

*Full Length Research Paper*

# **Public perception of the risk of climate change issues in Zaria city and its environs in Kaduna State, Nigeria**

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**Many researchers, climatologist, engineers and environmentalists are expressing deep concerns about changes in the overall climate system of the earth. Does the public perceive climate change to have occurred already? What are their sources of information? This study analyzed the public perception of climate change issues in Zaria city and its environs, Kaduna State, Nigeria. The objective of this paper was to analyze the public's level of awareness and perception on climate change issues. Four hundred respondents were randomly sampled and administered questionnaire. Open-ended questions were used to ask the respondents whether they had noticed long-term changes in temperature and rainfall. The study revealed that the public perceptions of climatic change in the study area were in line with climatic data records. Eighty-two percent of the respondents are well aware of climate change issues. The electronic media (television and radio) was the major source of awareness on climate change issues followed by schools. The result further revealed that the inhabitants of the city are to a large extent aware of the dynamics of the local climate. Indeed, age, occupation and level of education affected the respondents' knowledge on climate change issues. Based on these findings, some recommendations were made, which include the need for a comprehensive environmental education, studies on climate change and other environmental issues should be integrated into the primary, secondary and tertiary school curriculum among others.**

**Key words:** Awareness, climate change, climate variability, perception, Zaria city.

## **INTRODUCTION**

The hazards caused by global warming are continuously causing major damage to the Earth's environment. Most people are still unaware of global warming and do not consider it to be a big problem in years to come. What most people do not understand is that global warming is currently happening, and we are already experiencing

some of its withering effects. It is and will severely affect ecosystems and disturb ecological balance. Owing to the treacherous effects of global warming, some solutions must be devised (Shahzad, 2015). The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC, 2007) affirmed that climate

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change is no longer in doubt, it is now communally believed to be a foremost global problem. Although, extreme violent weather has occurred throughout history, recent upsurge in climate related hazards is confirming the argument for global warming and climate change (Odjugo and Ikhuoria, 2003; Nwafor, 2006). The evolving climate change coupled with increasing temperature has been observed to plunge some localities. The IPCC (2001) projected that climate change resulting from increased greenhouse gases concentrations has the potential to harm societies and ecosystems, agriculture and water resources among others.

Climate change is said to exist when the level of climatic deviation from the normal is very significant over a long period of time (preferably centuries) and such deviations have clear and permanent impacts on the ecosystem (Odjugo, 2009). IPCC (2007) defined climate change as a change in the state of the climate that can be identified (using statistical tests) by changes in the mean and/or the variability of its properties, which persists for an extended period typically decades or longer. Climate change, in the most general sense – encompasses all forms of climatic inconstancy (that is, any difference between the “long-term” statistics of the meteorological elements calculated for different periods but relating to the same area), regardless of their statistical nature or physical cause (Maunder, 1994). Climate change implies a new mean climatic state or climatic normal (Ayoade, 2002). The most crucial thing about the concept of climate change is not only the time periods involved but also the degree of variability that the change is subjected to as well as the duration and impact of such variability on man and the ecosystem.

According to Shahzad (2015), global warming begins when sunlight reaches the Earth surface. The clouds, atmospheric particles, reflective ground surfaces and surface of oceans then sends back about 30% of sunlight back into the space, whilst the remaining is absorbed by oceans, air and land. This consequently heats up the surface of the planet and atmosphere, making life feasible. As the Earth warms up, this solar energy is radiated by thermal radiation and infrared rays, propagating directly out to space thereby cooling the Earth. However, some of the outgoing radiation is re-absorbed by carbon dioxide, water vapours, ozone, methane and other gases in the atmosphere and is radiated back to the surface of Earth. These gases are commonly known as greenhouse gases due to their heat-trapping capacity. It must be noted that this re-absorption process is actually good as the Earth's average surface temperature would be very cold if there was no existence of greenhouse gases.

The ozone layer is a layer in Earth's atmosphere which contains relatively high concentrations of ozone (O<sub>3</sub>). This layer absorbs 93 to 99% of the sun's high frequency ultraviolet light, which is potentially damaging to life on earth (Albritton, 1998). According to McMichael (1993),

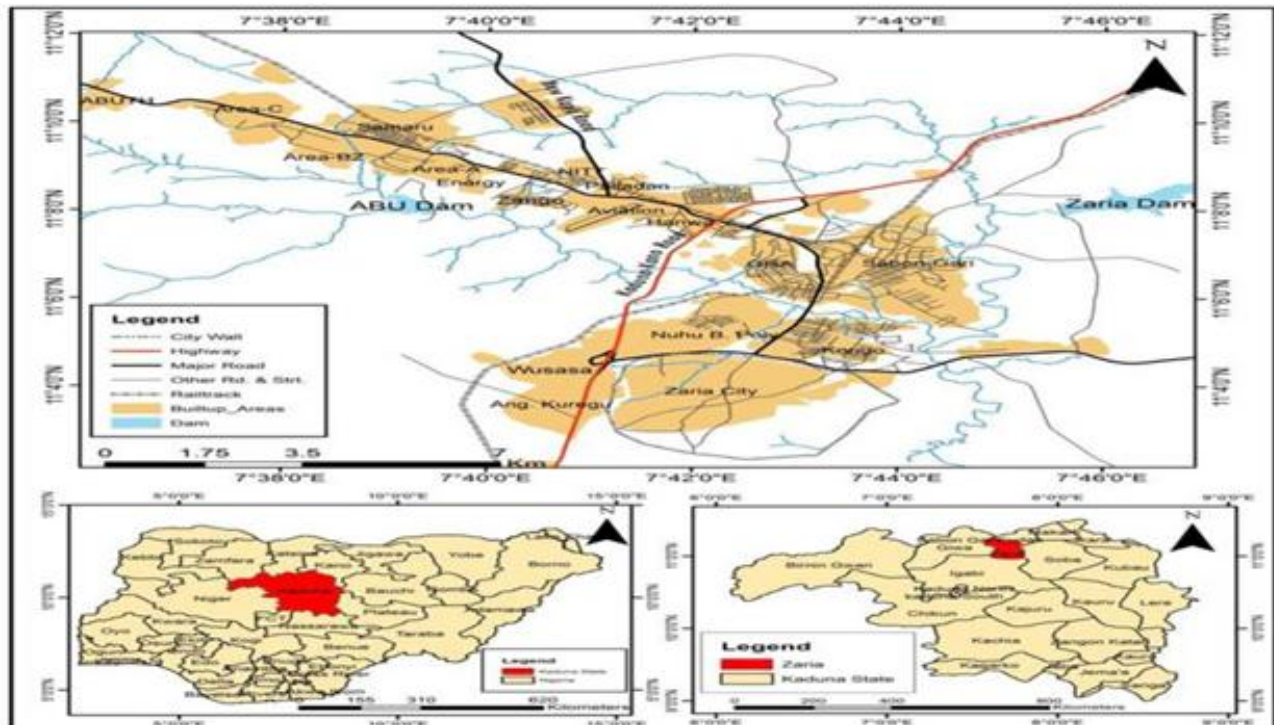
ozone depletion is a process that results from the accrual of greenhouse gases in the troposphere. Ozone depletion occurs when the natural balance between the production and destruction of stratospheric ozone is tipped in favour of destruction. Although natural phenomena can cause temporary ozone loss, chlorine and bromine released from man-made compounds such as CFCs are now accepted as the main cause of this depletion. In particular, most of the atmosphere's ozone resides within the stratosphere. The ozone layer absorbs much of the incoming solar ultraviolet radiation (UVR) and thus offers substantial protection from this radiation to all organisms living at, or near to, Earth's surface. Intriguingly, atmospheric ozone is not part of the planet's original system but a product of life on Earth.

Climate Change would directly or indirectly affect human health and settlements in Nigeria. According to Odjugo (2010a), about 15% of the country's population is presently affected by climatic variation and sea level changes. With climate change, between 50 and 60% of the population would be affected. The excessive heat, increasing water stress, air pollution and suppressed immune system occasioned by climate change will result in increasing incidence of excessive death due to heat exhaustion, famine, water related diseases (diarrhea, cholera and skin diseases), inflammatory and respiratory diseases (cough and asthma), depression, skin cancer and cataract (DeWeerd, 2007).

One of the greatest impacts of climate change is the worsening condition of extreme weather events like drought, flood, rainstorms, windstorms, thunderstorms and landslides and among others (Odjugo, 2001). Odjugo (2009) noted that the frequency and magnitude of wind and rainstorms did not only increase, they also killed 199 people and destroyed property worth 85.03 billion naira in Nigeria between 1992 and 2007. Odjugo (2010b) showed that climate change has shortened the growing season which has led to a shift in crops cultivated in northern Nigeria. The sea incursion is reducing the arable land of the coastal plains, and desertification with its associated sand dunes is depriving farmers of their agricultural farmlands and grazing rangelands.

The term perception is generally understood to mean an attitude or understanding based on what is observed or thought. Perception is a process by which people interpret and organize sensation to produce a meaningful experience of the world. Perception is the process by which we receive information or stimuli from our environment and transform it into psychological awareness (UNFCCC, 2006). Doss and Morris (2000) opined that the perspectives of the people in an environment, the way they think and behave in relation to climate, as well as their values and aspirations have a significant role to play in addressing climate change.

Awareness is having a knowledge or understanding of a subject, issue or situation. It is instructive to note that individuals understand certain situations or phenomena in



**Figure 1.** Map of Zaria City and its environs.  
Source: Administrative map of Zaria, 2017.

different ways using very similar or dissimilar sets of information. Banjade (2003) opined that knowledge, interest, culture and many other social processes can shape the behaviour of an actor who uses information and attempts to influence that particular situation or phenomenon. Perception varies with the individuals' past experiences and present sets or attitudes acting through values, needs, memories, moods, social circumstances, and expectations.

In spite of this, traditional people are only rarely considered in academic, policy and public discourses on climate change, though the impact of impending changes of climate is greater on them (Adefolalu, 1986). Does the public perceive climate change to have occurred already? What are their sources of information? Does age, occupation and educational level of the respondents affect their knowledge of climate change? What, if any, is the role of government, individuals and Non-Governmental Organizations (NGOs) in addressing the impacts of climate change? These are the questions this paper aimed to address.

## MATERIALS AND METHODS

The study area is located approximately within Latitude  $11^{\circ} 40'N$  and  $11^{\circ} 10'N$  of the Equator and Longitude  $7^{\circ} 38'E$  to  $7^{\circ} 46' 00'E$  of the Greenwich meridian (Yusuf, 2013). It is located in Zaria Local Government Area of Kaduna State. Zaria is the second largest town in Kaduna State after Kaduna town. Zaria has a total land mass of

about  $61\text{Km}^2$  and it is located at an average height of about 600 meters above sea level which is characterized by the bedrock of metamorphic rocks of the basement complex. The soils of Zaria are basically leached ferruginous tropical soils (Mortimore, 1970). The river system of the study area is dendritic in nature and the major rivers found are Galma, Kubanni, Kamacha, Saye, Shika and Yashi (Figure 1). Zaria has a population of about 408,198 people (2006 Census). The settlement pattern of the study area is mainly nucleated. Most of the populations are engaged in agriculture, trading, civil service jobs etc. (Yusuf, 2013). Data on the public perception of climate change issues in the study area were collected through structured questionnaire. The questionnaire was randomly distributed to four hundred (400) sampled respondents in the study area. Results of the study were analyzed using chi-square and summarized and presented in charts and tables.

### Climatic characteristics of Zaria

Figure 2 shows the total annual rainfall pattern of the study area. The trend line equation  $Y = 6.7883x + 914.83$  indicates an increasing total annual rainfall amount in the study area. Figure 3 shows the maximum temperature of the study area. The trend line equation  $Y = 0.0338X + 33.395$  shows an increasing temperature in the study area.

## RESULTS AND DISCUSSION

### Public awareness of climate change

The results of the awareness of climate change issues

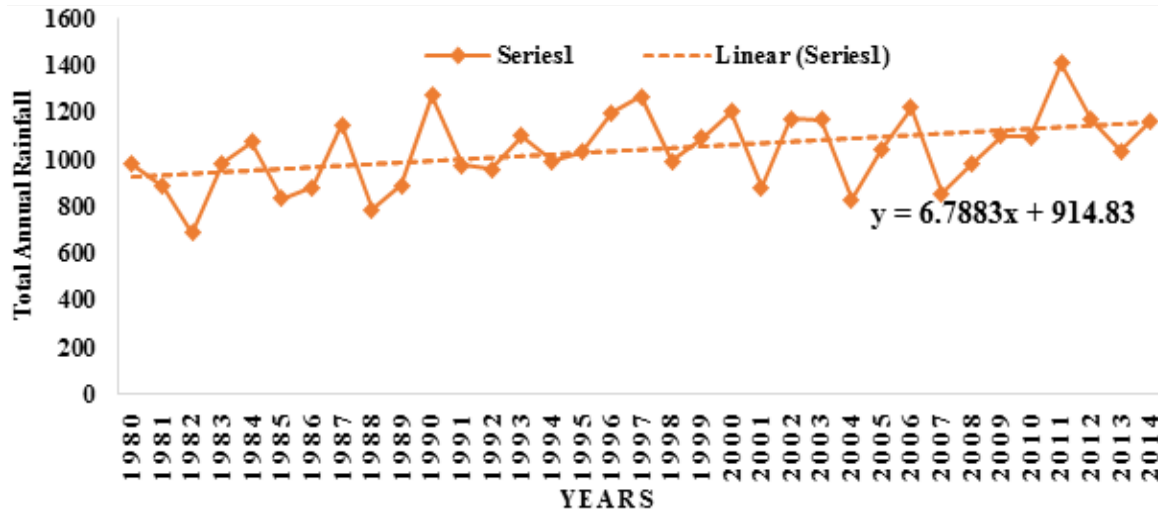


Figure 2. Total annual rainfall of Zaria.

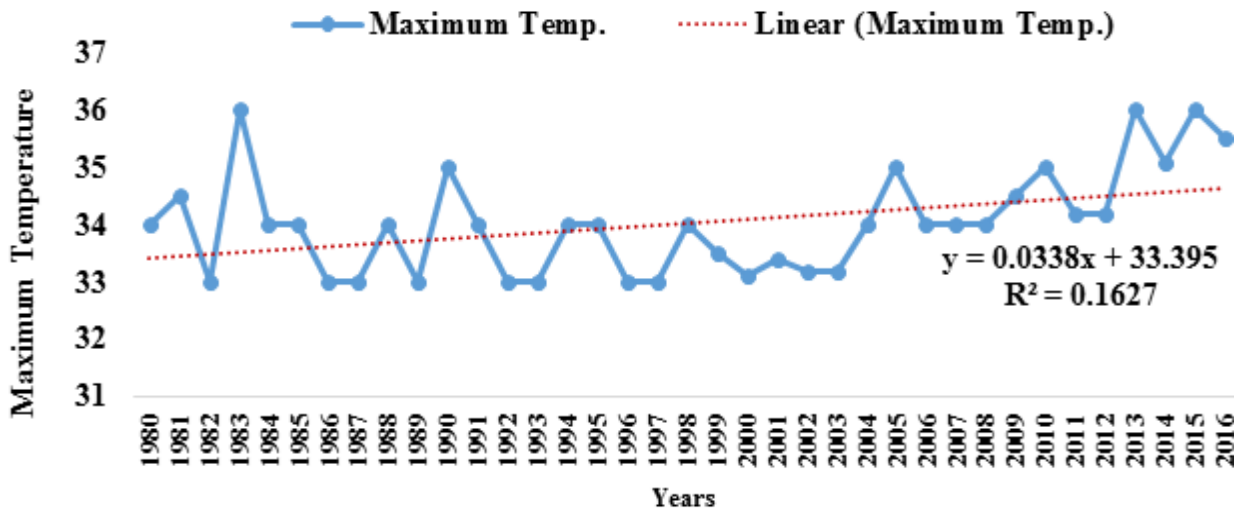


Figure 3. Maximum temperature of Zaria.

are presented in Table 1. The result shows that 82% of the respondents are aware of climate change issues in the study area, while 18% are not aware. According to Maddison (2006), respondent's awareness of change in climate attributes (temperature and precipitation) is important to adaptation decision making. The awareness of climate problems and the potential benefits of taking action is an important determinant of adoption of agricultural technologies (Hassan and Nhemachena, 2008). Araya and Adjaye (2001) reported that respondents' awareness and perceptions of climate change in an environment positively and significantly affect their decisions to adopt viable adaptation measures. This result agrees with the findings of Agboola and Emmanuel (2016) which indicated that 97% of

undergraduates in Southwest Nigeria are aware of climate change. There is tendency of the years of awareness of climate change to have positive effect on the adaptation strategies used by the respondents, that is, the higher the number of years of awareness the more experienced the respondents in coping with the change in climate (Otitoju, 2013).

Table 2 presents the age of the respondents and their knowledge on global climate issues. The result of the age and knowledge of global climate change issues indicate that age of the respondents affects their knowledge of climate change issues. Respondents who are between 20 years and 40 years are better informed about global climate change issues as shown in Table 2. This could be as a result of their active mind in education and exposure

**Table 1.** Public awareness of climate change issues in Zaria and its environs.

<b>Awareness</b>	<b>Respondents</b>	<b>Percentage</b>
Yes	328	82
No	72	18
<b>Total</b>	<b>400</b>	<b>100</b>
<b>How long have you heard about climate change?</b>		
1 - 5 Years	146	36.5
6 - 10 years	102	25.5
11 - 15 years	62	15.5
16 - 20 years	36	9
21 - 25 years	24	6
26 - 30 years	18	4.5
≥31 years	12	3
<b>Total</b>	<b>400</b>	<b>100</b>

Source: Field Survey 2016.

**Table 2.** Age and knowledge of global climate change issues in Zaria and its environs.

<b>Age (years)</b>	<b>Global climate change (%)</b>	<b>Global warming (%)</b>	<b>Ozone depletion (%)</b>	<b>Greenhouse gases (%)</b>
Less than 20	75	62.5	43.8	62.5
20 - 29	92	92.8	88	88.8
30 - 40	82	78.6	78.6	75
41 - 50	69.5	78.3	69.6	73.9
≥51	75	75	62.5	62.5
Chi square test	0.000*	0.000*	0.000*	0.000*

\*Significant at 0.05.

**Table 3.** Education and knowledge of global climate change issues in Zaria and environs.

<b>Education</b>	<b>Global climate change (%)</b>	<b>Global warming (%)</b>	<b>Ozone depletion (%)</b>	<b>Green house gases (%)</b>
None	40	40	46.6	26.6
Primary	63.3	60	70	66.6
Secondary	71.8	68.8	78.1	75
Tertiary	94.2	94.2	93.1	94.2
Traditional	83.3	80.5	72.2	75
Chi square test	0.000*	0.000*	0.000*	0.000*

\*Significant at 0.05.

to the social media. The result agrees with the study of Hassan and Nhemachena (2008) reported that the experience and ability of the respondent to observe climatic changes in the environment matters more than merely the age of the respondent when it comes to adaptation to climate change. They argued that a keen personal observation of the physical environment increases the probability of a respondent's awareness and knowledge of climate change. This result disagrees

with the study of Deressa et al. (2008) who argued that the older the respondents, the more his awareness and experience in knowledge of climate change and the more exposed to past and present climatic conditions over a longer horizon of his lifespan. This disagreement is on the perspective that the age of the farmers is related to his years of experience in farming activities.

Table 3 presents the level of education of the respondents and their knowledge on global climate

**Table 4.** Occupation and knowledge of global climate change issues in Zaria and environs.

Occupation	Global climate change (%)	Global warming (%)	Ozone depletion (%)	Green house gases (%)
Farmers	82.6	60.8	60.8	56.2
Traders	76	80	68	44
Students	78.9	84.2	78.9	84.2
Professionals	77.7	77.7	77.7	66.6
Civil servants	92.5	87.5	90	87.5
Other Professionals	94.4	88.8	83.3	88.8

**Table 5.** Gender and knowledge of global climate change issues in Zaria and environs.

Gender	Global climate change (%)	Global warming (%)	Ozone depletion (%)	Green house gases (%)
Male	83.9	76.9	75.5	69.9
Female	82.4	66.6	64.9	61.4
Chi square test	0.000*	0.000*	0.000*	0.000*

change issues in the study area. Higher level of education is often hypothesized to increase the knowledge and awareness of climate change and the probability of adopting new strategies (Adesina and Forson, 1995). Indeed, education is expected to increase one's ability to receive, decode, and understand information relevant to making innovative decisions (Wozniak, 1984). According to Enete et al. (2011), education has a positive and highly significant relationship between the farmers' level of education with the level of investment in indigenous and emerging climate change adaptation practices. This is to be expected as educated farmers may better understand and process information provided by different sources regarding new farm technologies, thereby increasing their allocation and technical efficiency. Table 3 showed that the respondents with tertiary education are better informed about climate change issues in the study area. This result agrees with the findings of Nkonya et al. (2008) who acknowledged that education increases one's ability to perceive climate change. Similarly, Gbegeh and Akubulo (2013) have found that education empowers a respondent to access and conceptualize information relevant to making innovative decision. However, it disagrees with the study of Constable (2016) which observed that education does not influence one's knowledge of climate change. This disagreement was predicated on the fact that most of the farmers based in the rural areas are not well educated, yet they do well in farming activities.

Table 4 shows the relationship between occupation and knowledge of global climate change issues in the study area. The result shows that occupation affects ones' knowledge of climate change. The result revealed that

farmers, students and Civil servants are better informed about climate change issues. The students must have read or taught about climate change issues in school. Researchers, environmentalists and policymakers are now advocating that climate change be integrated into the Nigerian curriculum system. The civil servants have access to different sources of information (print and media) on climate change issues, while the farmers through their experience and personal observation on farming activities have information on climate change.

The relationship between the knowledge of global climate change issues and gender is presented in Table 5. Table 5 indicates that gender affects one's knowledge on global climate change issues as males are better informed about climate change issues than the females as shown in Table 5. This result agrees with the findings of Umar et al. (2015) which reported that males dominate the agricultural workforce in Sokoto State with 99.1%, while female were about 0.9%. The results further agree with the observation of Adedoyin et al. (2005) who reported that women are restricted from actively participating in farming and other outdoor activities as a result of the socio-religious belief in northern Nigeria which affect their empirical knowledge on climate change issues.

#### **Sources of awareness on climate change issues in Zaria and its environs**

Among the many sources of information available to respondents on climate change related issues in the study area, electronic media is the most important source, followed by the school, printed materials and personal

**Table 6.** Sources of information on climate change issues in Zaria and its environs.

Sources	Respondents	Percentage (%)
Interacting with friends	30	7.5
School	50	12.5
Printed materials	40	10
Electronic media	112	28
Personal observation	40	10
All of the above	128	32
<b>Total</b>	<b>400</b>	<b>100</b>

**Table 7.** Public perception on weather and climate indices in Zaria and its environs.

Perception	Agreed (%)	Disagreed (%)	Undecided (%)
Total annual rainfall amount is increasing	77	18	5
Temperature is increasing	70	21	9
Number of rainy days have reduced compared to the past 5 years	67	22	11
Rain episodes are stormier now compared to the past 5 years	63	21	17
Floods after rain are more common now that 5 years ago	74	21	5
Harmattan period is now short compared to the past 5 years	47	38	13

observation (Table 6). That the majority stated that they got information on climate change from the electronic media disagrees with the study of Umar (2015) which reported that 96% of respondents in his study at Katsina identified friends and extension workers as important source of information on climate change which implies that information on climate change is majorly disseminated informally in his study area. The results further agree with the findings of Ejeh (2014) which stated that the respondents in Kano State received information on climate change majorly from Radio and Television as agreed by 73.1% of his respondents. The results further disagree with the findings of Ikpe (2021) which reported that grain farmers in Sokoto State, Nigeria got their information on climate change from personal observation and from interacting with friends. Personal observations and interaction with friends and researchers are viable sources of information on climate change issues. As earlier discussed, the students are well informed about climate change issues compared to traders.

This finding is in agreement with the findings of IPCC (2007) that media plays an important role in improving the "disaster reduction consciousness" of the general population and disseminating early warnings. In many cases, the media is the primary means of communication between policy makers, practitioners, and the public. In this regard, the media carries a great responsibility to serve the needs of their audiences, and policy makers and practitioners are tasked with improving ways to formulate messages that are "newsworthy" and attract the media.

The public perceptions on weather and climate change indices are presented in Table 7. The public perception on weather and climate change indices was analyzed; 77% of the respondents agreed that rainfall amount is increasing in the study area; 18% disagreed and 5% were undecided that rainfall amount is increasing in the study area. There is also a general consensus among households in the study area that temperatures have increased over the years. Trend analysis of the climatic data used for this study period (1970 - 2016) also revealed that recent trend in rainfall is increasing and temperature is getting warmer in recent years. The result that the number of rainy days is decreasing in study area as indicated by 67% of the respondents agrees with the study of Odjugo (2010b) who observed that rainfall amount and duration is decreasing as rainfall amount was reduced by 178mm within the 70 years reviewed (1940 - 2010) in the Northwest States of Sokoto and Zamfara.

Seventy-four percent of the respondents agreed that floods after rain are more common in recent years compared to the past five years; 21% disagreed, while 5% were undecided. Vincent and Afokoghene (2014) in their study: Natural hazard and crop yield in south-south Nigeria reported that the farmlands of Oleh community (South-south of Nigeria) have been subjected to seasonal flood events during and after every rain throughout the period of 2011 and 2012. The study further revealed that all the food crops cultivated by the inhabitants of Odah, Iwhreotah and Erorin quarters are affected by flooding. The results of the analyzed data showed satisfactory impact of flooding on crop yield in the area. Forty-seven



percent of the respondents agreed that Harmattan period is now shorter compare to the past 5 years. This result agrees with the study of Umar et al. (2015) who reported a shortening Harmattan season in Sokoto State.

## CONCLUSION AND RECOMMENDATIONS

The findings of the study revealed that majority (82%) of the public are well aware of climate change issues. Public perceptions of climatic variability are in line with the reviewed climatic data records. Also, age affects knowledge on global climate change issues as those from 20 years to 40 years have better knowledge and practical experience of climate change issues. Education and occupation are major determinant of the level of awareness of global climate change issues as those with tertiary education, civil servants and students are better informed about climate change issues in the study area. Moreso, electronic media is the main source of awareness on climate change issues.

Following the findings of the study, the following recommendations are made:

1. Since the electronic media is the main source of awareness on climate change issues, the government and relevant organizations should utilize the advantage of the public media to educate more and inform the general public on climate change issues.
2. Studies on climate change and other environmental issues should be integrated into the primary, secondary and tertiary curriculum. Further studies of the science of climate change and its potential impacts in Nigeria are important in creating awareness and providing the background information for targeting policies adequately.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interest.

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