

# Climate Change Education and Knowledge among Nigerian University Graduates

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## ABSTRACT

The introduction of climate change studies in universities has a fundamental role in helping the general public, especially the next generations, to recognize the global challenges of climate change and to find ways of adapting to the changing climate. This study examined the level of climate change education and perception of Nigerian university graduates. A mixed method approach was used to obtain data relating to perceptions, understanding, and level at which climate change has been taught in Nigerian universities. The results from this study revealed that about 70.7% of university graduates received brief lectures in some special elective courses during their university education, while only 4.1% were taught more than three semesters/terms in some special elective courses. It was also revealed that graduates from departments of environmental sciences have more class experience on climate change than students in the humanities and other faculties. The major finding of this study is that students appear far more informed about climate change, usually from the Internet and international media, than the level of climate change education they were taught in university. These results show the need for the introduction of climate change studies in Nigerian universities, with over 71% of participants believing that climate change studies should be included as a required course in both undergraduate and postgraduate studies.

## 1. Introduction

The world entirely is currently witnessing climatic change. Climate change affects all facets of human endeavor (IPCC 2007; Bates et al. 2008; Lesnoff et al. 2012). Understanding the impacts of climate change and its risks has been the principal focus of research at both global and local scales. Recent climate change studies have shown that climate change will affect every part of the socioeconomic activities of humans, including the environment where humans live and the natural resources that sustain humans in this environment. The Intergovernmental Panel on Climate Change (IPCC) has been the central international organization to synthesize research on climate change. Studies at the global and local scales have reported that agriculture production in Africa would be affected by climate change,

since the majority of farming activities are rain fed (Nhemachena and Hassan 2007; Cooper et al. 2008; IPCC 2014). Climate change, especially when not understood, has enormous implications for the global population, including, for example, drought, floods, food shortage (low crop yield and preservation), and the emergence of new diseases and global warming (IPCC 2000; Xiong et al. 2010; Zhang and Huang 2012). At the local level, studies have shown that climate change contributes to the burden of disease and premature deaths caused by direct human exposure to changing weather patterns and indirectly through changes in water, air, and food quality, and changes in ecosystems, agriculture, industry, and settlements and economy (Jennings 2008; Reilly and Schimmelpfennig 2000; Smit and Skinner 2002; Awulachew et al. 2005; Rufino et al. 2013; Young et al. 2015). To cope effectively with these developments, the knowledge and awareness of climate change and its implications are very important. It will enable planning and proactivity in adapting to the change. Understanding the dynamics of climate change would also make it possible to leverage the benefits of

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the resulting environmental change on the local population (see Maddison 2006; Mustapha et al. 2012; Crona et al. 2013). Thus, knowledge of and education about climate change cannot be overemphasized. The knowledge of climate change could be acquired through formal and informal means but waiting solely for informal acquisition could be very costly, in the sense that preventable loss of lives and properties would have been experienced through extreme climatic events. The appropriate model of knowledge acquisition of climate change would be through formal and informal exposure to its underlying concepts, processes, and causes. Acquiring knowledge of climatic change through formal means would imply the introduction and integration of the components of climate change into the undergraduate or tertiary education curriculum. Acquiring such knowledge informally evolves from previous exposure to this information from the media, the web, and each graduate's everyday experience and exposure to the surrounding climate.

The study described in this paper examines the level of climate change education and perception of Nigerian university graduates. The starting point of our discussion is to first assess climate change knowledge and awareness of its implications among graduates and how this knowledge was acquired. Graduates from institutions of tertiary education were selected as participants of this study because they are already prepared to generally participate in society and eventually become policy makers and catalysts in the implementation of these policies in different sectors of society. The study evaluates the perception of university graduates on the causes of climate change and its potential impact on socioeconomic sectors of the country. We assess how much of the graduates' understanding derives from informally derived experiential knowledge, and how much derives from formal studies in the classroom. We assess the level of courses on climate change taught in Nigerian universities and examine the potential role of climate change courses in the curriculum of the university system in Nigeria in the future.

## 2. Methodology

Both quantitative and qualitative methods of data collection were employed: a questionnaire and a focus group discussion were used in this study. The mixed methods were used to obtain data relating to perceptions, understanding, and level at which climate change had been taught in Nigerian universities. Mixed methods were used in this research based on the objectives of the study, in order to give confidence in the results of the findings from the questionnaire survey.

Marshall and Rossman (2011) reported that the mixed methods approach is effective for the purpose of triangulation and also permits the strength of each method to complement the weakness of the other. Since both the questionnaire survey and the focus group discussion have different merits and limitations, triangulation is applying different data collection methods within one study in order to validate the research outcomes (Saunders et al. 2009; Symon and Cassell 2012). The study adopted a survey design with National Youth Service Corps (NYSC) members as the population for the study. In Nigeria, graduates from tertiary institutions (under 30 years of age) join the NYSC to serve the country in a community development service for a period of one year after graduation. NYSC offices are located in every state of the country, where the NYSC members usually meet every week for community services and for youth empowerment training. Participants for the study were selected using a multistage sampling method. A total of 300 corps members were drawn from four southwestern states of Nigeria, namely, Ekiti, Ondo, Osun, and Oyo. Of these members, 75 were sampled from two local governments randomly selected from each of the selected states. The questionnaire surveys and focus group discussions were carried out during NYSC meetings in the states' NYSC offices. A total of 300 questionnaires were sent out (75 questionnaires were administered in each state), out of which only 220 were returned but 10 were not effectively or fully filled. This implies that a cohort of 210 were analyzed. The questionnaire survey was carried out in such a way that a total sample of 75 NYSC members were drawn using simple random sampling techniques from four NYSC offices in the states, and the questionnaire tagged climate change education, awareness, perceptions, understanding, and the level at which they were taught during their university education periods. Graduates from different universities were surveyed, and graduates from the major state and private universities were represented in the survey.

A minimum of 15 NYSC members participated in the focus group discussions in each of the states (see section 1 of Table 1). Focus group discussions were also conducted in three major NYSC offices in Osun State (see section 2 of Table 1). The focus group discussions were semistructured with simple questions. Questions were asked about the level of climate change taught in the universities, awareness, and graduates' attitudes toward climate change. Other issues examined include causes of climate change, its impacts, climate change and lifestyle, concerns about climate change, and combating climate change. The focus group discussion was used in this study as a means of gaining insight into participants'

TABLE 1. Composition of the questionnaire and the focus group discussion participants.

1. Questionnaires	Location	Ekiti	Ondo	Osun	Oyo
No. of questionnaires administered		75	75	75	75
Average age of respondents (yr)		20–29	20–29	20–29	20–29
Sampling method used		Simple random sampling technique	Simple random sampling technique	Simple random sampling technique	
Questionnaire administration		During their community development services	During their community development services	During their community development services	
2. Focus group discussion	Location (Osun State)	Ife center	Ife East		Osogbo
No. of participants in focus group		25	20		15
Average age of respondents (yr)		20–29	20–29		20–29
Nature of group		Natural group: All participants were mature men and women	Natural group: All participants were mature men and women		Natural group: All participants were mature men and women

understanding and views of climate change and to look at how such views differ by graduates of different universities (Gubrium and Holstein 2001). Before starting the focus group discussions, information sheets about the scope of the study were distributed to participants. The information sheet showed that the participants were not obligated to contribute to the discussions, but could join in if interested; choosing not to take part, however, would not disadvantage participants in any way.

### 3. Results and discussions

#### *a. The level of climate change courses taught in the universities*

The results from this study show that the majority of the graduates from Nigerian universities who participated in the study had heard about climate change and that they developed awareness of climate change through different channels. Despite the fact that they are familiar with climate change, they have a diverse understanding of it. The results show that climate change has different meanings to different graduates. Their perceptions might be based on their views of the physical environment, the level of courses taught on climate change, and the degree received in the tertiary education. The majority of the participants were taught issues relating to climate change; the lessons were not extensive but were briefly discussed during lectures.

About 70.7% of them received a brief lecture in some special elective courses during their education, while a few (4.1%) were taught more than 3 semesters/terms, in some special elective courses (Table 2). In total the majority of graduates, about 69%, were taught issues on climate change briefly and nearly 15.7%, 9%, and 6.2% were taught courses on climate change in 1 semester/term, 2–3 semesters/terms, and more than 3 semesters/terms, respectively (Table 2). Many of the discussions on climate change were taught in the elective courses from geography, 63.3%, and environmental sciences, 23.8% (Table 2). The percentage of those who received lectures for more than 3 semesters/terms was very low, as presented in Table 2. This means that much of climate change issues were taught as brief discussions during lectures, mainly in elective courses, but the required courses were not fully focused on topics relating to climate change (Table 2).

Cohorts assessed their definition of climate change and global warming, and issues relating to both. They were asked questions, such as the definition of climate change and global warming, the causes of climate change, and their level of concern for climate change impacts on socioeconomic sectors; they were asked to differentiate statements and issues relating to climate change (What do you think of these statements?), and their experiential knowledge of the effects of climate change. Table 3 presents the results of the assessment of participants' understanding of the meaning and knowledge

TABLE 2. Formal exposure of Nigerian university graduates to climate change.

Topics on climate change	Required course		Elective course		Total	
	No.	%	No.	%	No.	%
1. Were you taught topics on climate change?						
Brief discussion during lectures	58	66.7	87	70.7	145	69.0
1 semester/term	12	13.8	21	17.1	33	15.7
2 or 3 semesters/terms	9	10.3	10	8.1	19	9.0
>3 semesters/terms	8	9.2	5	4.1	13	6.2
Total	87	100.0	123	100.0	210	100.0
2. From which department?						
Geography	35	61.4	98	64.1	133	63.3
Environmental sciences	18	31.6	32	20.9	50	23.8
Sciences (e.g., physics, chemistry)	2	3.5	10	6.5	12	5.7
Technology	0	0.0	9	5.9	9	4.3
Others	2	3.5	4	2.6	6	2.9
Total	57	100.0	153	100.0	210	100.0

of the issues relating to climate change. The results from the assessment of their knowledge of climate change and ranking values were converted to a percentage based on the number of students (Fig. 1). A larger percentage of graduates have a low level of knowledge of the meaning and some issues relating to climate change, while very few of them have a very high level of knowledge (Table 3). What is obvious from Table 3 is that very low percentages, 5.7% and 6.7%, have some high level of understanding of climate change with less than 4 years and more than 4 years of training in university, respectively. These proportions are very low compared to the percentages of those that have low knowledge: 56.6% and 55.8% during 1–4 years and more than 4 years of training in university, respectively (Table 3). This result indicates that the differences in the number of the years spent in university have nothing to do with the knowledge of climate change.

The results from this study also revealed that students in the environmental sciences (i.e., geography) have more (50.01%) knowledge of climate change than students in the humanities and other faculties (Fig. 1). This implies that the high level of understanding of climate change as shown in Table 3 were mainly students with class experience on climate change, who graduated from environmental sciences. The results from the focus group discussion further show that apart from environmental sciences departments, there were few related courses taught in other faculties, which had little or no climate change content in their curriculum. This may be because faculties of environmental sciences are the major university units that conduct research on environmental issues, such as climate change. It also shows that the majority of universities in Nigeria do not offer classes that address climate change.

Different responses were given to the question on the causes of global warming and climate change. About 80% of respondents listed the increase in atmospheric pollution; anthropogenic factors, such as industrial activities, the emission of chlorofluorocarbon, and the discharge of carbon (CO<sub>2</sub>); and the depletion of the stratosphere (the ozone layer of the atmosphere). What is obvious from Fig. 2 is that nearly 71% of respondents agreed that the fundamental cause of climate change was a combination of both human activity and natural processes. Though the participants of the present study were first asked whether they thought that the causes of climate change were from natural processes or human activity, they were given the option to record that they did not believe in climate change; this was a spontaneous option only. Thus, during the focus group discussion, the respondents who did not believe in climate change were not asked any further questions, though only a small number (5%) of them did not believe in climate change. The percentage of respondents who felt that the main cause of climate change was a combination of human activity and natural processes stated that they have “seen no significant change over the past few years.”

Consequently, about 80% of the respondents prioritized agriculture as the major sector of the economy that will be highly affected by a change in climate and 78%

TABLE 3. Level of climate change understanding among graduates.

Knowledge of climate change	No. of years in university	
	<4 yr (%)	>4 yr (%)
Very high	5.7	6.7
High	8.5	9.6
Moderate	29.2	27.9
Low	56.6	55.8
Total	100.0	100.0

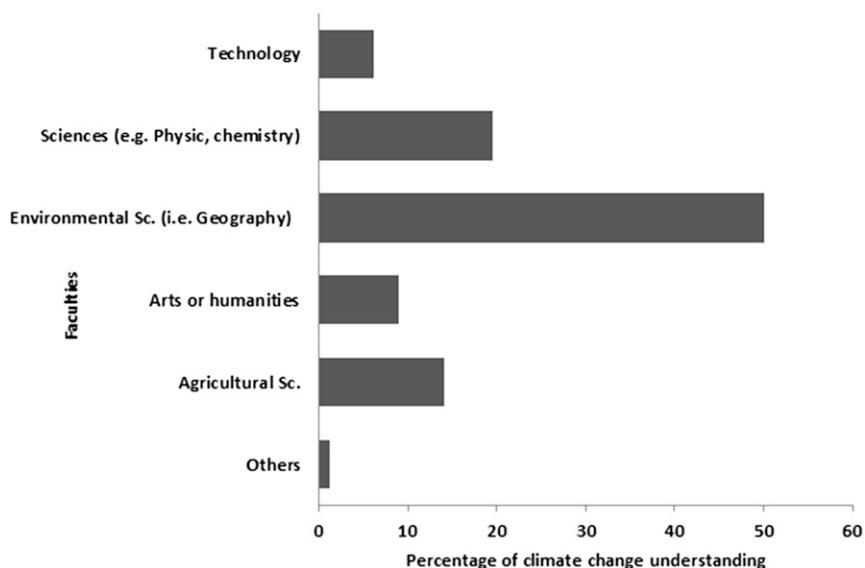


FIG. 1. Knowledge and understanding of climate change by subject.

prioritized that the impacts of climate change will be strong on the fishery sector (Fig. 3). Figure 3 shows that the participants believe that climate change will affect energy supply and demand (50%), and tourism sectors (48%). This finding is in line with the IPCC report that nearly all the sectors of the economy will be affected by climate change in the next few decades, but that the impacts would be felt more in the agricultural sector in Africa. The IPCC (2007) report highlighted the vulnerability of African agriculture and water resources and all that depend on them for food security and livelihood. It was predicted by the IPCC that agriculture in Africa will be affected by reduced growing seasons and higher

temperatures beyond the coping capability of the crops and water bodies. It was also predicted that rainfall crop yields in some countries will decrease by 50% and that an estimated 50–250 million Africans will face increased water stress by 2020. Other studies have reported the potential economic impacts of climate change and the policy structures that may be needed to assist the agricultural community in adaptation and mitigation (Fischer et al. 2005; Tol 2002; Howden et al. 2007; Smit and Skinner 2002; Smith et al. 2007; Thomas 2008; Murphy et al. 2016). These studies observed that climate policy risk is the potential threat posed by climate change regulations in the agricultural sector, to adapt

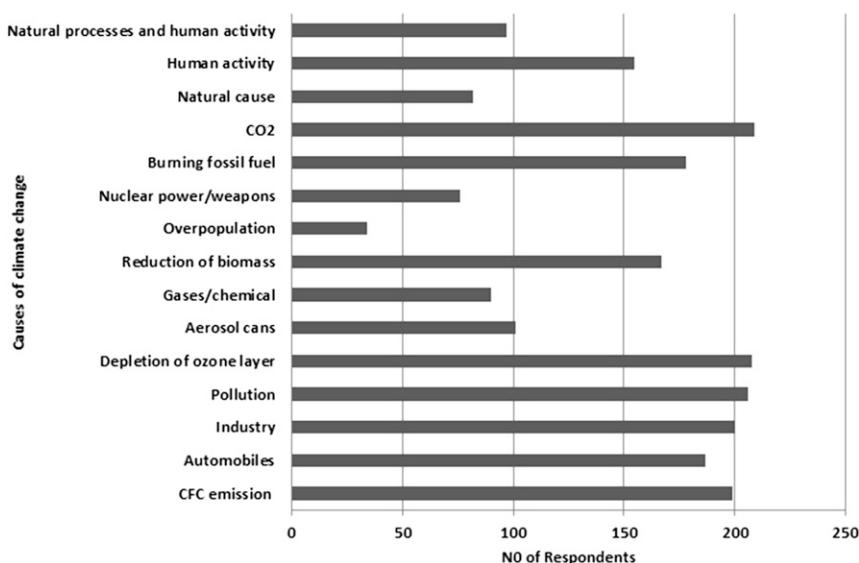


FIG. 2. Causes of climate change as perceived by participants.

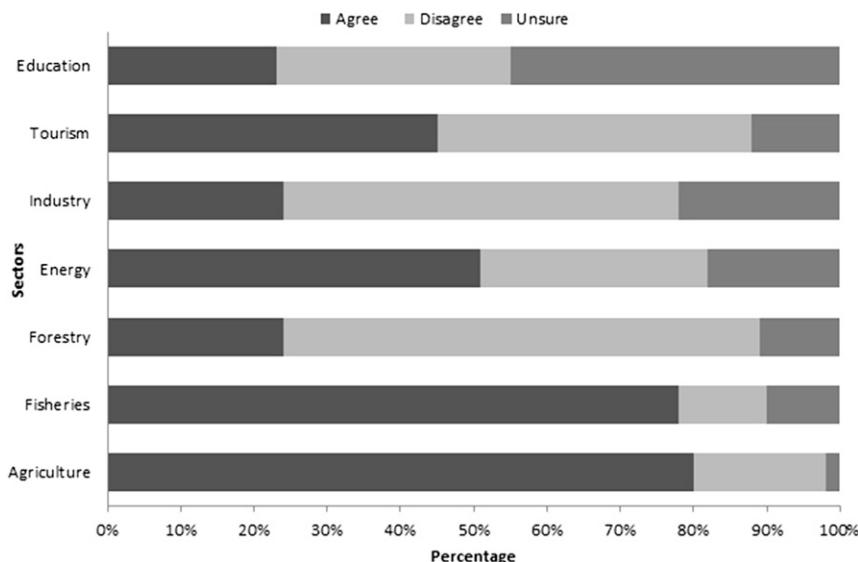


FIG. 3. Perception of climate change impacts on some sectors as a percentage of all answers.

and mitigate climate change. Thus, the findings from the present study revealed that the participants of this survey have some level of information on what the impacts of climate change might be and the sector of the economy that might be affected. The key issue is, What can be done to combat the impacts on the economy of the country? This question was asked during the focus group discussion, but the majority of the participants do not have a good idea of what could be the solution.

*b. Concern for local climate change impacts on socioeconomic sectors*

Figure 4 shows the participants' concern on the extreme-climate-related events. The responses of the participants vary when they were asked the following question during the focus group discussion: How concerned are you about the following climate-related events and the future impact they may have on different sectors of Nigerian economy? Here, their responses were ranked on a four-point scale ranging from very concerned to not concerned. This was used to obtain their perception of climate change impacts on some sectors as a percentage of all answers to the impacts and the risk.

There are two major findings from the focus group discussion. First, about 60% of respondents who believed in climate change were very concerned about the possible impacts on all sectors of Nigerian economy, especially the agricultural sector. Another major finding is that there were some significant differences in the level of concern of the respondents depending on whether they live in urban or rural areas and the location of their tertiary institutions. Respondents who

came from major urban and industrial cities of the country were more concerned about hotter temperatures and a more polluted atmosphere, while those that grew up in rural areas were much more concerned about the impacts on agricultural production. The majority of the participants who were from the southern part of Nigeria, especially those from cities close to the Atlantic Ocean, were very concerned about the rise in sea level and warmer sea surface that may result from climate change. Figure 3 shows that the highest concerns of people include crop death, an increase in erosion and flooding, a reduction in water availability, hotter temperatures, and famine. The majority of the respondents were very concerned that climate change might lead to crop yield failure (Fig. 4). This might be a result of a reduction in water availability from prolonged droughts. The respondents were very concerned that drought and crop failure might lead to famine. About 85% of the graduates that participated in the focus group discussion stated that they are very concerned that climate change might lead to famine due to crop failure. Some of them stated that the impacts of this might be a major concern, since the country's economy is primarily agrarian in nature. Some of the participants were also concerned about the recent increase in temperature and periodic extreme events of erosion and flooding, resulting in the spread of diseases (Fig. 4). They noted that a few years ago, the temperature had been hotter than usual and this is dangerous to both humans and agricultural activities.

The results from the focus group discussion are in line with the findings of Okali (2008) that climate change contributes to the global burden of disease and premature

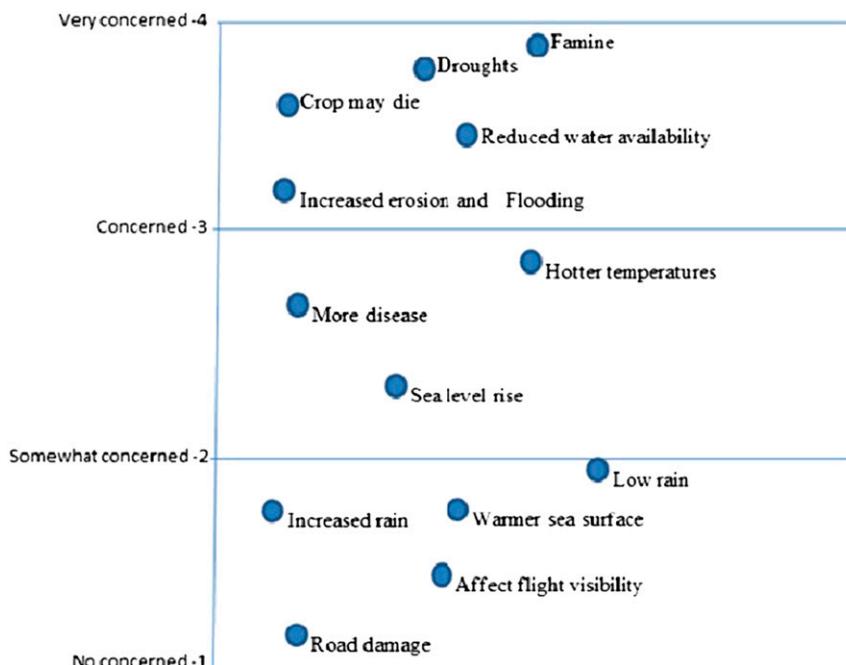


FIG. 4. Level of concern for climate change impacts on socioeconomic sectors.

deaths by a direct human exposure to changing weather patterns and indirectly through changes in water, air, and food quality, and changes in ecosystems, agriculture, industry, and settlements and economy. Since climate change is a threat to both biological diversity and socioeconomic activities of Nigerian citizens, the participants of this study were very concerned that water for agriculture and human consumption is also put under stress. The results mentioned above also show that few students receive a reasonable education about climate change in the universities' classrooms, but they have much knowledge of its potential impacts on Nigerian society and its economy. This implies that their perceptions of climate change were not essentially coming from the classroom. The question that could come to mind, since it does not appear to come from classes and formal education at universities, is "Where do students get this information?". Thus, it was obvious during the focus group discussion that students appear far more informed about climate change from information they received outside the classroom than the level of climate change education would suggest. When it comes to changes in temperature and rainfall, the majority of participants basically described personal observations and things they had read in the newspaper, seen on television, or read and heard on the Internet but not what they were taught in the classroom. There seems, therefore, to be a need to enhance the teaching of and learning about climate change in Nigerian universities, so as to expedite actions on adapting to climate change

among university students. This also calls for the need to link classroom activities to real-life issues relating to climate change.

In general, the results from this study revealed a need to introduce climate change studies into the curriculum of tertiary education in the country. Table 4 presents the perception of the graduates when asked the question about the need to include climate change studies in the university curriculum in Nigeria: 71% believed that climate change studies should be included as the required course, while about 29% perceived that it should be taken as an elective course at undergraduate levels in the universities (Table 4). For the postgraduate program, 85% of the participants believed that climate change studies should be taken as a major discipline in the universities. Earlier studies in other parts of the world have shown that those who have a basic understanding of the science and some level of understanding of climate change are more concerned with addressing climate change issues (Maddison 2007; Leiserowitz 2005, 2006; Amdu et al. 2013). Therefore, the introduction of climate change studies in Nigerian universities should be a top priority, one that can be addressed through science education and through a range of other communication, and education outreach strategies. Though implementation of climate change studies in the universities is a long-term venture, its returns can be quickly realized hereafter, with an understanding of climate change leading to informed action and more open discussion on adaptation (Leiserowitz

TABLE 4. The need to include climate change studies in the university curriculum in Nigeria.

Climate change studies	Required course		Elective course		Total	
	No.	%	No.	%	No.	%
1. Undergraduate						
As a discipline	71	40.3	10	29.4	81	38.6
1 semester/term	18	10.2	8	23.5	26	12.4
2 or 3 semesters/terms	25	14.2	9	26.5	34	16.2
>3 semesters/terms	62	35.2	7	20.6	69	32.9
Total	176	100.0	34	100.0	210	100
2. Postgraduate						
As a discipline	85	48.9	12	33.3	97	46.2
1 semester/term	12	6.9	3	8.3	15	7.1
2 or 3 semesters/terms	23	13.2	7	19.4	30	14.3
>3 semesters/terms	54	31.0	14	38.9	68	32.4
Total	174	100.0	36	100.0	210	100.0

et al. 2011). Thus, the introduction of climate change and societal implications in Nigerian universities might aid better understanding and the views of people for a need to adapt and facilitate support for policy-related adaptation decisions.

#### 4. Conclusions

Awareness and understanding of climate change are indispensable for better assessment of its impacts and risks at both global and local scales (Hansen et al. 2012). In this study, we examined the awareness and perception of university graduates of climate change and its potential impacts on some sectors in Nigeria. Graduates were selected for this study because they are the future generation who will be in charge of the management of climate hereafter.

Three major findings are obvious from this study. First, a majority of participants in the survey have an understanding of climate change, while just a small proportion of them do not. The respondents who understand the concept of climate change were very concerned about the possible impacts on all sectors of Nigerian economy, especially the agricultural sector. Second, there are some significant differences in the level of courses taught and in understanding of climate change in Nigerian universities. Also, the level of concern of respondents varies and this depends on whether they live in urban or rural areas and the location of their tertiary institutions.

A major reason why climate change should be included in the curriculum of universities is that this will aid better understanding of climate change issues and both global and local adaptation strategies. The introduction of climate change studies as a required course in universities has a fundamental role in helping the general public. There is a need for intensive teaching on key lessons on climate change issues, such as the

greenhouse effect, global warming, and weather-related disasters. Key lessons on climate change issues should be taught in the form of an interdisciplinary approach, since climate change might affect nearly all sectors of human activities (Fischer et al. 2005; Ebi et al. 2006). The major conclusion of this study is that tertiary education institutions in Nigeria have a vital contribution to make in improving educator content knowledge and in increasing climate change literacy of its own graduates, by addressing the need for curriculum reform, to change from traditionally emphasized credits in art and natural sciences to those in the earth and environmental sciences.

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