PUBLIC AWARENESS AND QUALITY OF KNOWLEDGE REGARDING CLIMATE CHANGE IN GHANA: A LOGISTIC REGRESSION APPROACH

Henry De-Graft Acquah

Department of Agricultural Economics and Extension, University of Cape Coast, Cape Coast, Ghana

ABSTRACT

Public awareness and knowledge on climate change is crucial to combating climate change and related problems. Against this background, this study assesses the awareness and quality of knowledge regarding climate change in central Ghana. A survey of 78 randomly sampled respondents was conducted using a standard questionnaire. A well-structured interview schedule was the main tool of data collection while descriptive statistics and logistic regression analysis were the main analytical techniques. Empirical analysis revealed gaps in the level of awareness as well as limited knowledge on the causes and prevention of climate change. Logistic regression analysis finds gender, years of education and income as significant predictors of the awareness of the importance of climate change.

Keywords: Awareness, Knowledge, Climate Change, Logistic Regression

INTRODUCTION

Climate Change is a multi-faceted challenge for today's societies through it impacts on human lives and the natural environment. The extent of climate change is manifested in several folds ranging from increasing diurnal temperature, seasonal changes in precipitation pattern, through increasing sun intensity to decreasing rainfall, thus introducing several distortions to industrial activities whose operations hang on the raw materials from agriculture. Besides these consequences, climate change invokes high spending on structure provision, commercial activities and other coping strategies with ascending livelihood implications and poverty level (Ferguson, 2006).

In the central region of Ghana, climate change is already determining the course of people's lives. Extreme weather events and unpredictability in weather patterns are having very serious consequence on people who rely on land, lakes and seas to feed themselves and earn a living. Climate change is a critical issue and a sound public knowledge and awareness is required to address the problem.

However, very little has been done to investigate the awareness and quality of knowledge regarding climate change in central region of Ghana. The objectives of this study are therefore to (1) examine the awareness level of climate change; (2) identify the sources of awareness of climate change; (3) analyze the importance of climate change; (4)

analyze the quality of knowledge on the causes and prevention of climate change; (5) examine the consequences of climate change; (6) identify the socio economic determinants of the awareness of the importance of climate change.

PREVIOUS STUDIES

Climate change is a multi-faceted challenge for today's societies through its impacts on human lives and the natural environment. However, awareness and quality of knowledge on existence and issues relating to climate change could reduce the impacts of the phenomenon.

Doss and Morris (2001) opines that the perspectives of the indigenous people, the way they think and behave in relation to climate change, as well as their values and aspirations have a significant role to play in addressing climate change. A report on South African awareness of climate change (Taderera, 2010) revealed that while most Africans are aware that weather patterns are changing, their understanding of global climate change is limited. Climate change terminology is poorly understood. It is often literally interpreted as 'changes in weather'.

Lefale (2003) examined the utility of traditional Samoan weather and climate forecasting. This study found Samoan knowledge to be acutely aware of environmental signs leading to extreme events such as tropical cyclones, and has suggested that western scientific understanding of Samoan meteorology and climate could well be improved by integrating the different epistemologies.

Early works on environmental knowledge and its inclusion into ecological assessment focused on the oral histories of Inuit (Spink, 1969), Icelandic (Bell & Olgilvie, 1978) and Yukon peoples (Cruickshank, 1984) to derive information on past changes in local climate. Later research examined the benefits of considering Inuit knowledge to better understand present weather and climate variability (Fast & Berkes, 1998) and to contribute to more formal assessments of climate change (Fox, 2000). Riedlinger and Berkes (2001) went on to identify how indigenous knowledge from the Canadian Arctic could complement western scientific approaches to understanding climate change. Following the examination of indigenous meteorological beliefs and knowledge in Saurashtra (Northern India), Kanani and Pastakia (2001) helped to establish the Ancient Rain Prediction Network where local experts and scientists make regular predictions on the basis of collective assessment (using both local and scientific forecasts).

Analysis of the determinants of farmer's choice of adaptation methods and perceptions of climate change in the Nile Basin of Ethiopia revealed that education increases climate change awareness and the likelihood of soil conservation and changing planting dates as an adaptation method Deressa, T. T., Hassan, R. M., Ringler, C., Alemu,T. & Yesuf, M. (2008). Schwarzkopf, J., Ziegler, A. & Hoffmann, V. (2009), using an econometric analysis with different choice models examined the determinants of knowledge of CO_2 offsetting based on unique data from computer assisted web interviews from Germany and United States. The preliminary results indicated that higher education had a positive effect on carbon literacy, as do, to some extent, higher income, and higher age and being male.

MATERIALS AND METHODS

Study area description and Survey method

Cape Coast is a coastal yet mountainous district municipality of central region of Ghana which stretches to about 122 square kilometers. The area lays approximately 5°60' latitudes and 1°15' longitude. Cape Coast is a humid area with mean monthly relative humidity and average rainfall of 92% and 730 mm respectively. The area is endowed with natural resources ranges from water bodies (which encourage people into farming) to a thick landscape which also engages some fractions of people into farming under small holder system. Due to the strategic location of the area, in terms of tourism, substantial number of the inhabitants engages in commercial business activities for living. A survey was conducted through a well-structured interview schedule which targeted residents in the metropolis since all are subject to the impact of climate change with respect to their occupational variability. A total of 78 respondents were randomly selected from different zones of the metropolis by the researcher.

FIGURE 1: MAP OF THE CENTRAL REGION OF GHANA
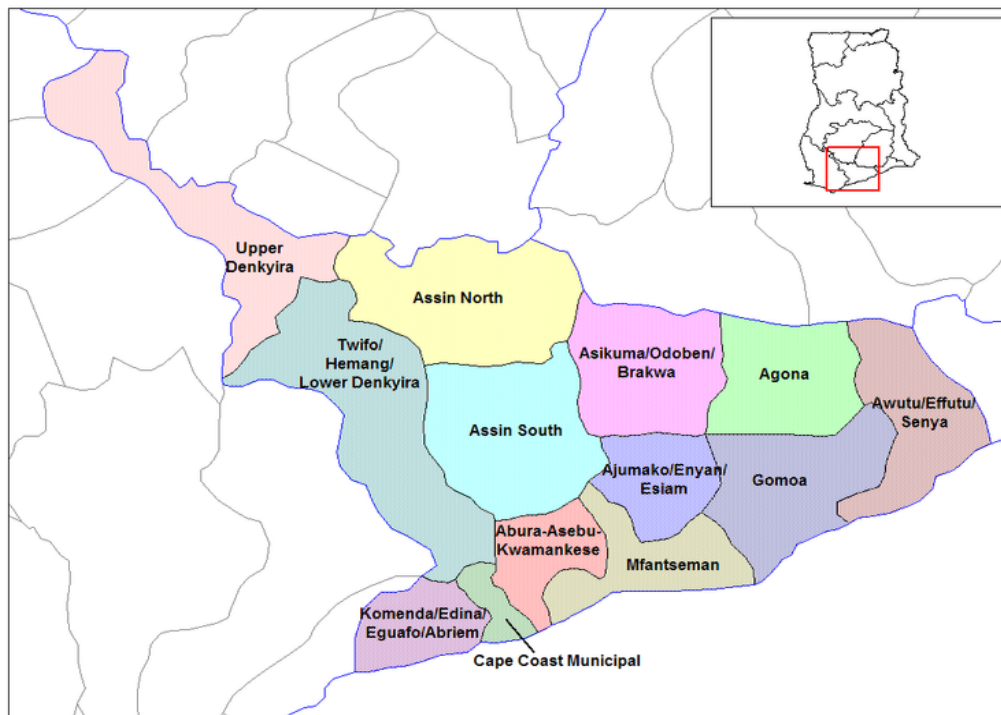
Source: Wikipedia

Data Analysis

An interview schedule was the main tool of data collection while descriptive statistics and logistic regression analysis were the main analytical techniques. Data was analyzed using the Statistical Package for Social Sciences (SPSS) and the R Statistical Programming Language.

The basic model of the logistic regression estimation is as follows:

$$P_i = \Pr ob(Y_i = 1) = \frac{1}{1 + e^{-(\beta_o + \beta_1 X_{1i} + \ldots \beta_k X_{ki})}}$$

$$= \frac{e^{(\beta_o + \beta_1 X_{1i} + \ldots \beta_k X_{ki})}}{1 + e^{-(\beta_o + \beta_1 X_{1i} + \ldots \beta_k X_{ki})}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Similarly,

$$P_i = \Pr ob(Y_i = 0) = 1 - \Pr ob(Y_i = 1)$$

$$= \frac{1}{1 + e^{(\beta_o + \beta_1 X_{1i} + \ldots \beta_k X_{ki})}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.(2)$$

Dividing (1) by (2) we get

$$\frac{\Pr ob(Y_i = 1)}{\Pr ob(Y_i = 0)} = \frac{P_i}{1 - P_i} = e^{(\beta_o + \beta_1 X_{1i} + \ldots \beta_k X_{ki})} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots..(3)$$

Where P_i is the probability that Y takes the value 1 and then $(1-P_i)$ is the probability that Y is 0 and e the exponential constant.

This research uses information criteria as technique for providing the basis for model selection. Most commonly used information criteria such as Akaike Information Criteria (AIC) is employed. The idea of AIC (Akaike, 1973) is to select the model that minimizes the negative likelihood penalized by the number of parameters as specified in the equation (4).

$$AIC = -2 \log(L) + 2p \qquad (4)$$

Where, L refers to the likelihood under the fitted model and p is the number of parameters in the model. Specifically, AIC is aimed at finding the best approximating model to the unknown true data generating process and its applications draws from (Akaike, 1973; Bozdogan, 1987; Zucchini, 2000).

RESULTS AND DISCUSSIONS

Socio-economic characteristics of respondents

In an attempt to investigate the socio economic characteristics, respondents were asked questions pertaining to that. Of the respondents interviewed, 55 representing 70.5% were males while 23 representing 29.5 were females. 53 respondents representing 67.9% were married; while 25 respondents representing 32.1% were not married. 2 respondents representing 2.6% had no formal education; 6 respondents representing 7.7% had obtained junior high school certificates; 16 representing 20.5% had obtained senior high school certificate while 53 representing 67.9%
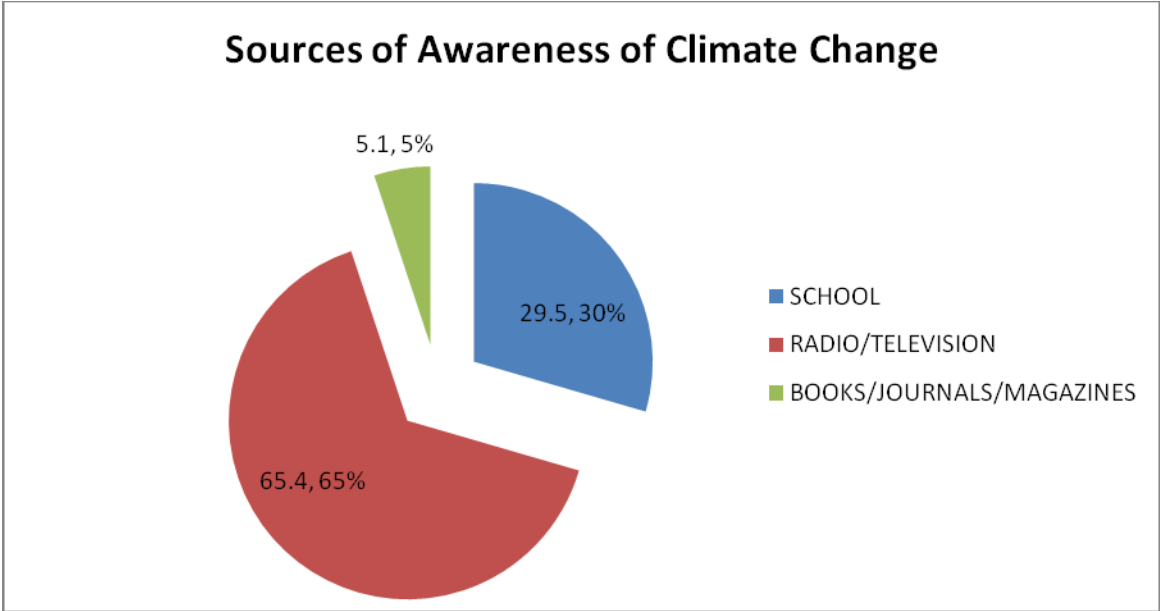
were in the tertiary level of education. Of the respondents interviewed, 22 representing 28.2% were between the age ranges 20-30 years; 46 respondents representing 59% were between 31-50 years; while 10 respondents representing 12.8% were between 51-70 years. 31 respondents representing 39.7% earn between GH60-GH300 per month; 29 respondents representing 37.2% earn between GH310-GH550; while only 1 respondent representing 1.3% earned between GH810-GH1000.

Analysis of awareness level of climate change

In an attempt to investigate people's awareness level regarding climate change, respondents were asked if they were aware of climate change, its causes, importance, its human induced nature and its methods of prevention. Of the respondents interviewed, 70 representing 89.7% thought climate change is happening while 8 respondents representing 10.3% saw no change in climate. Of the respondents interviewed, 68 representing 87.2% were aware of the causes of climate change while 10 respondents representing 12.8% were not aware; 57 respondents representing 73.1% were aware of the importance of climate change whilst 21 respondents representing 26.9% did not see climate change as important. 61 respondents representing 78.2% were aware of the methods of preventing climate change, whilst 17 respondents representing 21.8% were not aware. 64 respondents representing 82.1% were aware that human activities contributed to climate change whilst 14 respondents representing 17.9% were not aware. The results revealed a high level of awareness of climate change among inhabitants of central region of Ghana.
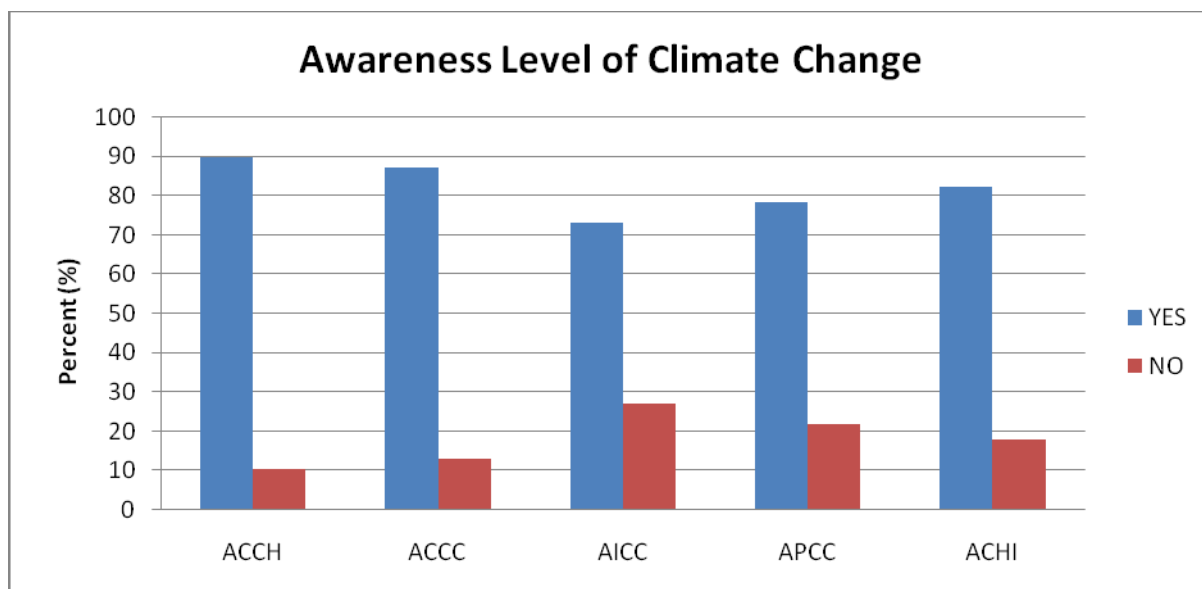
Note: ACCH= Awareness that Climate Change is Happening, **ACCC**= Awareness of the Causes of Climate Change, **AICC**= Awareness of the Importance of Climate Change, **APCC**= Awareness of Methods of Preventing Climate Change, **ACHI**= Awareness that Climate Change is Human Induced.

Sources of Awareness of Climate Change

5.1, 5%

29.5, 30%

65.4, 65%

- ■ SCHOOL
- ■ RADIO/TELEVISION
- ■ BOOKS/JOURNALS/MAGAZINES

Analysis of sources of awareness of climate change

In an attempt to find out about the sources of awareness of climate change, respondents were questioned on the sources alerting them on climate change. 51 respondents representing 65.4% cited the media (radio and television) with television accounting for about 36% of the respondents. 23 respondents representing 29.5% cited school as their main source of information on climate change; while only 4 respondents representing 5.1% cited books/journals/magazines as their main source of awareness. This relatively low proportion of the respondents who learn climate issues from books/journal/magazines results from the fact that most people do not have a reading culture.

Analysis of Importance Attached to Climate Change

In an attempt to examine the relevance of climate change to individuals as well as the country at large, respondents were asked to rate the importance of climate change. Of the respondents interviewed 44 representing 56.4% considered issues relating to the climate as very important; 22 respondents representing 25.6% saw climate change as important; only 1 respondent representing 1.3% was not concerned about climate change. However, 13 respondents representing 16.7% considered climate change as not important.

Importance Attached to Climate Change
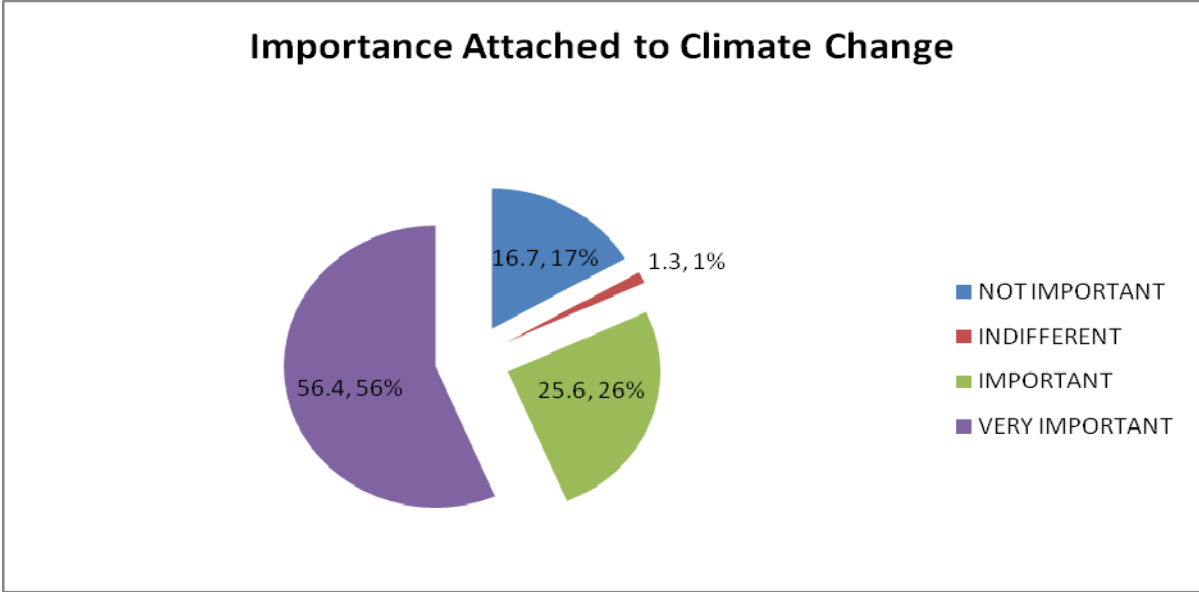
Analysis of the Quality of Knowledge on the Causes of Climate Change
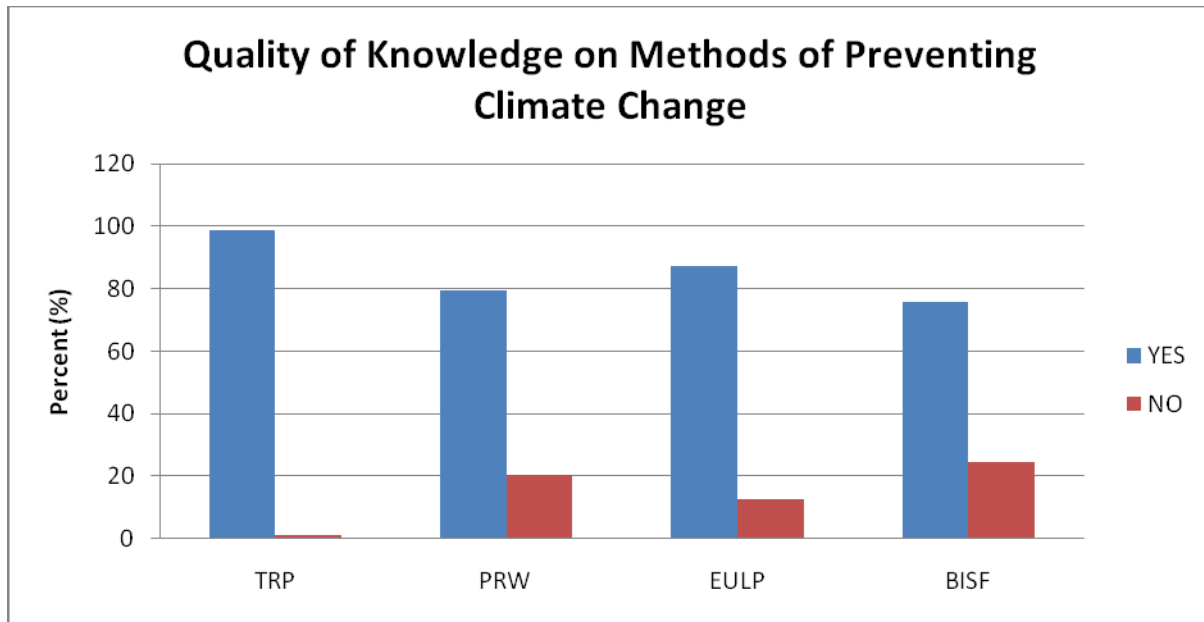
In an attempt to examine the quality of knowledge regarding climate change, respondents were asked to express their opinion on the causes of climate change. Of the respondents interviewed, 72 representing 92.3% thought climate change results from bush burning while 6 respondents representing 7.7% were not aware; 73 representing 92.4% thought deforestation causes climate change while 5 respondents representing 7.6% were not aware; 70 respondents representing 89.7% thought burning of fossil fuels lead to changes in the climatic behavior while 8 resenting 10.3% were not aware; 72 respondents representing 92.3% cited emission of gases from industries as a cause of climate change; and 54 respondents representing 69.2% thought uncontrollable use of aerosols causes climate change while 24 respondents representing 30.8% were not aware that the use of aerosols could lead to climate change.

Quality of Knowledge on Causes of Climate Change
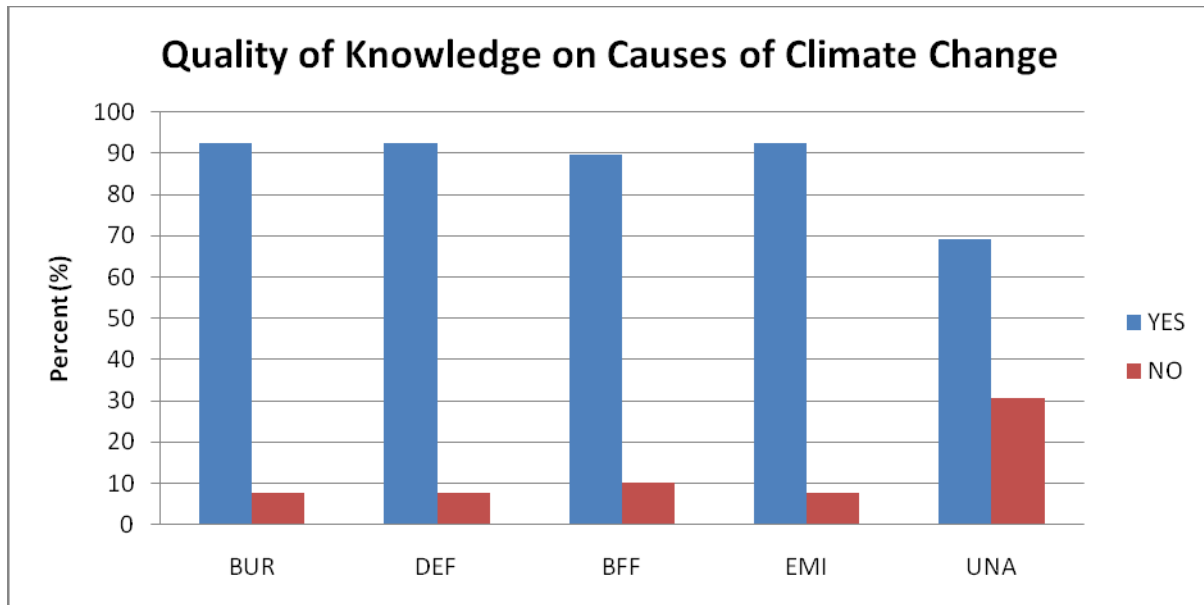
Note: BUR= Bush Burning, **DEF**= Deforestation, **BFF**= Burning of Fossil Fuels, **EMI**= Emission of gas from Industries, **UNA**= Uncontrollable use of Aerosols

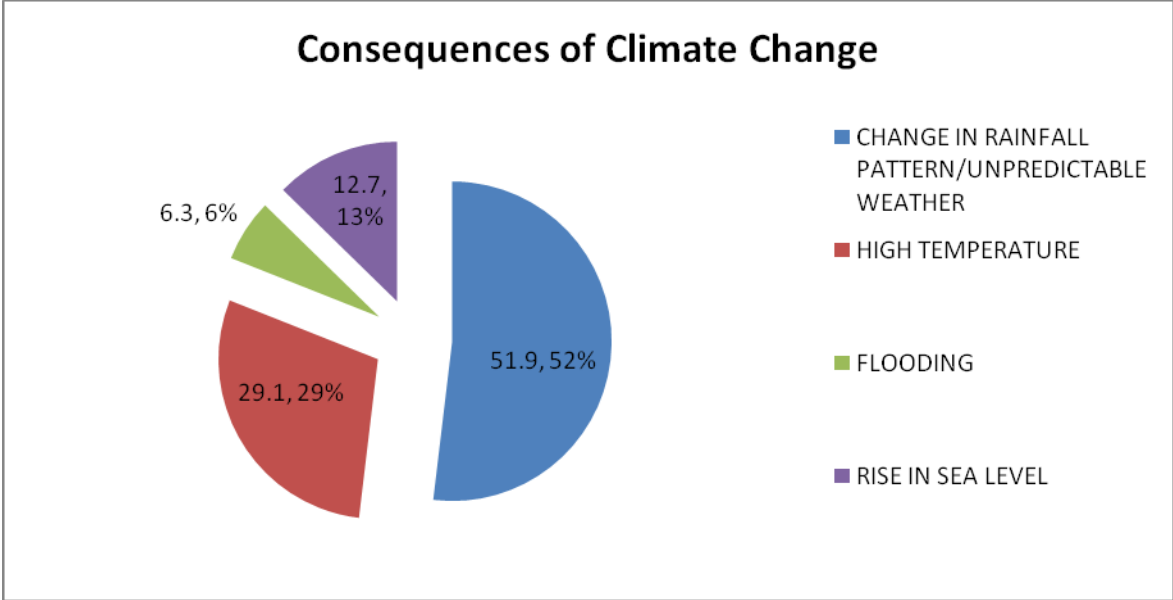**Analysis of Quality of Knowledge on Methods of Preventing Climate Change**

In an attempt to examine the quality of knowledge of climate change, respondents were asked to express their knowledge on methods of prevention of climate change. Of the respondents interviewed, 77 representing 98.7% thought tree planting can prevent climate change; 62 respondents representing 79.5% thought proper recycling of waste can prevent climate change but 16 respondents representing 20.5% were not aware; 68 respondents representing 87.2% emphasized the use of LPG instead of charcoal could reduce the impact of climate change but 10 respondents representing 12.8% were not aware; 59 respondents representing 75.6% thought ban on imported second hand fridges can prevent climate change while 19 respondents representing 24.4% were not aware.

Quality of Knowledge on Methods of Preventing Climate Change

Note: TRP= Tree Planting, **PRW**= Proper Recycling of Waste, **EULP**= Encourage the use of LPG, **BISF**= Ban on Imported Second hand Fridges

Analysis of the Consequences of Climate Change

The knowledge of the negative consequence of climate change can help people desist from the practices that will lead to these effects. In attempt to examine their current knowledge of these negative climatic effects, respondents were asked to express their opinion on consequences of climate change in recent times. Of the respondents interviewed, 41 representing 51.9% emphasize that climate change has caused a change in rainfall pattern which has led to unpredictability of the weather conditions; 23 respondents representing 29.1% said climate change has led to increase temperature as a result of high direct sun intensity in recent times. 5 respondents representing 6.3% thought climate change has resulted in flooding in most areas of the region; while 10 respondents representing 12.7% thought climate change has led to a rise in sea level in recent times which has resulted in relocation of most settlements closer to the sea.

Consequences of Climate Change

- CHANGE IN RAINFALL PATTERN/UNPREDICTABLE WEATHER — 51.9, 52%
- HIGH TEMPERATURE — 29.1, 29%
- FLOODING — 6.3, 6%
- RISE IN SEA LEVEL — 12.7, 13%

Model Estimation Results of the Logistic Regression

A logistic regression analysis was employed to analyze the socio-economic factors that influence individual's awareness of the importance of climate change. The Akaike Information Criteria (Akaike, 1973) provided the basis for selecting the model that provided the best fit to the climate change awareness data.

Table 1: Logit estimates of awareness of importance of climate change

Variables	Estimates	Std. Error	z value	Pr $(> |z|)$
Intercept	-5.118	1.846	-2.773	0.005**
GEN	1.302	0.691	1.884	0.059.
MS	-0.513	0.744	-0.689	0.490
EDU	0.233	0.110	2.118	0.034*
INC	0.004	0.002	2.062	0.039*
HHS	0.149	0.141	1.052	0.293

Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Note: GEN= Gender of respondent, **MS**= Marital Status, **EDU**= Years of education of respondent, **INC**= Income, **HHS**= Household Size

The model specification with awareness of the importance of climate change as the dependent variable and gender, marital status, years of education, income and household size as the covariates provided the best fit with AIC of 75.173. The model estimation result reveals a positive relationship between awareness of the importance of climate change and the regression covariates (i.e. gender, years of education, monthly income and household size). Evidence

from the logistic regression analysis finds the gender, years of education and income as significant predictors of the awareness of the importance of climate change.

The parameters of income and education were positive and significant at 5% level while gender was also positive and significant at 10%. It should be emphasized that a positive sign of a parameter indicates that high values of the variables tends to increase the probability of the awareness of the importance of climate change. A negative sign implies that high values of the variables will decrease the probability of the awareness of the importance of climate change.

CONCLUSION

Public awareness and knowledge on climate change is crucial to combating climate change and related problems. Against this background, this paper assesses the awareness and quality of knowledge regarding climate change in central Ghana. Specifically, the study investigated the level of awareness, sources of awareness of the phenomenon, importance of climate change, quality of knowledge regarding causes and prevention of climate change and determinants of climate change awareness.

Empirical analysis reveals gaps in the level of awareness as well as limited knowledge on the causes and prevention of climate change. Regression estimation suggests gender, years of education and income as significant predictors of awareness of climate change. Implications for policy will be to provide a public education program to create awareness and provide information and adequate knowledge on the causes and prevention of climate change. There is the need for these educational campaigns to target females, the poor and the illiterate among others given that gender, education and income were positive and significant on the awareness of the importance of climate change.

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