

CLIMATE CHANGE PERCEPTION IN SAMARU, SABON-GARI LOCAL GOVERNMENT AREA OF KADUNA STATE, NIGERIA

By

^aIsma'il, M*., ^aMuhammad, M. A., ^aSalisu, A., ^aKim, I. ^bMusa, I. and ^cIbrahim, I. D.

^aDepartment of Geography, Ahmadu Bello University, Zaria

^bDepartment of Geography, Federal College of Education, Zaria

^cDepartment of General Studies, Nuhu Bamalli Polytechnic, Zaria

*Correspondent's Email: mgeogjameel@yahoo.com

ABSTRACT

This study examined how the residents in Samaru, Sabon Gari Local Government Area of Kaduna State, Nigeria perceive climate change and their adaptation strategies. A total of 200 questionnaires were administered to respondents in the study area over a period of two weeks. Systematic random sampling technique was used in the administration of the questionnaire. Findings revealed that Samaru residents perceived climate change in form of temperature and rainfall variabilities. Results showed that 57% of the respondents believed temperature has been rising over the past few years, while 11% of the respondents said that the temperature is decreasing, while about 32% of the respondents perceived no change in temperature condition over the years. Moreover, about 64% of the respondents confirmed that rainfall is decreasing every year, while 25% believed that rainfall is increasing and about 11% viewed rainfall conditions to be normal. Majority of the people attributed the climate change to human activities such as deforestation and urbanization, while some few view the change as a result of natural factors, and a very little see it as an act of God. It was discovered that the people have developed some climate change adaptation strategies which include planting different varieties of crops and irrigation/fadama farming. Although there is some level of awareness on climate change among the people, there is the need to increase the level of awareness through enlightenment.

Key words: Climate Change, Perceptions, Adaptation, Samaru, Basawa, Sabon-gari

INTRODUCTION

Climate change is defined in the Article 1 of the United Nations Framework Convention on Climate Change (UNFCCC: 1992), as “a change of climate which 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 periods”. Climate change is principally caused by the emission of greenhouse gases into the atmosphere from energy production and consumption. The energy sector is responsible for 84% of global CO₂ emissions and 64% of the world's greenhouse-gas emissions (International Energy Agency, 2009). The greenhouse gases include Carbon dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O), Sulphur Dioxide (SO₂), Hydrofluorocarbons (HFCs), Hydrochlorofluorocarbons (HCFCs), and Carbon Monoxide (CO). Increasing greenhouse gases in the atmosphere results into continuous trapping of heat within the earth's atmosphere leading to rising global atmospheric temperatures referred to as global warming. Global warming according to De Chavez and Tauli-Corpus (2008) is the

average increase of the earth's surface temperature and oceans as compared to previous centuries. Global warming is one of the key aspects of climate change (Faraut, Egbule, Idrisa and Agu, 2011). Misconceptions about climate change are among the most important problems facing climate change campaigns. Studies by Kempton (1991) and Lofstedt (1991) revealed how many people confuse stratospheric ozone depletion with the greenhouse effect and weather with climate whereas only few people perceived links between energy use, carbon dioxide and climate change. These misconceptions affect people's attitude to climate change. Bostrom and Lashof (2007) proposed the use of mental models and effective ways of presenting the climate issue that suggest the right causes in order to improve the public's understanding of climate change and influence them toward taking action. This suggests that our mental perception of climate change determine how we respond to it.

Stamm, Clark and Eblacas (2000) discovered that although people are aware of climate change in a general sense, their perceptions of it causes and consequences differ greatly. This is evidenced in the findings of a national survey conducted from November 2002 to February 2003 to investigate the role of affective imagery in American global warming risk perceptions as reported by Leiserowitz (2007). The survey concludes that "most Americans lack vivid, concrete and personally relevant affective images of climate change" (Leiserowitz, 2007: 50). Moreover, Bostrom and Lashof (2007) mentioned that while majority of Americans believe that anthropogenic factors have contributed to global warming, many also still view it as natural. We can see how perception of climate change has divided Americans and consequently their cause of action. Therefore any climate change policy formulation should consider perception as a key issue. In addition to a lack of basic knowledge about the causes of climate change, Lorenzoni and Pidgeon (2006) identified inadequate information about its links with environmental issues and partial evidence to be among the most important barriers to individual understanding and engagement with climate change. Moreover, studies have shown that understanding the correct causes of global warming is central in influencing peoples' attitude and winning their support to address global warming (Bord, O' Connor and Fisher, 2000; Bostrom and Lashof, 2007).

Furthermore, addressing climate change requires engaging both the stakeholders and the general public. In order to motivate people to understand climate change and orientate their attitude towards addressing its impact, there is the need to appraise their perceptions of climate change. Many factors affect the public's perception of climate change. These include educational, demographics and social factors. Hence people's perceptions of climate change vary from one place to another (Lorenzoni and Pidgeon, 2006). Weber (2010) revealed in a study on the relationship between environmental views and climate change perceptions that individual's physical surrounding and experiences influence his perception of climate change. Ishaya and Abaje (2008) examined climate change perceptions and adaptations among indigenous people in Jema'a Local Government Area of Kaduna State. Their findings revealed that the peril of climate change is more on health, food supply, biodiversity loss and fuelwood availability than on businesses; and it is the poor that are the most vulnerable because they depend heavily on the natural resources that are mostly affected by incidence of climate change. In adapting to climate change, they found that indigenous people cultivate different varieties of crops which are tolerant to climate change and shortening of growing season as adaptation strategies. Mertz, Mbow, Reenberg and Diouf (2009) reported that households in rural areas of Eastern Saloum of Senegal identified wind and occasional excess rainfall as the most destructive climate factors suggesting that they are aware of climate variability. They also attributed poor livestock health, reduced crop yields and a range of other problems to climate factors. Odjugo (2011) conducted a survey

on climate change perceptions in the Niger Delta. The findings revealed that “42% of the respondents are ignorant of the concept of climate change while those who have varying degree of knowledge on the causes and effects of climate change show that the television and radio are the main sources of their information”. The author also discovered that majority of the people within the Niger Delta region of Nigeria have very poor knowledge of the causes and effects of climate change. Although the respondents were able to identify increasing temperature and changes in rainfall pattern as the main effects of climate change in their locality, they are unaware of other devastating effects like melting of polar ice, sea level rise and desertification outside their locality. Moreover, Odjugo (2011) observed that although most local perceptions of climate change did not conform to scientific data, local knowledge can be rapidly and efficiently gathered using systematic tools. Such knowledge according to him is useful to scientists for research and to policy makers for climate change mitigation and adaptation strategies in the Niger Delta.

Findings of a survey on climate change adaptations in four states (Adamawa, Borno, Kaduna and Kogi) of Nigeria as reported by Farauta et al (2011) showed that the respondents were aware and knowledgeable on the issue of climate change, and sources of information were mainly from mass media. The study showed that there was an increase in the incidence of climate change in the area as symbolised by low rainfall, higher temperature and desertification. The study further revealed overgrazing of farmland by livestock, deforestation and bush burning among the perceived causes of climate change. This study investigates the perceptions of climate change among Samaru residents in Sabon Gari Local Government Area of Kaduna State in northwestern Nigeria, and their adaptation strategies, with a view to find out whether the situation in the area is different from that of south-southern Nigeria and other parts of Africa as reported in the literature.

THE STUDY AREA

Samaru is located on latitude 11° 10' N and longitude 7° 37'E in Sabon Gari Local Government Area (LGA) of Kaduna State, northwestern Nigeria. It is about 15Km north west of Zaria City along the Zaria –Sokoto trunk 'A' road, 8Km from Shika and 9Km from Basawa Barrack. It is about 2,200ft above sea level. Samaru falls under the tropical continental climate according to Koppen's climate classification. The region has a distinct wet and dry season which are under the influence of the north-easterly trade wind (dry and cold Harmattan wind from the Sahara Desert) and the south-westerly trade winds (warm and moist monsoon from the Atlantic Ocean) respectively. It is also characterized by relative wide rapid change in temperature and humidity in the beginning of Harmattan period.

The mean minimum temperature rises from its lowest value of 10°C in December and January to the average maximum temperature of 33°C reaching its peak in April with a temperature of 41°C. The annual rainfall is about 1200-1500mm. The rainy season starts around the month of May and lasts till October while the dry season starts in the month of November and ends in April. The region has a single minimum rainfall which occurs during the month of August with a mean annual rainfall of about 1,100mm. Samaru is one of the urban areas and one of the largest and the most densely populated districts in Sabon Gari LGA of Kaduna State. It is heterogeneous in nature with people from different parts of Nigeria. It is inhabited by indigenous Hausas and other ethnic groups who migrated in as a result of trade, commerce, civil service, lecturing, education and various job opportunities. Samaru is an area hosting Ahmadu Bello

University, Zaria. The residents of the area consist of workers, students and traders directly or indirectly linked to the university or other nearby institutions. The University is the biggest employer of labour in Samaru area.

MATERIALS AND METHODS

The study design is exploratory in nature and data used for this study were obtained through the use of questionnaires, interviews and other secondary sources. The questionnaires were designed to obtain information on the perceptions of climate change among Samaru residents. A total of 200 copies of questionnaire were administered to respondents in the study area over a period of two weeks out of which 171 copies were returned as valid for analysis.

Systematic random sampling method was employed in the administration questionnaire. In this case, the road network of Samaru was used in selecting the houses to be administered the questionnaire. Samaru is connected by four major roads, with numerous minor roads all taking their source from these major roads. In every minor road within a group, equal number (2) houses were chosen systematically, one at the beginning and the other one at the end of the road. It is also important to note that special considerations were given to some area units during the questionnaire survey due to their wide area extent in order to ensure effective circulation of questionnaires within each of the unit.

RESULTS AND DISCUSSION

The results are presented in the following sections and analysed using descriptive statistics.

Socioeconomic Characteristics of Respondents

Based on sex, about 82% of the respondents were males while 18% were females but the age characteristics are varied. Owing to the heterogeneous nature of the study area, the educational and occupational attributes of the respondents are as well diverse. More than half of the respondents which constitute about 61% fall between 36-45 years, those of 26-35 years which are mostly married and employed make up 15%, and those of 46-55 years constitute 15%, the age categories of 15-25 which are mostly students and 56 and above which are the elderly make up the least of the respondents. Samaru is inhabited by mostly literate people as only about 3% of the respondents have no formal education, while about 50% have secondary education and 35% have tertiary education. This cannot be unconnected with the location of higher institutions in the area especially the renowned Ahmadu Bello University, Zaria.

Close to 30% of the respondents are civil servants majority of which are staff of Ahmadu Bello University (ABU), Zaria, Chemical and leather research institute, Institute of Agricultural research, ABU teaching hospital and several other establishments. Those primarily engaging in business activities constitute 23% mostly in Samaru market and street side shops; followed by students which make up about 19% and farmers constituting about 18%. It is obvious that majority of the people are employed as only about 3% of the respondents are unemployed. It is instructive that farming as secondary and tertiary occupations are engaged in even among civil servants and other categories of artisans and professionals. This is because of the abundant land availability and the need to augment income in the study area.

Residents' Perception of Climate Change

Majority of the respondents (about 95%) are of the view that the climate has been changing over the years as shown, while only about 5% believe there is no change. It is observed from the survey that out of about 95% of the respondents that viewed the climate to be continuously changing (see Table 4), 58% opined that human activities such as farming, deforestation, overgrazing, and urbanization are responsible for the change as indicated in table 1. Whereas, 15% of the respondents perceived it as caused by natural activities such as volcanic eruption and earthquake, 20% of them suggest both natural and anthropogenic factors, while about 7% of the respondents viewed it as an act of God. It is obvious that although majority of the respondents are aware of climate change their understanding of the actual causes of the change vary and this is as result of varying levels of education and exposure.

Table 1: Perception of causes of climate change

Causes	Frequency	Percentages (s)
Human activity (s)	98	58
Natural activity (s)	26	15
Natural & Human Activities	35	20
Act of God	12	7
Total	171	100

The relationship between energy use and climate change

Scientists have established that energy production and consumption particularly fossil and biomass-based energy result into emission of greenhouse gases leading rising atmospheric temperature that contributes to climate change. The respondents were asked about the relationship between energy use and climate change. About 40% of the respondents believe that there is positive correlation between the two, while about 40% are unaware of the relationship between energy use and climate change, and 20% reported that they don't know that energy use lead to the emission of greenhouse gases causing climate change.

Table 2: Climate change and temperature conditions over the years

Temperature condition	Frequency	Percentages (%)
Increasing	98	57.3
Decreasing	19	11.1
Normal	54	31.6
Total	171	100

Table 2 indicates that about 57% of the respondents believed temperature has been rising over the past few years which is an evidence of climate change; while 11% of the respondents said that the temperature is decreasing, while close to 32% of the respondents perceived no change in temperature condition over the years. The view of the majority of the respondents that temperature has been rising over the years corroborates scientific records from Institute of Agricultural Research (IAR, 2013), Samaru, Zaria.

Table 3: Climate change and rainfall condition

Rainfall condition	Frequency	Percentages (%)
Increasing	43	25.2
Decreasing	110	64.3
Normal	18	10.5
Total	171	100

Table 3 illustrates that about 25% of the respondents believed that rainfall is increasing, while 64% of the respondents expressed that rainfall is decreasing every year with varied rainfall abnormalities. Whereas close to 11% of the respondents perceived rainfall as being normal. However, the view of the majority that rainfall is decreasing contradicts scientific records from IAR (2013) which showed that mean annual rainfall has been high and steady over the past few years. Apart from the impact of climate change on temperature and rainfall conditions as observed by the respondents in the study area, close to 65% of the people stressed that excessive de-vegetation by human is on the increase leading to loss of forest resources. The worrisome situation according to these respondents is already taking its toll on fuelwood supply which incidentally is used by many residents. However, about 35% have contrary view, may be because they are not directly using fire-wood hence may not be able to establish relationships.

Adaptation to climate change impact on farming

This section elicits information on climate change and agriculture in the area. It was observed that not all the respondents answered the questions in this section. Out of those who responded about 71% of the respondents believe rainfall is declining and not supporting crop production while about 24% have contrary view; whereas only about 5% reported that they don't know. This suggests that rainfall decrease is attributable to changing climate among the respondent. About 54% of the respondents believed that climate change has led to various forms of crop infestation and diseases, thereby reducing the quality and quantity of crop yield which has affected the cost of food produced in the area. While about 46% believe in the contrary. As hinted earlier that many respondents engage in farming for several reasons hence adapted several strategies to mitigate the perceived impact of climate change on the farming pursuits.

It can be observed from table 4 that 56% of the respondents cultivate different variety of crops while 15% employ crop rotation as adaptation strategies which appear to be environmentally friendly. Some of the people combine both mixed cropping and crop rotation. This includes planting crops that are resistant to higher temperatures and drought conditions.

Table 4: Climate change and adaptation strategies in agriculture

Adaptation measures	Frequency	Percentages (%)
Planting different variety of crops	56	56
Rotating different crops	15	15
Mixed cropping and crop rotation	5	5
Increasing the land area for crop production	6	6
Changing to irrigation / <i>fadama</i> farming	6	6
The use of chemical fertilizer	2	2
Mulching	2	2
Improve in water maximization	3	3
No adaptation method used	4	4
Others	0	0
Total	100	100

Crop rotation is adopted to check the incidence of pest and diseases. Some of the respondents mentioned increasing the size of agricultural land, irrigation, water maximization by practicing *fadama* farming, as adaptation strategies to check decreasing rainfall. Others include mulching and the use fertilizer. Furthermore, recent rainfall extremes according to some people

have led to a shift from farming to non-farming activities. This strategy is adopted when rainfall becomes less.

Awareness and enlightenment campaign on Climate change

Close to 95% of the respondents averred that there have not been adequate awareness or enlightenment campaigns on climate change in the area, and only about 5% reported that they have witnessed very few campaigns in the area. Findings of the field survey revealed that there have not been any serious awareness and enlightenment campaigns on the causes and consequences of climate change in the area. Those who are aware of climate change obtained knowledge of the change mostly from school and interaction with experts consequently leaving those without formal education unaware of the change.

RECOMMENDATIONS AND CONCLUSION

The study found that majority of Samaru residents (95%) believe climate is changing and correspond with the finding of Odjugo (2011) who reported that about 60% of the people in Niger Delta are aware of climate change. In addition, majority of the residents Samaru attributed climate change to human factors such as deforestation, overgrazing, and urbanization as against the majority of the people within the Niger Delta region of Nigeria who have very poor knowledge of the causes of climate change. Residents of Samaru perceive increasing temperature and decreasing rainfall as effects of climate change. The perception of majority of the residents that temperature has been increasing over the years corroborates with scientific records from IAR (2013). However, the view of the majority that rainfall is decreasing contradicts scientific records from IAR which showed that mean annual rainfall has been high and steady over the past few years. Most of the farmers in Samaru plant different variety of crops as the most viable adaptation strategy to climate change as observed by those in Jema'a Local Government Area of Kaduna State. Other adaptation measures in Samaru include crop rotation which includes planting of crops that are resistant to higher temperatures and drought conditions; increasing the area of land for crop production, adopting irrigation/fadama farming, the use of chemical fertilizer; improve in water maximization and mulching.

Based on the findings of this research, the following recommendations become imperative:

- Although there is high level of awareness on climate change among Samaru residents, there is the need for the government and Non Governmental Organizations to intensify and expand the enlightenment campaigns to reach out to the surrounding areas so as to increase the level of awareness on climate change. This is because information gathered from the surveys suggests that most of those who are aware of climate change are educated and result of interviews suggest that there is no serious awareness campaign by the government and NGOs through the media as obtained in other parts of the world.
- In addition, there is the need to educate Samaru residents on the relationship between energy use and climate change as the study suggests that a large number of them do not see the linkage between the two. This will go along in influencing their behaviour in seeking for sustainable energy sources.

- Moreover, the government should support adaptive capacity of the people and enlighten the public on viable adaptation strategies.
- A combination of scientific records and publics' perception on climate change is required to achieve a viable climate change policy, mitigation and adaptation strategies.

REFERENCES

- Bord, R. J., O' Connor, R. E. and Fisher, A. (2000): In what sense does the public need to understand global climate change? *Public Understanding of Science* 9 (3): 205–218.
- Bostrom, A. and Lashof, D. Weather it's climate change? In: Moser S. C., Dilling, L., eds. *Creating a Climate for Change Communicating Climate Change and Facilitating Social Change*. New York: Cambridge University Press, 2007:31–43.
- De Chavez and Tauli-Corpus (eds.) (2008): *Guide to climate change*. Accessed on 26/06/2009 from www.tebtebba.org.
- Farauta, B. K., Egbule, C. L., Idrisa, Y. L. and Agu, V. C. (2011) *Climate Change and Adaptation Measures in Northern Nigeria: Empirical Situation and Policy Implications*, African Technology Policy Studies Network Working Paper Series No. 62, Nairobi, Kenya
- Institute of Agricultural Research (2013): *Weather and Climate Data*, IAR, Samaru, Zaria.
- International Energy Agency (2009) *World Energy Outlook 2009* IEA, Paris
- Intergovernmental Panel on Climate Change (2007): Summary for Policymakers. In Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (Eds.]. *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* Cambridge University Press: Cambridge, United Kingdom and New York, USA.
- Ishaya, S. and Abaje, I. B. (2008) Indigenous people's perception on climate change and adaptation strategies in Jema'a local government area of Kaduna State, Nigeria *Journal of Geography and Regional Planning* Vol. 1(8), pp. 138-143
- Kempton, W. (1991) Lay Perspectives on Global Climate Change, *Global Environmental Change* 1, 183–208.
- Lofstedt, R. E. (1991) Climate Change Perceptions and Energy-use Decisions in Northern Sweden, *Global Environmental Change* 1, 321-324

- Lorenzoni, I. and Pidgeon, N.F (2006) Public views on climate change: European and USA perspectives. *Climatic Change*, 77, 73-95
- Mertz, O., Mbow, C., Reenberg, A. and Diouf, A. (2009) Farmers' Perceptions of Climate Change and Agricultural Adaptation Strategies in Rural Sahel, *Environmental Management*, 43:804–816
- Odjugo, P. A. O. (2011) Perception of Climate Change in the Niger Delta Region of Nigeria, *CPED Policy Paper Series*, Centre for Population and Environmental Development (CPED), Benin City, Nigeria
- Stamm, K. R., Clark, F., and Eblacas, P. R. (2000): Mass Communication and Public Understanding of Environmental Problems: the Case of Global Warming *Public Understanding Science* (9) 219–237
- United Nations Framework Convention on Climate Change (UNFCCC), *Article 1* http://unfccc.int/essential_background/convention/background/items/2536.php Accessed on 02/07/10
- Weber, E. (2010) What shapes perception of climate change? *Wiley interdiscip. Rev. climate-change* I, 332-342