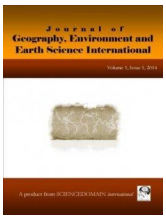

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The Socioeconomic/Demographic Determinants of Public Perception about Climate Change in Ekiti State of Nigeria

Biola K. Badmos[1*], Henry O. Sawyerr[2], Samson O. Awopeju[3], Gabriel A. Salako[1], Abdulrasheed A. Adio[4] and Atinuke R. Oyewumi[5]

[1]Department of Environmental Management and Toxicology, Kwara State University, Malete, Nigeria.
[2]Department of Environmental Health Sciences, Kwara State University, Malete, Nigeria.
[3]United Nations Convention to Combat Desertification, Bonn, Germany.
[4]Department of Plant and Environmental Biology, Kwara State University, Malete, Nigeria.
[5]Centre for Ecological and Environmental Research Management Studies, Kwara State University, Malete, Nigeria.

Authors' contributions

This work was carried out in collaboration between all authors. Authors BKB and HOS conceived the idea. Authors BKB and ARO designed the field work. Authors BKB, SOA, GAS, AAA and ARO managed the literature search. Authors BKB, HOS, SOA and ARO performed the statistical analysis. All authors wrote the first draft of the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Perception influences the manner people address the risks and opportunities associated with climate change and this in turn influences the manner people respond to the impact(s). Based on questionnaire data collected from 197 respondents, this paper examined public perception about climate change and the socioeconomic/demographic factors influencing their perception in Moba Local Government Area of Ekiti State, Nigeria. To establish these factors, socioeconomic/ demographic variables (sex, age, marital status, educational level and occupation) were regressed on the climate change perception of the people using a binary logistic regression approach.

**Corresponding author: E-mail: biolakz@yahoo.com;*

Education level (P = 0.000) and occupation ($p = 0.079$) significantly influenced peoples' perception about climate change in the study area. The result indicates that there is higher likelihood to understand and improve perception about climate change as educational level increases. Also, as one gets involved in climate sensitive occupation, there is higher likelihood to understand and improve perception about climate change. This study suggests expanding access to climate change education can enhance peoples' understanding about climate change and their ability to relate to consequences of climate change impacts which may influence the willingness and capacity to adopt and implement adaptive measures to climate change. Further, continuous public sensitization about climate change will ensure the knowledge about climate change is not limited to only those who are impacted directly.

Keywords: Climate change; socioeconomic/demographic determinants; perception; climate change response.

1. INTRODUCTION

Climate change discussion has been on for some time now. The principal goal of the discussion is on how to minimize climate change and its impacts. The two responses to climate change are – mitigation and adaptation. Mitigation refers to limiting global climate change through reducing the emissions of greenhouse gases (GHGs) and enhancing their sinks. Adaptation primarily aims at moderating the adverse effects of unavoidable climate change through a wide range of actions that are targeted at the vulnerable system [1]. Perception of climate change affects how people react to it. As the climate change discussion/debate progresses, the focus is expected to be more on research and policies that can make significant impact in addressing the challenges of climate change. Among these, are studies aimed at understanding the factors that can enhance people's perception, knowledge and awareness about climate change.

Humans explore and observe their environment and act in line with what they see [2]. Perception describes the organisation, identification and interpretation of sensory information in order to represent and understand the environment [3,4]. Perception enables humans to generate experience of the environment and to act within the same environment [5]. Claudia Juech of the Rockefeller Foundation quoted that *"Before we can solve a problem, we need to know exactly what the problem is, and we should put a good amount of thinking and resources into understanding it"*. In the context of climate change, perception strongly affects how people deal with climate-induced risks and opportunities, and the precise nature of their behavioural responses to this perception will shape adaptation options, the process involved and adaptation outcomes [6,7]. Climate change perception is essential for the adoption of adaptation strategies [8], and it also helps in guiding policy responses on adaptation [9], thus allowing people to adapt appropriately [10]. Misconception about climate change and its associated risk may result in no adaptation or maladaptation thus increasing the negative impact of climate change [11]. Increasing knowledge about climate change may change their views on how they might cope with the effects of climate change. As pointed out in [12], understanding, planning and adapting to a changing climate, individuals and societies can take advantage of opportunities and reduce risks. Solving the challenges posed by the changing climate demands that majority of people across different groups, socio-economic classes are aware of its impact. Perception on climate change and its implication is a first step before adaptation [13]. Perception affects peoples' concern on climate change. People who are concerned about the environment and climate change are likely to engage in actions or effect behavioral changes that foster and support political decisions that safeguard the environment. If people are better able to relate to the potential consequences of climate change impacts, they may also be more likely to feel that their behaviour can lead to changes in these impacts [14]. An understanding of the causes and impacts of climate change and a willingness to adjust behaviors are crucial for effectively adapting to and mitigating climate change. Such actions are based upon the recognition that climate change is happening and action is necessary [15]. As noted in [14], one of the reasons that people may not take action to mitigate climate change is that they lack first-hand experience of its likely impacts.

It is a well-known fact that humans form their perceptions based on values, beliefs and knowledge, socio-economic/demographic factors

(e.g. age, level of education, occupation type, gender, information, and local environment) can influence how people perceive and interpret climate change and respond to its realities. Understanding how socio-economic/ demographic factors affect climate change perception can help to analyze people's behavior, decision-making, their willingness and capacity to adopt and implement adaptive measures to climate change. It will also help policy makers in their design of comprehensive climate change adaptation policy frameworks. Furthermore, the impact of climate change is not limited to certain groups, but the general public. As a result of the direct and noticeable impact of climate change on the agricultural sector, many climate change perception related studies have focused more on farmers. However, bringing the view of larger public from various groups could improve understanding on climate perception. This paper therefore has the following objectives, to: (i) explored the public perception and knowledge about climate change, and (ii) examined the factors influencing people's perception about climate change.

2. MATERIALS AND METHODS

2.1 Study Area

This study was conducted in Moba Local Government Area (LGA) of Ekiti State, Nigeria (Fig. 1). Ekiti state is in the South-west Geo-political zone of Nigeria. It shares boundary with Kogi, Kwara, Ondo, and Osun states in Nigeria. According to the 2006 population census of Nigeria [16], the state was reported to cover a total land area of about 5,887.89 km^2, 16 LGA and a population of about 2,398,957. The state lies within the equatorial climatic belt characterized by alternating tropical wet and dry seasons and classified as Koppen's Aw climatic type [17]. According to [18], the state benefits from the double maxima of rainfalls, the rainy seasons usually commence from April and last to October while the dry seasons resume from late October/November and last to March with temperature variations of between 21^{o}c and 28^{o}c. The southern part of the state is covered by typical tropical rainforest while the guinea savanna forests are found towards the northern parts of the state. Agriculture is the predominant occupation of the people in Ekiti State, and their major produce includes cocoa, kola nut, orange, oil palm, maize, rice, cassava, yam and sweet potato. People also engage in trading and manufacturing of goods [19]. Moba LGA is located in the northern part of the state. According to the 2006 population census of Nigeria [16], Moba LGA covered a total land area of about 202.801 km^2 with a population of about 145,408.

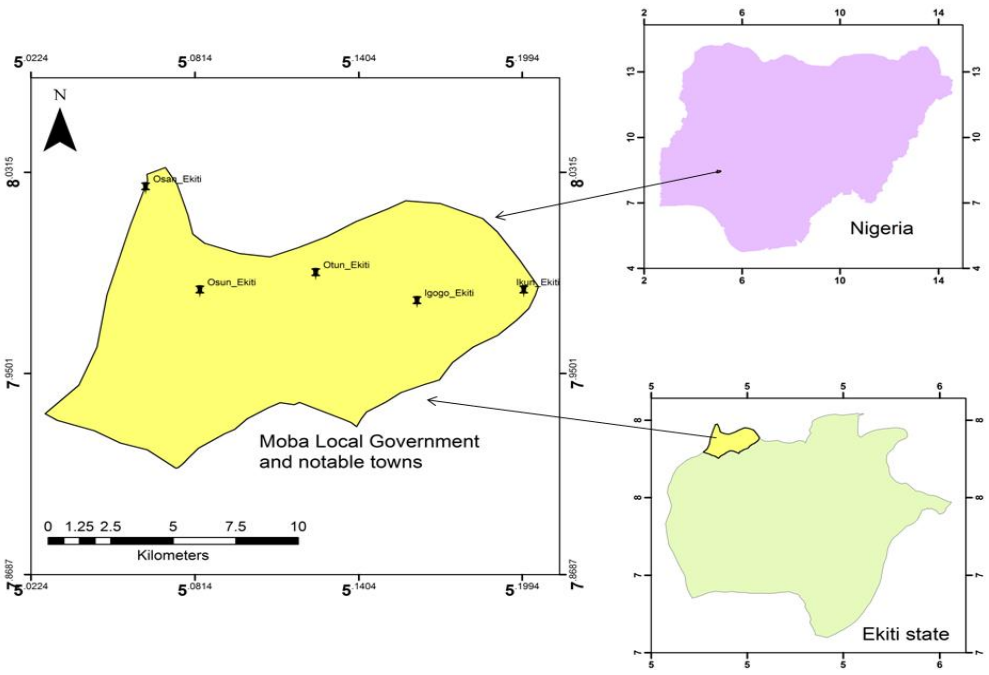

Fig. 1. Map of the study area

2.2 Data Collection and Analysis

Data for this study was collected by means of a semi-structured questionnaire. Using the sample formula in [20], the expected number of respondents was 383. However, due to resource constraints, a total of 200 questionnaires were distributed proportionately and randomly to the 13 communities in Moba LGA [http://ekitistate.gov.ng], and 197 responses were retrieved. The data collected from the respondents were socioeconomic/ demographic, and data on their perception/knowledge about climate change. The quantitative data were analyzed in IBM-SPSS statistics software, version 20. The statistical techniques used include descriptive statistic and binary logistic regression. The descriptive statistic was used to analyse respondents' perception/knowledge about climate. Binary logistic regression (Bi-logit) was used to determine the factors influencing respondents' perception about climate change. We selected Bilogit model because our observation falls into two categories i.e. weak perception and good perception). In the course of data collection, considerations on ethic, consent, culture, confidentiality and reassurances to the respondents were ensured. For instance, the participants were accorded the due respect so as to ensure co-operation. The information collected was treated with utmost confidentiality. Also, the cultures of each community were respected during the course of the field work.

2.3 Bi-logit Model Specification

The Bilogit model is shown in equation 1. We adapted the aggregated perception approach used in [21]. The choices of explanatory variables used in this study were based on data availability and literature reviewed. Aggregated climate change perception implies the summation of the answers of the respondents to climate change perception/knowledge related questions. From the climate change perception/knowledge related questions presented to respondents, the response to five questions were selected based on expert judgment, and the questions were used to develop an aggregated perception. The questions include: (i) perception on change in weather pattern, (ii) sources of information about climate, (iii) personal opinion on the importance of climate change issues, (iv) knowledge on drivers of climate change, (v) knowledge on whether one is aware of a role to play in addressing climate change issues. Each perception/knowledge related question was reclassified to two classes "0 = weak perception; 1 = good perception" (see Table 1 for description). To determine the main factor(s) that determined respondent's perception about climate change in the study area, we created two perception scales "3 – perception scale and 4 – perception scale". The former implies that respondents that have good perception in three or more questions (3 – perception scale) are classified to have good aggregated perception, while respondent with good perception in less than three questions is described to have weak aggregated perception. In the later, respondents that have good perception in four or more questions (4 – perception scale) are classified to have good aggregated perception, while respondent with good perception in less than four questions are described to have weak aggregated perception. The socioeconomic/demographic characteristics of the respondents were regressed on their aggregated climate perception at the two perception scales "3 – perception scale" and "4 – perception scale". The explanatory (independent) variables in the Bi-logit model are the socio-economic/demographic variables - sex, age, marital status, education and occupation, while the dependent variable in the Bi-logit model is the aggregated climate change perception.

$$Ln\left(\frac{Px}{1-Px}\right) = \beta_0 + \beta_{1}X_{1i} + \beta_{2}X_{2i} + \ldots + \beta_{k}X_{ki} \quad (1)$$

Where,

i denotes the i-th observation in the sample, P*x* is the predicted probability of respondents' having good perception, 1 - P*x* is the predicted probability of respondents' having weak perception. $ß_0$ is the intercept term, and $ß_1$, $ß_2$... $ß_k$ are the coefficients associated with each explanatory variables X_1, X_2,...X_k.

3. RESULTS AND DISCUSSION

3.1 Socioeconomic/ Demographic Characteristics of the Respondents

The socioeconomic/demographic distribution of the respondents is shown in Table 2. About 47.2% of the respondents were females, while 52.8% were males. Majority of the respondents (86.8%) fall in the age range of 20 – 50 years, while 13.2% fall in the age category of above 50 years. Majority of the respondents (84.8%) have received formal education. Farming and civil servant jobs are the most dominant occupation amongst the respondents.

Table 1. Description of variable reclassification into two scales "0 = weak perception; 1 = good perception"

Selected question	Description
Perception on change in weather pattern	This describes the awareness of respondents as regards whether they have observed any significant change in the weather pattern in the recent time. Respondents that answered "yes" to this question were classified to have good perception, while respondents that answered "no" or "not sure" were classified to have weak perception.
Sources of information	People may receive climate change information from various sources, while some may have not received the information. For those that have received the information, it may be from a single source and for others from more than one source (multiple sources). Respondents that have received information about climate change from multiple sources were classified to have good perception, while those that received information from a single source and those that have not received information were classified to have weak perception.
Personal opinion on the importance of climate change issue	Depending on how one is impacted by climate change, one may see it as an important issue or not. Those that have seen it as an important issue were classified to have good perception, while those that that have not considered climate change as an important issue were classified to have weak perception.
Knowledge on drivers of climate change	Knowledge on the drivers of climate change implies how well the respondents know the factors contributing to climate change. Respondents that have "good" and "very good" knowledge on the drivers of climate change were categorised to have good perception, while those with fair/weak knowledge on the drivers of climate change were categorised to have weak perception.
Knowledge on whether one is aware of role to play in addressing climate change issue	Climate change is serious challenge facing humanity and the environment. Everyone has one or more roles to play in addressing climate change issue. Knowing well that one has role(s) to play in addressing climate change issue could be an indication of good perception. Hence, respondents that indicate that they can play a part in addressing climate change issue are categorised to have better perception. On the other hand, those that did not indicate that they can play a role in addressing climate change issue, as well as those who were not sure of the role were categorised to have weak perception.

3.2 Perception about Climate Change

The perception and knowledge of respondents about climate change is presented in Table 3. Most of the surveyed respondents (92.4%) have noticed change in the weather pattern and (91.9%) have received information about climate change. Information about climate change was received from various sources. For instance, majority of the respondents (47%) received information about climate change from a single source. Nearly 80% saw climate change as an issue that requires immediate attention. However, from the standpoint of personal importance attached to climate change 50.3%, 21.3% and 28.4% described the climate change issue as very important, quite important and not important

respectively. Most of the respondents show good/very good knowledge (66%), while a considerable number (20.3%) possess weak knowledge on the factors contributing to climate change. In terms of solution to climate change, the majority of the respondents (71.6%) believed climate change issue can be addressed. From the stand point of personal contribution in reducing climate change, lesser number (43.7%) believed they can play a role in addressing the climate change issue. The reclassified perception of the respondents based on two classes (0 = weak perception; 1 = good perception) is shown in Fig. 2.

Table 2. Socioeconomic/Demographic distribution of the respondents before

Variables	Level	% respondent
Sex	Female	47.2
	Male	52.8
Age	20 - 30 years	28.9
	31 - 40 years	33.0
	41 - 50 years	24.9
	> 50 years	13.2
Marital status	Single	34.5
	Married	65.5
Educational level	None	15.2
	Primary	9.1
	Secondary	14.7
	Tertiary	60.9
Occupation	Farming	23.9
	Civil servant	23.9
	Artisan	10.7
	Student	17.8
	Trading	9.6
	Others	14.2

Table 3. Respondents' perception and knowledge about climate change

Variable	Response	Frequency (%)
Have you noticed any change in the weather pattern?	No	6.1
	Yes	92.4
	Don't know	1.5
Have you received information about climate change?	No	8.1
	Yes	91.9
What are the sources of information about climate change?	Single source	47.0
	Few sources	24.3
	Several sources	28.7
Climate change is an issue that needs immediate attention?	No	19.3
	Yes	79.7
	Don't know	1.0
What importance is climate change issue to you?	Not important	28.4
	Quite important	21.3
	Very important	50.3
Knowledge on drivers of climate change	Weak	20.3
	Fair	13.7
	Good	30.5
	Very Good	35.5
Climate change issue can be addressed?	No	21.8
	Yes	71.6
	Don't know	6.6
Can you play a part in addressing climate change issue?	No	49.7
	Yes	43.7
	Don't know	6.6

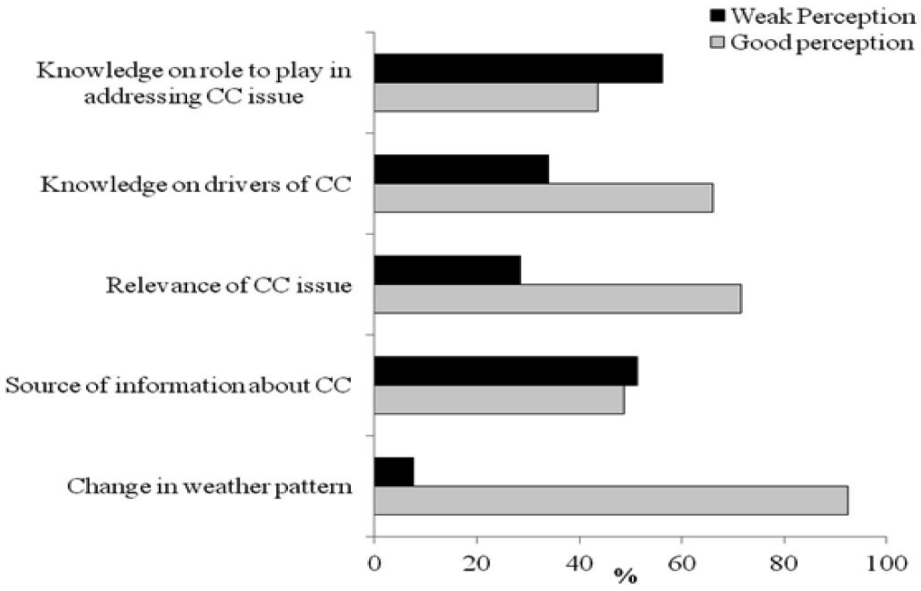

Fig. 2. Reclassified perception of respondents about climate change (CC) based on two levels (Weak or Good)

Climate change is a serious challenge facing humans and the environment. The impact of climate change knows no boundary and it cuts across various sectors of human endeavor. The impact does not distinguish between social, economic and demographic classes. What could make a distinction between classes is their preparedness and response to the impact. An important factor that can stimulate people's preparedness and response to climate change is the way it is perceived. Climate change perception forms a key part in the two stage adaptation process. First, perception that climate is changing, secondly, responding to changes through adaptation [8,13,22]. Climate change is reshaping the way we think about ourselves, our societies, relationships between sociopolitical and biophysical systems, and humanity's place on Earth [23]. The perception about climate change is not just the awareness that the weather pattern has changed, but also having detailed information about the drivers, impacts and appropriate responses. Adequate knowledge about the drivers and the impacts of climate change would enable efficient response. From this study the majority of the respondents (92.4%) have noticed change in the weather pattern. Similarly, majority (91.9%) have received information about climate change. However, from those that have received information about climate change, larger majority (47%) obtained their information from a single, while others obtained their information from few sources (24.3%) and several sources (28.7%). The indication therefore is to widen climate change information access through the use of multiple methods.

Large number of the respondents (79.7%) perceived climate change to be an issue that requires immediate attention and only small proportion (43.7%) believed they can play a role in addressing climate change issue. People not having sufficient knowledge on the role(s) they can play in addressing climate change issue may be described as having incomplete awareness. It is therefore essential to inform people and make see a variety of roles they can play in addressing climate change.

3.3 Socioeconomic/ Demographic Determinant of Perception about Climate Change

The output of the binary logistic regression that determined the socioeconomic/demographic determinant of respondents' perception about climate change is presented in Tables 4 and 5. Table 4 shows the regression output when a "3 – scale perception" was used as the dependent variables while Table 5 shows the regression output when a "4 – scale perception" was used as the dependent variables. The Chi-square tests show that the empirical Bi-logit regression is significant in both perception scales. This indicates the Bi-logit model fits significantly better

than an empty model. In the "3 – scale perception", education level (p = 0.000) and occupation (p = 0.079) were the significant factors that influenced respondents' perception about climate change. However, in the case of the "4 – scale perception", only education level (p = 0.001) was significant in explaining peoples' perception about climate change.

This study found out that as educational level increases, there is higher likelihood to have better perception about climate change. This finding agrees with a baseline survey among vulnerable communities in Bangladesh, where education shows a significant association with climate change knowledge [10]. In Kyuso district of the Eastern Province of Kenya, it was established that the probability of more educated farmers to perceive climate change was higher than that of less educated farmers because higher education was likely to expose farmers to more information on climate change [24]. Education affects climate change belief and can predict what and how people think about climate change. Generally people with higher years of education tend to have access to more sources and types of information. Level of education can influence public opinion of climate change as people with higher levels of education are more likely to understand complex climate change issues than their less-educated counterparts [25, 26]. Employing data collected on public opinion on climate change from 119 countries, it was observed that education level was a significant determinant of climate change risk perceptions in 62% of countries around the world and educational attainment is the single strongest predictor of climate change awareness [25].

Table 4. Binary logit regression estimation of socioeconomic/demographic factors influencing peoples' perception about climate change using 3-scale perception

Explanatory variables	Coefficient	Wald	Sig.	Odds ratio
Sex	0.062	0.032	0.857	1.064
Age		2.521	0.471	
Age (1)	-0.375	0.424	0.515	.687
Age (2)	0.404	0.287	0.592	1.499
Age (3)	0.296	0.125	0.724	1.344
Marital status	0.018	0.001	0.975	1.019
Education level		23.676	0.000***	
Education level (1)	2.563	11.660	0.001	12.969
Education level (2)	2.936	17.005	0.000	18.839
Education level (3)	2.827	20.227	0.000	16.899
Occupation	0.985	3.077	0.079*	2.679

Statistics: chi-square statistics = 36.134; df = 9; p = 0.000
Overall percentage prediction: 72.6%
****, ** and * indicate the significance level of 1, 5 and 10% respectively*

Table 5. Binary logit regression estimation of socioeconomic/demographic factors influencing peoples' perception about climate change using 4-scale perception

Explanatory variables	Coefficient	Wald	Sig.	Odds ratio
Sex	0.453	1.865	0.172	1.572
Age		4.259	0.235	
Age (1)	-0.598	1.142	0.285	0.550
Age (2)	-0.005	0.000	0.994	0.995
Age (3)	0.529	0.429	0.512	1.697
Marital status	0.477	0.694	0.405	1.611
Education level		16.967	0.001***	
Education level (1)	-0.051	0.004	0.950	0.950
Education level (2)	1.090	2.807	0.094	2.973
Education level (3)	2.147	12.516	0.000	8.560
Occupation	-0.026	0.003	0.960	0.975

Statistics: chi-square statistics = 26.587; df = 9; p = 0.002
Overall percentage prediction: 63.5%
****, ** and * indicate the significance level of 1, 5 and 10% respectively*

It is very understandable why many climate change perception studies were directed to farmers, due to the climate sensitivity of their occupation and the contribution of the sector to national food security. There is general scientific consensus that the rapid rise in anthropogenic greenhouse gas emission over the past two centuries, particularly since 1950 has been a key contributor to the global warming that has occurred [27]. We all have a role to play in this climate change era. Hence, concentrating climate change research/study on a selected few and ignoring the other member of the public might not allow us to fight the battle of climate change completely. This study was able to establish the importance of public perception in climate change study. From this study, we can infer that, the more climate sensitive occupation one is involved, the higher the likelihood to also have better perception about climate change. In the context of this study, those that are employed in farming activity were described to be involved in climate sensitive occupation. The higher likelihood of farmers perceiving climate change could be linked to the fact they are directly involved in climate sensitive activity, i.e. farming. Even though, this study did not explore climate change information dissemination via extension officers, better perception about climate change have been attributed to access to information from extension officers [21,24].

4. CONCLUSION

Based on data collected through questionnaire survey, we assessed public perception about climate change and we identified the socioeconomic/demographic determinant of the public perception about climate change using Bi-logit model. Education level and involvement in climate sensitive occupation (farming) were the significant determinants of public perception to climate change in the study area, with education being the most significant. This research has further established the potential of education in the climate change sensitization of the public. Expanding access to education can be a useful tool that policy makers can use to expand climate change understanding of the public. Aside conventional/traditional education systems that can expand people's access to climate change information, the incorporation of climate change into the education curriculum would contribute to addressing the current climate change challenge. Further, continuous community sensitization on the climate change issue will ensure that not only the people who are engaged in climate sensitive jobs are aware of climate change but the overall public too. It is therefore recommended that integrated approach to climate change adaptation be implemented including strengthening extension service, integration of traditional techniques with modern strategies and supporting of role model farmers with agronomic inputs that are subsidized and/or cost-free! Factors undermining adaptation should be addressed, while those that promote adaptation be enhanced further in the study area.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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