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RESEARCH ARTICLE

KNOWLEDGE AND ATTITUDE TO CLIMATE CHANGE AMONG UNDERGRADUATE STUDENTS IN THE FACULTY OF AGRICULTURE, UNIVERSITY OF NIGERIA, NSUKKA

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ABSTRACT

Environmental awareness among students is highly influenced by their background, knowledge, attitude and sensitivity towards the environment. The study assessed the knowledge and attitude to climate change among undergraduate students in the Faculty of Agriculture, University of Nigeria, Nsukka. Nigeria. A Proportionate random sampling technique was employed to select 92 students. Data were collected through the use of structured questionnaire and analyzed using percentage, mean score and logistic regression. The results revealed that the mean age of the students was 24years and majority (60.9%) of the students were females. The findings further revealed that 94.6% of the students had high knowledge about climate change and 86% expressed favorable attitude towards climate change. The results of binomial logistic regression revealed that variables (sex, age, mode of admission, trainings) had no significant (P>0.05) influence on the students' knowledge level of climate change. Knowledge influences the attitudinal change towards climate change and in most cases translates to desirable actions on the environment. Institutions of higher learning should be in the forefront of increasing knowledge, awareness and capacity for eco-friendly environment through curriculum revision to increase climate science content of courses. Government and institutions should explore all avenues to increase awareness, literacy and environmental sound practices. Efforts should target grass root orientation and early child\students' educational development.

INTRODUCTION

Climate change is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is, in addition, to natural climate variability observed over comparable time period (United Nations Framework Convention on Climate Change (UNFCCC), 2007). According to International Panel on Climate Change (IPCC) (2007), the major cause of climate change is the increasing concentration of carbon iv oxide (CO) and other greenhouse gases in the atmosphere, released directly through human activities such as the increased industrialization in the developed nations which has led to the introduction of large quantities of greenhouse gases (GHGs) including nitrous oxide (N_2O). Obadiah (2010) reported that Methane (CH_4) produced by ruminant animals, insects and rice paddies during anaerobic fermentation and nitrous oxide from the intensive use of agrochemicals leads to greenhouse effect on the environment, thereby increasing the global temperature.

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Other causes of climate change are through agricultural practices characterized by deforestation (fuel wood harvesting), overgrazing, over cultivation and bush burning. Emissions from aviation industry also have greaterclimate impacts than the same emissions made at ground level. This is because emissions at altitude can instigate a host of chemical and physical processes that have climate change consequences to the atmosphere inform of nitrogen oxides, water vapor, soot and aerosols. (Jardine, 2005). Climate change has affected different regions, ecosystems, and sectors of the economy in many ways, depending not only on the sensitivity of those systems to climate change, but also on their ability to adapt to risks and changing conditions. Throughout history, societies and ecosystems alike have shown remarkable capacity to respond to risks and adapt to different climates and environmental changes. Largely, effects/impacts of climate change have already been observed, and the rate of warming has increased (Environment Protection Agency, (EPA) 2010). In many areas, climate change is likely to increase water demand while shrinking water supplies. This shifting balance would challenge water managers to simultaneously meet the needs of growing communities, sensitive ecosystems, farmers, ranchers, energy producers, and manufacturers. In some areas, water shortages will be less of a problem than increases in

runoff, flooding, or sea level rise. These effects can reduce the quality of water and can damage the infrastructure used to transport and deliver water (EPA, 2016). Agriculture and livestock depend on water. Heavy rainfall and flooding can damage crops and increase soil erosion and delay planting. Additionally, areas that experience more frequent droughts will have less water available for crops and livestock (USGCRP, 2009).Given that in many countries, sectors may experience similar effects/impacts from climate change, there is need for cooperation and synergies amongst stakeholders. Sharing experience can broaden knowledge on how to address the adaptation and mitigation challenges. Climate change should be integrated into the curriculum of schools and work of different organizations, agencies, and in particular through partnerships of sectors such as water and agriculture in order to share experiences and lessons learned by communities facing similar problems. Improving public awareness and developing overall communications strategies makes climate change science accessible to the average citizen and can reduce vulnerability. Besides, it is also important to involve high-level policymakers to ensure integration of climate change risks into national development policies (UNFCCC, 2007). For example, in Cuba, hurricane and disaster risk reduction is taught in schools and training is carried out for the entire population every year (Cuba 2001).

Knowledge is a precondition for environmental awareness. It is the students' ability to understand and evaluate the impact of a society on the ecosystem (Gambro and Switzky, 1996). Rational actions toward the environment are the translation of knowledge on the environment. These actions will create positive attitude towards it (Murphy, 2002). Knowledge increases awareness, which would motivate environmentally responsible actions (Leeming, Dwyer, Porter and Cobern, 1993). Students' attitude towards the environment is conceptualized as their verbal and actual commitment, motivation and sensitivity to nature and environmental issues (Aminrad, 2009). Attitude is also a complex mental construct (perception) which emerges out of an integration of an individual's belief and value system (Boershing and De Young, 1993). Hence, institutions of higher learning with the aim of advancing the frontiers of knowledge and stake to enlarge human choices, skills and capabilities, by developing human resources, have pivot roles in the whole process. Above all, with the science of climate change now becoming increasingly clear, sustainability and adaptability are turning more and more into issues for education (Institute of Education, IOE, 2009). Thus, as reiterated by Bloom *et al*. (2005), higher education should play a critical role in preparing and providing the leadership to meet these challenges and stimulate sustainable development through increase climate literacy and environmental education.

The Department of Agricultural Extension of the University established Climate Change Outreach Programme in response to the increasing challenges of climate change and the need for high climate literacy in the society among professionals, policy makers and farmers, in particular. It is an offshoot of practical fourth year course of the department organized primarily to expose students of agriculture to practical experience in the knowledge and use of extension methods and principles. It also aims to train and train professionals that are responsive and more compliant to climate science and environmental issues. Students are exposed to fundamental and contemporary issues on climate change and are equipped with requisite knowledge and skills to communicate the same to rural farmers. They employed role play, drama, lecture amongst others, to communicate climate change message in a real life situation to rural communities. Generally, the main purpose of environmental education is to attain consciousness of all parts of the society through positive and permanent changes of behaviors and active involvement. According to Sah, Bellad and Angolkar (2015) such education should be a lifelong education, starting from the preschool stage to all the formal and public education stages. Therefore, the study was conducted to,

- Describe the socio-economic characteristics of the students;
- Assess students' attitude towards climate change and;
- Assess students' knowledge level of climate change.

MATERIALS AND METHODS

The study was carried out in Enugu State, Nigeria. Enugu State is one of the South-east states that make up the thirty six states in Nigeria and is located between latitude of 6^0 30'N 7^0 30'E and a longitude of 6.500^0N7.5 00^0E It occupies an area of about 8,022,95km^2 and has a population of about 3,257,278 (Nigeria Population Commission (NPC), 2006). The vegetation of the state is mainly forest type, but stretches out into derived savannah in the Northern fringes. Enugu State experiences distinct wet and dry seasons with a total annual rainfall of about 1,700mm (Enugu State Government Official Gazette, No.25, 1997). The major occupation of people in the state is farming. They produce crops like yam, cassava, rice, maize, pineapple, banana etc. They are also involved in poultry production, small livestock (sheep and goat) production amongst others. The population of the study consists of final year students of the Faculty of Agriculture, University of Nigeria Nsukka, who participated in the outreach programme during their fourth year programme. Out of the seven Departments in the Faculty, five departments (Agricultural Economics, Agricultural Extension, Animal Science, Crop Science, and Soil Science) were purposively used because they were involved in the practical farm year.A proportionate random sampling technique was employed to select the respondents for the study. Sixty percent (60%) of students from each department was used, giving a sample size of 92 respondents for the study.

Table 1. Sample frame

Departments	Population	Sample used at 60%
Agricultural Extension	30	18
Agricultural Economics	48	29
Animal Science	34	20
Crop Science	24	14
Soil Science	19	11
Total:	155	92

The instrument for data collection was questionnaire. The questionnaire was validated by the Lecturers in the Department of Agricultural Extension, University of Nigeria, Nsukka. The questionnaire was structured to elicited information on the socio-economic and institutional characteristics of students, students' knowledge level of climate change and students' attitude to climate change. The respondents were asked to indicate their age in years and sex by ticking either 'male' or female'. The sex of the respondents

were recorded at nominal level as male =1 and female =2. To determine knowledge level of farmers on climate change, students were required to tick 'Yes'=1 or 'No'=2 against a list of knowledge statement on climate change and 31 knowledge statements were provided. Some statements in the list includes: Overgrazing by animals, excessive use of nitrogenous fertilizer, cutting down of trees/deforestation, use of generator for electricity by many households, bush burning etc. Based on the correctness of responses by the respondents on the thirty-one statements measuring knowledge, scores were categorized as follows: Low knowledge: 1-10 correct responses, Moderate knowledge: 11-20 correct responses, High knowledge: 21-31correct responses.

To determine students' attitude to climate change, a four (4) point Likert-type scale with values of strongly agree = 3; agree = 2; disagree = 1; strongly disagree = 0, was used. The values were added up to get 6 which was later divided by 4 to get mean of 1.5. Variables with mean score greater than 1.5 were regarded as favourable attitude, while mean score less than 1.5 were regarded as unfavorable attitude. Some of the variables listed were climate change is scientific jagon, it affects all sphere of life, it requires an urgent attention of the government & international bodies, human activities causes climate change & awareness is a priority, etc. Data for the study were analyzed using descriptive statistics and logistic model. Also, the altitudinal index of respondents was obtained based on the scale and the weighted values. The 17 altitudinal statements have a maximum score of 51 and a minimum score of 0 on five point Likert type scale . This gave a mid-point score of 26. Thus, respondents with scores at mid-point and below (0-26) were tagged as the percentage of personnel with unfavourable attitude (less supportive) to climate change; while above mid-point (27- 51) were tagged as the percentage of students with favourable attitude (more supportive) to climate change.

Logit model is a qualitative choice model used to model relationship between dependent variable (Y) and one or more independent variable (X) where the dependent variable (Y) is a discrete variable that represents a choice or category from a set of mutually exclusive choices or category. In this case relationship between knowledge and characteristics of the respondents. Categorical variables such as sex, mode of admission, involvement in faculty climate change programme, training in climate change and membership of professional organization belong were coded in order to transform them into dichotomous variable, while the other variables such as age and numbers of profession bodies one belongs were entered directly into the equation. The response variable has only two possible values; high and medium knowledge level that is the dependent variable has only two categories or bases (binomial). The outcome was loaded as "0" and "1" where the target group (referred as a case) is coded "1" and the reference group (reference as a non-case) is coded "0". In this case the dependent variable (Y) was dichotomized into two (high knowledge level with the value of 1 and moderate knowledge =0). A binary logistic model was employed as follows:

First;

The probability of high knowledge = Pi = $\frac{\exp^{Zi}}{1+\exp^{zi}}$ ……..(1)

Where z = a random variable that predicts the probability of the ith personnel having high knowledge of climate change.

Therefore, the model is expressed for individual personnel as

$=Z_i=\text{In}\frac{Pi}{1-\text{pi}}=\sum_{n=1}^{n} B_n\chi_{ij}$ ……(2)

(logit i.e. log-odds or natural logarithm of the odds which is equivalent to the linear regression equation).

Where;

P_i = probability of high knowledge/moderate
β_0 = constant term, β_n = coefficients
X_{ij}= independent variables

Also the coefficient = effect of each explanatory variable on log odds expressed thus:

$Z_i= \beta_0+\beta_1x_{1i}+\beta_2x_{2i}$ .....+ β_nx_{ni} …….(3)

Thus, the model specification is thus summarized as

$Z_i= Y =\beta_0+ \beta_1x_1 + \beta_2x_2$ + ...+ $\beta_nx_n+\varepsilon$ …….(4)

Where,

Y= Knowledge Level (Moderate / high)
X1= Age (yrs)
X2= Sex (Male)
X3= Mode of admission (dummy Merit=1, Supplementary=0)
X4= Training in climate change (dummy yes=1, no=0)
X5= Number of the trainings (number)

RESULTS AND DISCUSSION

The mean age of the students was 24 years. The students are within the age bracket of 20-30years, which is the most productive age. They are all youths. This shows their youthfulness, characterised by high propensity to seek for more knowledge on climate change and promise for greater innovativeness to find answers and solutions to threats posed by climate change to the environment. The finding is in consonant with Nwobodo and Agwu, (2015) who reported that the average age of youths in climate change programme in Benue State was 24.14years. The majority (60.9%) of the students were females, while 39.1% were males. This suggests that the number of female studying agriculture surpasses that of male. This confirms the current trend, where womenare more involved in agriculture than men and this may pose a challenge to the future of agriculture, giving the tedious nature of agricultural practices. The Food and Agriculture Organisations of the United Nations (FAO) (2010) however, reported that women are engaged just as likely, or even more likely, than men in agriculture. Almost 70 percent of employed women in Southern Asia and more than 60 percent of employed women in sub-Saharan Africa work in agriculture.

Course of choice

Figure 1 reveals that greater proportion (25%) of the students applied for courses in Health sciences as their first course of choice, 22.8% applied for medicine. About, 22.8% and 21.7%

applied for agriculture and pharmaceutical sciences, respectively as their first course of choice (Figure 1).

Table 2. Distribution of students according to personal characteristics

Variable	Percentage (%)	Mean
Age (in years)		
20-23	48.9	
24-27	47.8	23.84
>27	3.3	
Sex		
Male	39.1	
Female	60.9	

Only 6.5% of the students applied for courses in physical sciences and 2.2% of the students applied for course in biological science. This means that 77.2% of the students did not have agriculture as first course of choice. This confirms lack of interest in agriculture common among Nigerian students. In order words, most students studying agriculture have no interest in agriculture and this affects the labour force in the agricultural sector. Consequently, majority of the graduates from agriculture may have no plan and ambition to practice agriculture. This contributes to the continued aged workforce, the persistent of traditional and subsistence nature of the agricultural sector in the country.

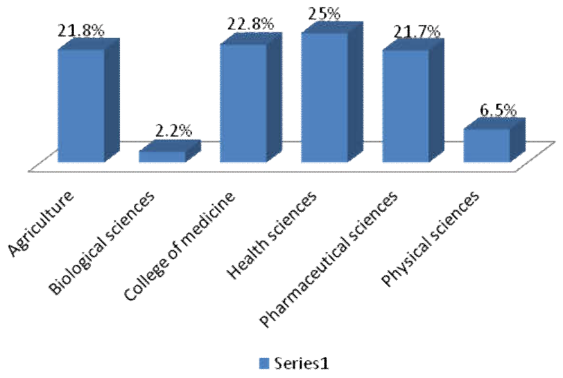


Figure 1. Percentage distribution of students based on first course of choice

Students' knowledge level of climate change

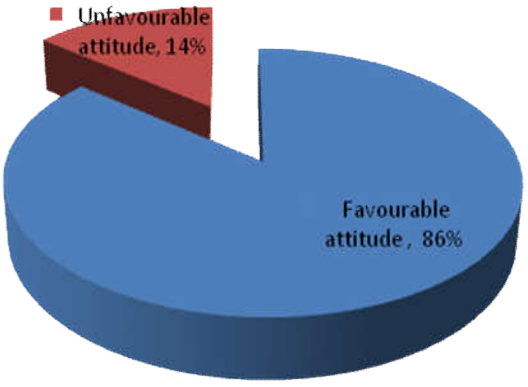
Result in Table 3 reveals that majority (94.6%) had a high knowledge of climate change, while 5.4% of them had a fair knowledge of climate change. The students possess good knowledge of climate change. This may be due to educational experience and training, particularly those who belong to Climate Change club, University of Nigeria, Nsukka). It equally confirms the impact of the students involvement in climate change activities like outreach programme. Moreover, with young brain and exposure, the high knowledge of climate change could have been possible due to access to climate change information on radio, television, online pamphlets, websites etc. The finding is in agreement with Rosta, Lim and Fadhilah (2011) who reported that students in Malaysia demonstrated a good level of knowledge of environmental issues like climate change etc. These are assets for agricultural adaptation, mitigation and sustainability. According to Kahlor and Rosenthal (2009), knowledge about climate change may lead to a more engaged citizenry and subsequently adaptation potential and resilience to climate change effects.

Table 3. Percentage distribution of the students' knowledge levels on climate change

Knowledge level	Frequency	Percent (%)
Medium knowledge	5	5.4
High knowledge	87	94.6
Total	92	100.0

Students' attitude towards climate change

Entries in Table 4 show that respondents had positive/favorable attitude towards most of the attitudinal statements namely human activities causes climate change and awareness is a priority (M =2.46), adaptation to climate change is crucial and therefore needs urgent attention (M=2.45), adaptation to climate change has potential for improved production, food security and poverty alleviation, there are sufficient evidence of climate change and it's impact in the globe, it requires urgent attention of the government and international bodies (M=2.41), it affects every sphere of life (M=2.36) among others. The low standard deviation further indicates homogeneity of perception within categories. However, respondents had unfavorable attitude towards some attitudinal statements such as; it is the problem of developing countries (M=1.41), climate change is scientific jag on (M=1.03), it is only the problem of practicing farmers in rain fed agriculture (M=0.83), I have no role to play in addressing the problem of climate change (M=0.66) and it is does not affect crop and animal production in Nigeria (M=0.32). Overall, the findings revealed that out of the seventeen (17) attitudinal statements the respondents indicated positive/ favorable responses in twelve (12) of them, showing that students attitude towards climate change issues was favorable and positive. Responses among the group, confirms the homogeneity of perception of climate change which can be attributed to the verse knowledge of climate change phenomenon. The unfavourable attitude displayed in response to some variable suggests that the respondents perceive climate change challenges as a corporate concern requiring attention of all. This corroborates with a study on students' attitude about environmental issues by Fielding & Head (2012), who explained that positive environmental intentions and behavior were related to the perception of greater community responsibility. On the other hand, Wong and Yan (1996) reported that students held only marginally pro-environment awareness and lacked environmental action.



Source: Survey data (2015)

Figure 2. Index of students' attitude towards climate change

Generally, Figure 2 shows that majority (86%) of the students expressed favourable attitude towards statements about climate change, while only 14% had unfavourable attitude towards climate change issues. The high proportion with favourable attitude could be attributed to adequate knowledge of climate change phenomenon shown by the respondents. This suggests that students who are conversant with climate change issues will have a relatively favorable attitude towards climate change and will be more conscious about their environment.

Table 4. Mean score of students' attitude to climate change

Attitude to climate change	Mean	Std. Deviation
Climate change is scientific jagon	1.03	0.954
It affects every sphere of life	2.36*	0.673
It is only the problem of practicing farmers in rain fed agriculture	0.83	0.779
It requires multi stakeholder response	2.16*	0.778
I have no role to play in addressing the problem of climate change	0.66	0.745
It is an area of intellectual exercise for researchers & policy makers	1.87*	0.997
It requires urgent attention of the government & international bodies	2.41*	0.713
It should be an area of priority for government investment	2.24*	0.761
It does not affect crop and animal production in Nigeria	0.32	0.628
Adaptation to climate change is crucial and therefore needs urgent attention	2.45*	0.600
Adaptation to climate change has potential for improved production, food security and poverty alleviation	2.41*	0.699
There are sufficient evidence of climate change & it's impact in the globe	2.41*	0.596
Generating technology for climate change should be research priority	2.13*	0.699
Climate change should be incorporated into higher education curriculum	2.18*	0.678
Building capacity of stakeholders for adaptation is timely	1.71*	0.704
Human activities causes climate change & awareness is a priority	2.46*	0.670
It is the problem of developing countries	1.41	1.121

(*)Positive/favourable attitude

Table 5. Binomial logit model; the influence of students' socioeconomics characteristics on their knowledge level

Socioeconomic factors	B	S.E.	Wald	Df	Sig.	Exp(B)
Sex	0.672	1.437	0.219^{NS}	1	0.640	1.958
Age	-1.293	0.833	2.411^{NS}	1	0.120	0.275
Mode of admission	0.512	1.582	0.105^{NS}	1	0.746	1.668
Training in climate change	2.550	1.820	1.963^{NS}	1	0.161	12.806
Number of trainings	18.331	1.015E4	0.000^{NS}	1	0.999	9.145E7
Constant	12.307	1.015E4	0.000^{NS}	1	0.999	2.213E5

Note: S=significant at 5% level of probability. NS shows not-significant -2 Log likelihood =63.503, $X^2 = 12.059P>0.05$

When knowledge level about the environment is high, taking desirable mitigation, adaptation and sustainable actions are inevitable. This is in line with the finding of Fielding and Head, (2012), who concluded that young people with higher level of environmental concern and knowledge, and internal locus of control to environment, held stronger pro-environment intentions and engaged in pro-environment behaviors more proactively.

Factors that determine knowledge level of climate change among undergraduate students

The result of the factors that determine knowledge level of climate change using binary logistic regression analysis shows the relationship of the personal/ socioeconomic characteristics of the students and their knowledge level on climate change.

Sex of the students had no significant (B = 0.672, p> 0.05) influence on the knowledge level of climate change. Both sexes have equal chance of acquiring new information, skills about climate change provided they show enthusiasm about it. Besides, they have similar exposure to climate change seminar and outreach programmes, but could only vary in their access to information from other sources. The finding is in variation to Inez and Christian, (2013), who found that gender appears to have an effect on opinion related to climate change. Males are less likely than females to hold the opinion that both individuals and governments are responsible for addressing the challenges of climate change mitigation and adaptation. Age of the students was not significantly (B = -1.293, p> 0.05) related to the knowledge level on climate change. This is not surprising because the respondents are within the same age bracket. Though climate change affects all irrespective of age, but youths are expected to be more knowledgeable because of their responsiveness and quest for new things.

Moreover, they have greater access to information due to their connectivity. According to Fielding and Head (2012) young people with higher level of environmental concern, attitude, knowledge, and internal locus of control to environment, hold stronger pro-environment intentions and engaged in pro-environment behaviors more proactively. Overall, the effects of climate change on our environment (increasing temperatures, decreasing rainfall, drought, extreme weather, floods, water scarcity etc.) are being felt by the old and young. Mode of admission showed no significant (B = 0.512, p>0.05) relationship with knowledge level of the students. Recall that 77.2% of the students did not have agriculture as first course of choice, thus greater proportion of the respondents was admitted through supplementary. This probably explains the non -significant influence of mode of admission on the knowledge of climate change. Also, training in climate change and number of trainings had no significant (B = 2.550, p>0.05 & B = 18.331, p>0.05) influence on the students' knowledge of climate change, respectively. In other words, training do not have any influence on the student's knowledge of climate change issues. Ordinarily, trainings should have improved or contributed to the knowledge base of the students but most of the respondents never attended any training on climate change. The students were only exposed to Forth Year Students' Outreach Programme on climate change using the same training/teaching methods, training content and approaches to

teaching and learning. Although, outreach programme may not have been the only source of information on climate change issues in this 21st century, where knowledge can be acquired/ learned anywhere and everywhere with the aid of information communication technology devises. Lowe *et al.* (2006) states that perceptions of climate change are linked to people's own direct experiences and endeavors. This finding is contrast to Inez and Christian, (2013) who suggested that the student's specialization (in form of training) affects opinions about climate change. Students specializing in Mathematics and Sciences are less likely to have the opinion that climate change is a threat than students specializing in Arts.

Conclusion

Climate change is a global phenomenon, cutting across sectors and nations, but with greater impact on agrarian economy and developing countries because of high dependence on rain-fed agriculture, natural resources and low technological capacity. Thus, efforts to mitigate and adapt to the effects are generally believed to be a multi-stakeholder and multidisciplinary concern. Students of higher learning, particularly students of agriculture who are the future workforce in the agricultural sector are important stakeholders and have critical role to play in adopting and promoting environmentally best practices and technologies relevant to fostering resilience and sustainable environment. The study revealed that the students had high knowledge and favorable attitude towards climate change. Additionally, the result of the binary logistic model showed that personal/socioeconomic characteristics (age, sex, mode of admission, training on climate change before outreach programme and number of such trainings) have no significant influence on the knowledge level of climate change. This suggests that the university outreach programme on climate change impacted significantly on the students' knowledge of climate change. This might be because the students had several seminar presentation on climate change and were also instrumental to educating communities. It points to the need for curriculum revision to increase climate change contents of courses offered in higher institutions. This will increase climate change literacy and environmental sensitivity among citizens. It is also possible that knowledge could have been gotten from non-formal sources (television, radio, online pamphlets, online video (youtube) and newspapers) bystudents. Knowledge influences the attitudinal change towards climate change and in most cases translates to desirable actions on the environment. The impacts of climate change directly and indirectly affect all living things and their environment, hence government and institutions should explore all avenue to increase awareness, literacy and environmental sound practices. Efforts should target grass root orientation and early child\students' educational development.

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