms of people from a different cultural and educational background, given this study a unique nature, unlike most of the reviewed literature, which mostly focused on some regions or municipalities of some countries. This study also assesses the effect of one's location on their readiness to accept RE's development. Although this research focuses on a single country, i.e., Ghana, this study's results and drawn concluding remarks can be applied in most developing countries with similar conditions as Ghana. It is expected to serve as reference material during decision-making by policymakers, investors, and stakeholders. Information from this research can also help Ghana's government devise appropriate measures to assist investors and customers in its quest to achieve the 10% RE penetration by 2030.

The study is organized in the following form: Section 2 presents a short description of sustainable energy and social acceptance, Section 3 presents a brief overview of Ghana's current energy position, the methodology adopted for the study is presented in Section 4. Section 5 covers the results and discussions, whiles the conclusion for the study is presented in Section 6.

2. Sustainable Energy and Social Acceptance

The availability of energy is a key component in sustainable development; thus, it has put significant environmental pressure at all levels, i.e., local, regional, national, and global. Sustainable development can be defined as total sustainability, required to fulfill human needs, using socially allowed technological systems, and the appropriate policies and political instruments [36,37]. Renewable energy is key to the sustainable development agenda. RE technologies have their merits and demerits. Some of the merits include decreasing cost of operations, eco-friendly, energy security, energy quality, reliability, conservation of natural resources, job creation, reducing the reliance on fossil fuels, and development at the local levels [37–39]. The demerits of RE also include the impact on fauna and flora, landscape variations, high initial installation cost, and noise pollution from the installations [37,40]. However, the advantages outweigh the disadvantages.

Policy analysts mostly use the social acceptance concept; however, several researchers have provided definitions to it. Three dimensions have been identified to define the social acceptance concept [9,41]:

- Sociopolitical acceptance: this relates to accepting a particular technology by policymakers, the public, key stakeholders, and political actors. In this case, the politicians are required to enhance the market and community's acceptance of RE technologies. Therefore, this makes sociopolitical acceptance the initial element needed to achieve general social acceptance
- Market acceptance: in this case, it looks at the diffusion of innovation; this explains consumers adoption of a particular product through a communication process among individual users and their environment. In this type of acceptance, the focus is on both the consumer and the investor.
- Community acceptance: this is in relation to specific acceptance of RE projects and their siting decisions by local stakeholders, principally local authorities, and residents. This is the stage whereby the issue about the NIMBY (Not in My Back Yard) phenomenon emanates. In this case, some people are of the view that the difference between resistance to specific projects and general acceptance can be described by the fact that people support RE development provided it is not sited in their backyard. In contrast, others are also of the view that this is too simplistic relative to people's actual motives.

The word acceptance is frequently used synonymously with acceptability by most authors. However, as discussed in [23,42]: acceptability considers the experts' judgments relative to whether the development of a specific facility (e.g., transmission line or power plant) is a real burden under normal thoughts of quantifiable criteria (e.g., noise or health implications). Whereas acceptance is a measure of an individual's or peoples' readiness to accept the development of a certain facility in their catchment area regardless of the rational judgments, in this case, it is subjective. As a result, this study looks at the acceptance of RE in that sense and not in the sense of acceptability. This is because the questionnaire looks at RE in general; this may include large-scale deployments and small to medium-scale deployments. As considered by [23], acceptance in this paper is regarded as passive or active sociopolitical and community acceptance of RE in Ghana.

3. Brief Overview of Ghana's Energy Sector

Ghana's total primary energy supply was estimated to be around 10,852 Ktoe in 2018; it increased by 2.7% in 2019 to about 11,149 Ktoe. The breakdown for the 2019 total primary supply is as follows: oil (38.3%), biomass (37.8%), and gas (18.2%). In Ghana, biomass energy formed a more significant part of its total primary energy supply between 2000–2011. Oil, however, overtook biomass and has remained the dominant primary energy supply for Ghana's economy from 2012–2019. The country's yearly average growth rate from 2000 to 2019 relative to the total primary energy supply was 3.1% [43].

In terms of electricity consumption, the residential and industrial sectors consumed 2026 GWh and 4380 GWh representing 29.4% and 63.6%, respectively, for the total final electricity consumed in 2000. These dynamics have since changed considerably; the share of electricity consumed in the industrial sector dropped to 4242 GWh representing 30.4%. The residential sector increased to some 6357 GWh representing 45.6% of the total final consumed electricity by 2019. Ghana's total capacity relative to electricity generation increased from 1652 MW to 5172 MW in 2000 and 2019, respectively, representing a yearly average growth of 6.2%. The dependable capacity also saw an increase from 1358 MW in 2000 to about 4695 MW in 2019. Installed grid-connected RE also increased to 42.6 MW in 2019 from a paltry 2.5 MW in 2013 [43]. Figure 1 shows Ghana's dependable and installed capacities from 2000–2019.

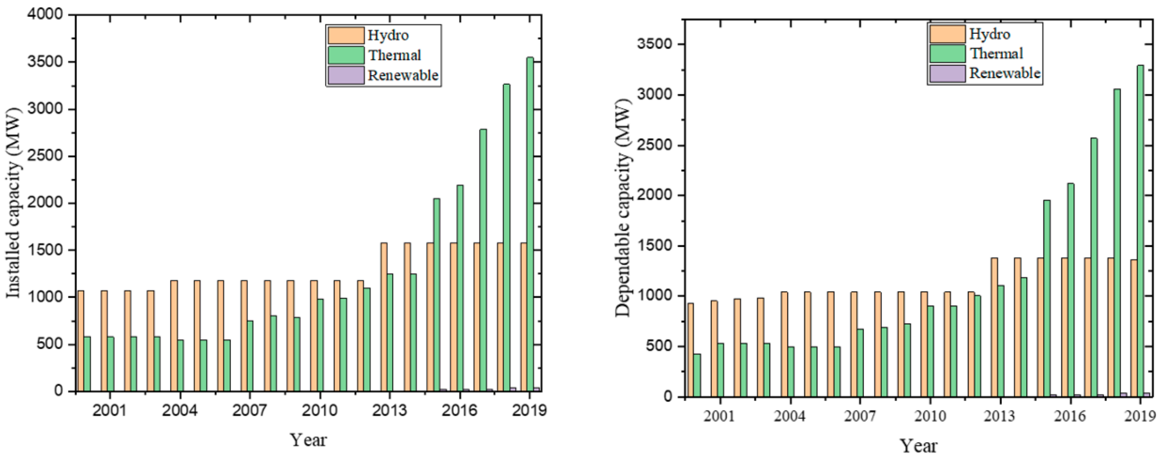

Figure 1. Ghana's installed (**a**) and dependable (**b**) capacities from 2000–2019 [43].

4. Materials and Methods

In this section, we presented the methodology adopted for the assessment and details of the number of respondents used for the survey.

4.1. Data and Sampling

We gathered primary data from interviews in Ghana across different age groups using a multistage sampling technique. In the first stage, a list of communities was obtained from the various district and municipal assemblies across the 16 regions of Ghana.

In the second stage, we randomly selected 4 regions, each from Ghana's Northern and Southern sectors. Furthermore, we classified each of the sectors into urban and rural communities. In the third stage, twenty (20) communities each from the rural and urban communities were randomly selected under the two sectors, respectively.

A semi-structured questionnaire was used for the data collection from respondents across the study areas. It comprised questions on respondents' socioeconomic characteristics, income levels, and level of knowledge on renewable energy sources (see Table 1). Before conducting the survey, enumerators from the various study areas were trained on the questionnaire to assist the authors in the data collection. A face-to-face interview was therefore employed to collect the data. Firstly, this type of data collection was preferred because it allowed the enumerators and authors to interact with the respondents freely. Secondly, it enabled us to provide a detailed interpretation of respondents' questions with low formal education. Thirdly, it enabled the enumerators to discuss specific general issues about the study that were not captured in the questionnaire.

Table 1. Descriptive statistics of the study.

Variables	Description	Mean	Standard Deviation
Age	Measured in years	35.24	11.09
Gender	Dummy: 1 for male; 0 for female	0.52	0.49
Education	Years of formal education	17.99	2.92
Employment	Dummy: 1 for Yes; 0 for No	0.76	0.43
Income	Amount in Ghana cedis	1566.67	1378.48
Utility	Amount in Ghana cedis per month	102.43	100.76
Electricity	Dummy: 1 for Yes; 0 for No	0.9	0.3
knowledge	Dummy: 1 for Yes; 0 for No	0.85	0.36
Residence	Dummy: 1 for Urban Ghana; 0 for Rural Ghana	0.52	0.5
Geography	Dummy: 1 for Southern Ghana; 0 for Northern Ghana	0.54	0.5

A total of 1020 questionnaires were distributed across the various study areas (northern and southern sectors). However, incomplete questionnaires that were detected during data cleaning resulted in eliminating responses from 21 respondents. In effect, 458 responses from the northern sector comprised of 203 rural and 255 urban respondents interviewed were valid. Similarly, 541 responses from the southern sector comprising 227 rural and 264 urban respondents interviewed were valid.

Ethical issues are very crucial in field surveys. Before starting the questionnaire, enumerators sought the consent of respondents by explaining the purpose of the study. The enumerators also guaranteed the anonymity of the respondents and the information provided. Additionally, respondents were informed that participation was voluntary.

Following Nassiuma [44] as cited in Okuthe et al. [45], Obuobisa-Darko [46], and Ali [47], we determined the sample size by applying Equation (1).

$$n = \frac{NC^2}{C^2 + (N-1)e^2} \tag{1}$$

where n = sample size; N = population size; C = coefficient of variation; e = error of margin.

$$n = \frac{24,658,823 \times 0.35^2}{0.35^2 + (24,658,823 - 1)(0.02^2)}$$
$$n = 2500$$

However, following such limitations as funding and time factors, we opted for a sample size of 1020 respondents, which is equally ideal for this study.

It is important to note that the population size was adopted from Ghana's 2010 population and housing census report [48].

4.2. Analytical Framework

In the first stage of our analysis, we used the five-point Likert scale to assess respondents' levels of willingness to accept renewable energy (Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree). We subsequently used the ordered logit regression to estimate the factors that affect a respondent's willingness to accept (WTA), i.e., how do respondent's socioeconomic and other factors affect their social acceptance of RE in Ghana?

4.3. Willingness to Accept and the Logit Regression Model

To assess respondents' willingness to accept renewable energy, we first employed the five-point Likert scale to identify their choices. Starting from point 1 to 5, we defined respondents' choices as follows: (1) Strongly Agree; (2) Agree; (3) Neutral; (4) Disagree, and (5) Strongly Disagree. This means that the dependent variable has a meaningful order of importance and renders the ordered logit regression appropriate [49,50]. This model allows for the partial acceptance of a product or project (in our case, renewable energy). Thus, the ordered logit model is built on the latent regression in the same manner as the binomial logit model [49]. The theoretical framework of the model is premised on the theory of random utility theory [51], where the underlying latent dependent variable is as indicated in Equation (2):

$$y_i^* = X_i^1\beta + \mu_i \text{ for } i = 1,\ 2,\ \ldots,\ n \tag{2}$$

where Xs are a set of explanatory variables; β is the parameter to be estimated; μ is the stochastic error term for unexplained variations in the response variable and is assumed to be normally distributed; Y_I^* is unobserved. Instead, we observe the discrete response variable willingness to accept (WTA). Thus, we observe Y_I^* as specified in Equation (3):

$$Y_i = \left\{ \begin{array}{c} 1\ if\ WTA_i \leq \delta_0 \\ 2\ if\ \delta_0 < WTA_i \leq \delta_1 \\ 3\ if\ \delta_1 < WTA_i \leq \delta_2 \\ 4\ if\ \delta_2 < WTA_i \leq \delta_3 \\ 5\ if\ WTA_i \geq \delta_1 \end{array} \right\} \tag{3}$$

where Y_i is observed as a five-point Likert scale response and δ_s are the thresholds.

The general probability that Y_i falls into the response category $i(i = 1, 2, 3 \ldots\ldots I)$ is the difference between two cumulative probabilities:

$$\begin{array}{c} Prob\ (y_i = 1) = \varnothing(-x_i\beta), \\ Prob\ (y_i = 2) = \varnothing(\delta_1 - x_i\beta) - \varnothing(-x_i\beta), \\ Prob\ (y_i = 3) = \varnothing(\delta_2 - x_i\beta) - \varnothing(\delta_1 - x_i\beta), \\ Prob\ (y_i = 4) = \varnothing(\delta_3 - x_i\beta) - \varnothing(\delta_2 - x_i\beta), \\ Prob\ (y_i = 5) = 1 - \varnothing(\delta_3 - x_i\beta), \end{array} \tag{4}$$

where $\varnothing(.)$ is the standard normal cumulative distribution function. Following [52] and [10], we used the log-likelihood function of the Probit model as follows:

$$\log L = \sum_{i=1}^{n} \sum_{j=1}^{5} log\{I_i^j Prob(y_i = J)\} \tag{5}$$

where $I_i^j = 1(y_i = J)$ for $J = 1, 2, 3, 4, 5$.

From Equation (2), we specify the empirical model as follows:

$$\begin{array}{c} WTA = \beta_0 + \beta_1 Age + \beta_2 gender + \beta_3 education + \beta_4 employment + \beta_5 income + \beta_6 utility \\ +\beta_7 electricity + \beta_8 knowledge + \beta_9 residence + \beta_{10} geography + \mu_1 \end{array} \tag{6}$$

5. Results and Discussion

The results and discussions of the survey are presented in this section; the implication of the study on the country's RE development is also covered in this section.

5.1. Descriptive Statistics

As discussed above, to achieve the study's objectives, we first interviewed respondents about their social acceptance (WTA) of renewable energy in Ghana. The five-point Likert scale was used to achieve this aim, and the result is presented in Figure 2. From the result, it is observed that there is a general sense of acceptance of renewable energy among Ghanaians. However, the level of acceptance varies from one respondent to the other. The study observed that the majority of the respondents (45.65%) agree to their WTA renewable energy, while 36.04% strongly agree. The result showed that while 6.21% and 0.3% disagree and strongly disagree, respectively, 11.81% of the respondents were indifferent regarding their willingness to accept renewable energy development and utilization in Ghana. The differences in respondents' WTA the development and utilization of renewable energy in Ghana could be affected by several factors that are socioeconomic or demographic. The study further explored the factors that are likely to influence respondents WTA, and details of the variables are presented in Table 1.

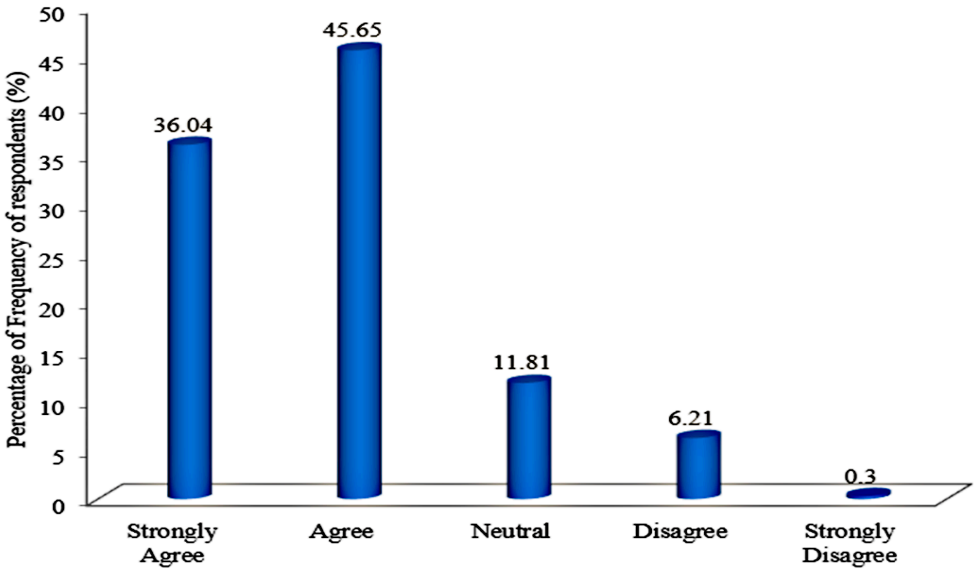

Figure 2. Frequency of respondent's level of willingness to accept.

5.2. Econometrics Results and Its Implication for RE Development

To assess the factors that influence respondents WTA renewable energy development and utilization in Ghana, we employed the ordered logit regression model. Table 2 shows the marginal effect estimates of the ordered logit regression model. The independent variables' coefficients were identified not to be jointly equal to zero; this is demonstrated through the probability value for the Chi-square test of 0.000. At p values of 0.000 or less, the Chi-squared tests of the equality of the two cutoff points are rejected. The significant variances in the cut-off points suggest that the five categories are statistically and significantly different. Hence, it justifies the inclusion of all five categories in the model. The pseudo R^2 of 0.165 implies that all the variables jointly contribute to explaining 17% of the variation in WTA levels among respondents.

From the model, seven out of the ten independent variables used in the study were statistically significant. Out of the seven significant independent variables, three have a negative sign while four have a positive sign. The estimated coefficients for age, electricity, and geography all have negative signs and are statically significant at a 1% level of significance. The study further revealed that gender, education, employment, and knowledge about renewable energy development and utilization positively influence respondents WTA.

Table 2. Marginal Effects of the ordered logit model and the individual stages of willingness to accept.

	Strongly Agree		**Agree**		**Neutral**		**Disagree**		**Strongly Disagree**	
Variables	**Marg. Eff.**	**Std. Err.**	**Marg. Eff.**	**Std. Err.**	**Marg. Eff.**	**Std. Err.**	**Marg. Eff.**	**Std. Err.**	**Marg. Eff.**	**Std. Err.**
Age	−0.013 [a]	0.002	0.007 [a]	0.001	0.005 [a]	0.001	0.002 [a]	0.0004	0.0001	0.00004
Gender	0.120 [a]	0.028	−0.060 [a]	0.015	−0.045 [a]	0.011	−0.015 [a]	0.004	−0.001	0.0004
Education	0.093 [a]	0.010	−0.047 [a]	0.007	−0.034 [a]	0.005	−0.011 [a]	0.002	−0.0005 [c]	0.00027
Employment	0.284 [a]	0.033	−0.044 [c]	0.024	−0.168 [a]	0.033	−0.069 [a]	0.017	−0.003	0.002
Income	0.00004	0.000	0.0001	0.000	0.0001	0.000	0.0004	0.000	0.000	0.000
Utility	−0.001	0.000	0.0003	0.000	0.0002	0.000	0.0007	0.0001	0.000	0.000
Electricity	−0.628 [a]	0.038	0.483 [a]	0.037	0.111 [a]	0.011	0.033 [a]	0.005	0.001 [c]	0.001
knowledge	0.020 [a]	0.032	−0.037 [b]	0.018	−0.123 [a]	0.030	−0.048 [a]	0.014	−0.002	0.001
Residence	0.032	0.032	−0.010	0.016	−0.007	0.012	−0.002	0.004	0.000	0.0002
Geography	−0.122 [a]	0.030	0.063 [a]	0.017	0.044 [a]	0.011	0.014 [a]	0.004	0.001	0.0004

Note: Number of observations = 999; log-likelihood = −974.29664; pseudo R2 = 0.165; LR Ch2 = 385.16; prob > chi2 = 0.000; a to c represent 1%, 5%, and 10% significant levels, respectively.

5.2.1. Age

From Table 2, the negative sign of the coefficient for age shows that an increase in age will result in a decrease in a respondents' willingness to accept (Strongly agree) while decreasing their low level of acceptance (Strongly disagree). The marginal effect values show that an increase in a respondent's age by 1 year reduces his/her high level of acceptance (strongly agree) by 0.013 and increases his/her low level of acceptance by 0.0001. This result confirms the results of [5,53], who argued that respondents' age negatively correlates with their acceptance of RE. This indicates that while older people are more risk-averse, especially if they are attached to what they accept as a norm, younger people are more inclined to take risks and tend to accept and adopt new technologies. Due to the higher initial capital cost associated with RE and the lengthy investment payback period [54], the elderly who are either close to retirement or retired tend to show little interest relative to investments in that sector [55].

5.2.2. Electricity

Whether or not a respondent is connected to the national grid (electricity) measured as a dummy negatively influences respondents' willingness to accept (strongly accept) and positively influences their low level of acceptance (strongly disagree). The values of the estimated coefficient for electricity imply that a respondent who is not connected to the national electricity grid will most likely decrease his high level of acceptance by 0.638 and increase his low level of acceptance by 0.001. Normally, this should not be the case for a respondent without access to electricity. Still, this response can be attributed to the perception held by some that RE is expensive to construct. As a result, the respondents are of the view that the use of RE will require a high level of effort, hence the negative effect of their willingness towards RETs. A possible reason for these results is that most people without electricity access are normally in rural areas where knowledge and skill about RE are typically non-existent, as collaborated by [56]. Such people would most likely prefer electricity from the traditional national grid.

5.2.3. Geography

Contrary to our expectation, respondents who live in the northern sector of Ghana are more likely to increase their low level of acceptance (strongly disagree) by 0.001 units at the expense of a decrease in their high level of acceptance (strongly agree) by 0.122 units.

Given that the northern sector of Ghana has an abundance of renewable energy sources such as high sunshine intensity and the fact that most communities are not connected to the national grid, it was expected that their willingness to accept would be higher than their counterparts from the southern sector. According to the respondents, inhabitants of the northern sector are generally poor; hence the high initial cost associated with RETs makes it virtually impossible to invest in RE as individuals. However, it is their view that the government should lead such a cause, and they are willing to accept its use relative to its development. Until then, they prefer to get their source of energy from the traditional national grid system, which is relatively cheaper due to government subsidies.

5.2.4. Gender

Gender was identified as one of the critical determinants of respondents' choice of acceptance of renewable energy development and utilization in Ghana. The estimated coefficient shows that a male is about 0.12 times more likely to accept renewable energy development and utilization and 0.001 times less likely to have a low WTA. This result resonates with our prior expectation as men are more financially capable of adopting and accepting technological changes and improvement. This result confirms a similar study conducted in Kenya, also on the African continent, by [13], who indicated that the female population is less likely to accept the development of wind and geothermal energies. However, [57], who also focused on green consumerism, found out that women are more concerned about issues relating to the environment and, as a result, will want to push for a cleaner source of energy generation. However, this study's findings show otherwise and thus presents another research opportunity to investigate factors that influence this position, especially in the African context.

5.2.5. Education

The level of education indicates a respondents' level of knowledge and awareness of renewable sources, utilization, and their influence on the environment, consistent with earlier studies such as [58–60]. This, therefore, makes education an important factor in determining respondents' willingness to accept. The findings revealed that people who have a high level of education (i.e., spend more years in school) are more likely to increase their high acceptance level by 0.093 and decrease their low level of acceptance by 0.0005. Holding all else constant, higher levels of education could relate to an in-depth understanding of the benefits of renewable energy sources and how these could help solve some of the negative ramifications of non-renewable energy sources on the environment. As reported by [61,62], educated people support pro-environmental policies and actions and are more willing to pay for or accept renewable energy technologies compared to their uneducated counterparts. It is also consistent with previous studies such as [53,63,64], who posited that an individual's educational level has a significant effect on one's readiness to accept the use of RE.

5.2.6. Employment

Employment status is another factor with a high likelihood of influencing respondents' willingness to accept the decision. The findings show that employed respondents are more likely to accept renewable energy development and utilization than their unemployed counterparts. More specifically, employment increases a respondent's high level of acceptance by 0.283 units and decreases their low level of acceptance by 0.003 units. According to [65], people who are employed would most likely be aware of microgeneration. This result is also in tandem with that of [11], who found out that a person's status relative to renewable energy implementation affects one's readiness to invest in RETs.

5.2.7. Income

Income also significantly affected a respondent's willingness to accept RE; people with relatively higher income are more inclined to accept and adopt RETs than those on the opposite side. This indicates that the perceived high initial cost of RE power plants relative to their installation and maintenance negatively affects the intention to adopt them. Studies such as [19,66] confirm this finding; according to them, households' income indeed plays a determining factor in a family's energy expenditure (i.e., acceptance to pay more).

5.2.8. Knowledgeability

From Table 2, it can also be seen that while knowledgeability about renewable energy increases the high level of acceptance by 0.21, it decreases the likelihood of a low level of acceptance by 0.002. This result meets our prior expectation that knowledge about renewable energy enables respondents to understand and appreciate that the benefits of using renewable energy outweigh the negatives. This suggests that any country that intends to integrate RE energy at large-scale or residential levels will have to increase its level of education about RE energy among the populace. During the survey, one key issue that respondents highlighted was the lack of knowledge about RE. This means that the current structure of Ghana's educational curriculum needs restructuring. Depending on the course that one chooses after secondary education, one may never learn anything about RE at the tertiary level. For this reason, refs. [67,68] recommends the teaching of RE at all levels, starting from the basic school level; this will help realize a more expansive awareness about RETs.

5.3. The Implications for Ghana's RE Sector

The survey results indicate that the 2030 vision of 10% RE in Ghana's energy generation mix can be met—at least based on respondents' level and willingness to accept. The majority of the interviewees either agree or strongly agree to the development of RE. However, some issues for which others have dissenting views must also be looked at and possibly provide solutions. From our engagements with some of the respondents, one major challenge in the country's energy sector, which also can impede its quest to go green, is the poor grid network available in the electricity generation system. This is also confirmed by studies such as [33,69]. According to statistics from [43], transmission losses increased from 2.8% (229 GWh) in 2000 to 4.7% (844 GWh) in 2019, partly because of obsolete equipment in the sector. To effectively manage and promote RE's development, the government of Ghana is requested to invest in the energy sector to repair and replace obsolete systems to minimize grid losses. Doing this can increase the public interest relative to RE investments and development, especially for those interested in investing in the sector.

Education has also been identified as key to one's WTA in developing RE, which is crucial, particularly in a developing country such as Ghana. The government is thus entreated to bolster its strategies for education and disseminate information about RE. This can be achieved by introducing the RE studies to the primary school level (i.e., the teaching content can be in a way they understand considering infographics, storytelling, etc.). On the other side, the older and people with less education on the various clean energy technologies could also be reached through targeted advertisements in traditional media and social media to increase such people's knowledge relative to RETs. Intermediary organizations can also be established to disseminate information and transfer knowledge in the various districts, regions, and at the national level.

To build on the acceptance rate of the various communities relative to RE development, a comprehensive policy targeted towards the RE sector is key. Such policies should be able to make RETs cheaper and easier to access. Political support will also be key for the acceptance of RE in the various communities [70].

Finally, it is also essential to include the public in policy formulation, especially for technologies such as RETs that require the general populace's support to succeed. According to [13], the usual top-down approach relative to policy formulation and implementation should be discouraged. It thus suggests that governments around the African continent who are pushing for a strong inclusion of RE in their electricity generation mix must factor the views of their citizens in policy formulation. For this reason, studies such as this must be encouraged to help collect, analyze, and interpret the views of society to arrive at a robust policy for the sector. Such an approach will safeguard the social, environmental, and economic interests of the various countries on the continent [13].

6. Conclusions

With the advent of an increasing rate of the adverse ramification of climate change and unsustainable development on the natural environment, governments and policymakers have set national and global targets to find sustainable ways of improving the environment while achieving sustainable economic development. As part of its effort to pursue sustainable development in all sectors of the economy, Ghana has a national agenda in place to achieve a 10% increase in RE energy by 2030. However, the attainment of this goal is partly dependent on RE's public social acceptance by the citizenry. Therefore, this study attempted to investigate the public social acceptance of RE (WTA) and the possible factors that affect their decision using the ordered logit regression model.

The study's findings show a 75.18%-point gap between respondents who are willing to accept RE and those opposed to it. This massive point gap points to the fact that more people are willing to support RE as long as the Ghana agenda is intensified. Indeed, even if all the neutrals were to decrease their willingness to accept (Strongly disagree), the difference will still be significant. This signals a substantial potential for RE development and utilization for Ghana.

The study's findings also revealed that whereas the age of respondents, electricity, and geography negatively influenced WTA RE, gender, education, employment status, and knowledge about RE all had a positive relationship with RE. This implies that older respondents who are not connected to the national electricity grid and are residents in the northern sector of Ghana will most likely reject the idea of RE compared to their younger counterparts. On the contrary, male respondents, who are well-educated and employed and have knowledge about RE, are more likely to accept RE than their female counterparts.

Governments can use findings in this study, stakeholders, and investors during decision-making to develop RE in Ghana and other African countries with similar conditions like Ghana. Despite our study's comprehensive nature, some areas were not considered and needed to be highlighted briefly. According to [71], the political environment in a particular country can affect its energy strategy. Countries with high energy generation from conventional sources either than RE, such as what currently exists in Ghana and most other African countries, have the propensity to pay less attention to RE debate, especially in the political domain. This can possibly affect the perception of the general public and their ability to accept its use. This was, however, not considered in this study; future studies may have to consider the political element in one's readiness to accept RE. Furthermore, whereas some studies indicate that women are more concerned about issues relating to the environment and, as a result, will want to push for a cleaner source of energy generation, findings in this study show otherwise, and thus presents another research opportunity in the future to investigate factors that influence this position, especially in the African context. It is also essential to conduct a study on those citizens who opposed the development of RE to know factors that can increase their acceptance level; this was not comprehensively assessed in this paper. It is also recommended as part of future studies to conduct a survey that looks at the social acceptance of specific renewable energy technologies among the populace.

Author Contributions: Conceptualization, E.B.A. (Ephraim Bonah Agyekum), E.B.A. (Ernest Baba Ali), and N.M.K.; methodology, E.B.A. (Ephraim Bonah Agyekum) and E.B.A. (Ernest Baba Ali); software, E.B.A. (Ernest Baba Ali); validation, E.B.A. (Ephraim Bonah Agyekum) and E.B.A. (Ernest Baba Ali); formal analysis, E.B.A. (Ephraim Bonah Agyekum) and E.B.A. (Ernest Baba Ali); investigation E.B.A. (Ephraim Bonah Agyekum) and E.B.A. (Ernest Baba Ali); data curation, E.B.A. (Ephraim Bonah Agyekum) and E.B.A. (Ernest Baba Ali); supervision, N.M.K.; project administration, N.M.K.; writing—original draft preparation, E.B.A. (Ephraim Bonah Agyekum) and E.B.A. (Ernest Baba Ali); writing—review and editing, N.M.K., and E.B.A. (Ephraim Bonah Agyekum) and E.B.A. (Ernest

Baba Ali); visualization, E.B.A. (Ephraim Bonah Agyekum) and E.B.A. (Ernest Baba Ali). All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Acknowledgments: The authors would like to acknowledge Ural Federal University named after the first President of Russia Boris Yeltsin for the valued financial support for this study. We also thank all the survey enumerators and respondents who spent their precious time to collate the results to help us realize our objectives.

Conflicts of Interest: The authors declare no conflict of interest.

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