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Socio-Economic Drivers of Climate Change Perception in Metropolitan Cities of Sub-Saharan Africa

SAMUEL OSAYAMEN TONGO, OLANREWAJU TIMOTHY DADA,
OLUWAFEMI MICHAEL ODUNSI, SOBOWALE TOLULOPE OLADIMEJI
FESTUS OSARUMWENSE UZZI
Olabisi Onabanjo University, Ago-Iwoye, Nigeria

Abstract. This research used the metropolitan cities of Kano and Lagos in Nigeria to assess socio-economic variables that drive the perception of the two broad classes of climate change beliefs: "climate change is real" and "humans cause climate change." The multistage sampling technique was used to respectively select 134 and 278 respondents across the different neighbourhoods in Kano and Lagos metropolises. Uniformly in Kano and Lagos metropolises, beliefs in climate change reality and the human cause were influenced by residents' age, parental status, and level of education. Anthropogenic climate sceptics were strongly influenced by ethnicity in both Kano and Lagos metropolises. While Muslim-dominated Kano mostly believes climate change is occurring but not caused by human activity, the Christian-dominated Lagos believes in climate change's reality and human cause. The results can assist the government in knowing how to embark on enlightenment and environmental education where all socio-economic status will be captured.

Keywords: climate change, perception, beliefs, socio-economics, ill-health, Nigeria

1. Introduction

Globally, there is abounding evidence of the effects of human-induced climate change on socio-economic systems and physical processes (United Nations Foundation-Sigma, 2007). However, there are diverse beliefs because of a consensus gap across countries on the perception of human-induced changes (Dunlap and Jacques, 2013). Some believe that human-made climate change is happening, while others do not. Other beliefs are convinced that climate change but do not support the view that humans drive these changes. What this implies is that there is still some denial that the climate is changing and disbelief in human causation, despite the weight of scientific evidence on the current existence and future worsening of climate change as well as its causes and consequences (Whitmarsh, 2011; IPCC, 2014; Gueye et al., 2015). For instance, Rahmstorf (2004) identified three opinions about climate change scepticism. These are trend, attribution, and impact scepticisms. According to him, trend sceptics do not believe at all in the existence of climate change. In contrast, attribution sceptics accept its reality but do not agree that man contributes to its cause. Impact sceptics, however, believe in climate variability and its anthropogenic factors but deny the attendant risks and effects.

Furthermore, Sibley and Kurz (2013) classified these opinions into four. These are climate believers, undecided/neutral, climate sceptics, and anthropogenic climate sceptics. Sibley and Kurz (2013) further submitted that climate believers believe in reality and human cause, while climate sceptics are sceptical about reality and human cause. The anthropogenic climate sceptics believe climate change is occurring but not caused by human activity, and the undecided/neutral are not sure about both reality and human cause. Thus, it is conclusive that gaps exist between scientific evidence and perception of climate change, yet the gaps are hardly accommodated in climate change modeling.

Perhaps more importantly, studies have not examined the core variables underpinning belief in the reality of climate change and anthropogenic climate change in developing nations. As such, this study explores how

socio-economic variables (age, gender, ethnicity, employment status, parental status, religiosity, neighbourhood type, and level of education) can explain the two central climate change beliefs. These beliefs are that climate change is real and humans cause climate change. Some studies have attempted to describe the issue. The results revealed that many people misunderstand the science of climate change and, in particular, are confused about the nature, causes, and consequences (Bord et al., 1998; Brechin, 2003). Others claimed that the depth of understanding of climate change depends mostly on individual characteristics such as educational level, age, gender, occupation, and ethnic origin (Aoyagi-Usui, 2008). For instance, Semenza et al. (2008) indicated that individuals with higher incomes are likelier to know that climate is changing than those with lower incomes. Sampei and Aoyagi-Usui (2009) and Akter and Bennett (2009) revealed that exposure to mass media increases awareness and concern about the damage associated with climate change.

Furthermore, other factors such as education, gender, ethnic background, membership of environmental groups, and newspaper readers were found to affect perceptions of climate change (Maddison 2006; Leiserowitz 2006; Gbetibouo 2009). Similarly, higher levels of religiosity, measured by attendance, were found to be related to climate change denial (McCright and Dunlap, 2011). However, Heath and Gifford (2006) retorted that age was negatively associated with anthropogenic climate change but not the belief that climate change is occurring. Meanwhile, income was positively related to climate change reality but not anthropogenic climate change. The findings possibly did not represent all different beliefs in climate change globally, especially in developing nations such as Nigeria.

As such, this study seeks to explore whether the established influence of socio-economic variables on climate change perceptions is genuine about Nigeria. This idea is examined in two Nigerian metropolises, Kano and Lagos, regarding the following research questions: What socio-economic variables affect perceptions of climate change in these cities? Are there any possible inter and intra-cities variations in climate change beliefs? Based on these research questions, this study contributes to the existing body of literature to provide empirical facts to correlate socio-economic variables and climate change beliefs in Nigeria's environment. Though some research has investigated many more cities in a similar analysis, this study contributes to the literature by comparing metropolises with different seasonal patterns and socio-economic backgrounds. The uniqueness of this study is that no research in developing nations has examined the extent to which particular socio-economic variables can explain these distinct climate change segments. Most prior research into perceptions of climate change has investigated the phenomenon at a global level and has assumed spatial homogeneity of climate change beliefs across a city. There has been almost no research on the variation of climate change beliefs in developing nation towns with different climates. It is, perhaps, the first study to investigate the influence of socio-economic variables on climate change beliefs at a Neighbourhood level in Nigeria and the tropical region. This study believes a better understanding of socio-economic variables will help identify substantive ideological differences between climate change believers and deniers. This research can assist the government in knowing how to conduct environmental education and enlightenment programmes where every socio-economic status will be present.

2. Drivers of Climate Change Perception and Belief

The arguments that drive climate change beliefs and vulnerabilities can be narrowed down to four main strands. The first argument suggests that climate change is a natural phenomenon. It is adduced that the earth's climate has changed several times in response to natural causes, which are reflections of variability over certain time scales. These natural causes include interactions between oceans and the atmosphere, changes in the earth's orbit patterns, microcosmic properties of the climate systems, frequencies in weather elements, increase in the degree of variability, and volcanic eruptions of gases that absorb energy that are radiated from the earth's surface (Tompkin and Adger, 2004; Karl, Melillo and Peterson, 2009). The trapped or absorbed energy concentration in the atmosphere warms the atmosphere, increasing the earth's surface temperature globally. Therefore, the persistent shift in the mean state of natural climate or in its variability refers to Climate Change (Ziervogel and Zermogllio, 2009). Hence, these arguments support the view that climate change occurs naturally. If this view holds, actions currently taken to reverse climate change effects are redundant and likely to distort the patterns of the natural environment and increase peoples' vulnerability.

Another line of argument is that the activities of human beings induce climate change. Karl and Trenberth (2003) argued that climate change is caused by human beings (Anthropogenic).

Supporting Karl and Trenberth (2003) and Odjugo (2010) identified some man-made factors like urbanization, transportation, land use, deforestation, geometric increase in global population, industrialization, and increased release of greenhouse gases. These human factors reduce the carbon dioxide absorption capacity of the environment and, consequently, increase the greenhouse gas concentration in the atmosphere, which causes depletion of the ozone layer, which in turn causes global warming (or cooling in some cases), leading to climate change (Odjugo, 2010). A survey by the American Geographical Union (AGU) (2009) observed that 82% of Earth Scientists and 97.4% of Climate Scientists agreed that human activities are responsible for climate change.

In line with the already stated arguments, the third posited that human and natural factors cause climate change (IPCC, 2007; Biesbroek et al., 2010; Odjugo, 2010). The natural factors of biological processes, astronomical and extra-terrestrial factors heat the earth's surface. At the same time, human-induced activities like urbanization, deforestation, and pollution continue to emit greenhouse gases into the atmosphere. Both combined elements are absorbed into the atmosphere, apparently leading to global warming, which is fundamentally responsible for Climate Change. These greenhouse gases can alter the energy balance of the earth by being able to absorb long-wave radiation emitted from the earth's surface. The net result and the re-emission of long waves back to the earth's surface increase the quantity of heat energy in the earth's climatic system. These have resulted in heat waves, which are detrimental to human health.

The fourth argument posited that although there is variation in climate change across countries, it is likely caused by the workings of the natural processes and not climate change, as it is regarded as a myth. Carter (2007) believes that IPCC is an alarmist group because its membership is mostly constituted by politicians who may not even understand the workings of the climate compared to scientists. The position further stressed that IPCC's assertion that climate change is real is merely circumstantial and part of the workings of the natural environment and that any human causation could only be assessed and examined when all the causes of natural environmental changes have been well understood. Thus, Carter (2007) submitted that even the media has failed in its role as a public watchdog, accusing them of being a self-interested party in the debate over the existence of climate change. These views are more subjective than objective; hence, it is unrealistic to the obvious fact that the global climate has indeed been changing over the years.

Labohm, Simon, and Dick (2004), however, explained that the 'scare' or state of denial in accepting the reality of climate change may be due to the huge financial burden and its implications on the global economy. It was concluded that the views of the IPCC on the existence of climate change are mostly one-sided and designed only to favour human-induced causes. However, Labohm et al. (2004) were criticized by Ebohon (2006) in that their views were quite weakened because they lacked objectivity in an attempt to discredit the anthropogenic activities linked with the climate change phenomenon. Nevertheless, one thing that remains clear is that the world is warming, altering global climate trends. Importantly, the side of these arguments that people subscribe to will determine their belief and level of vulnerabilities in the short and long run. East of the Greenwich

3. Research Methodology

3.1 Climate Characteristics of Kano and Lagos

The study area covers two principal metropolitan cities viz Kano and Lagos in Nigeria: a country situated between latitudes 4º 0' to 14º 0' North of the Equator and between longitudes 2º 2' and 14º 30' East of the Greenwich meridian. Nigeria lies within the tropical zone and enjoys a seasonally damp and humid climate dominated by the West African monsoon system (Nigerian Meteorological Agency (NiMet), 2016). It has only two seasons: the dry and wet seasons. The dry season from November through March is influenced by an airmass (Tropical Continental (C.T.) Airmass) from the Sahara Desert (harmattan), bringing dusty and fair weather. In contrast, the wet season starts from April through October and is influenced by an Airmass (Tropical Maritime (M.T.) Airmass) originating from the Atlantic Ocean, bringing cloudy and rainy weather. The point at which these two airmass meet is termed Inter-tropical Discontinuity (ITD).

There are, however, wide variations in climate in different regions of the country, with relief being a significant factor. Seasonal mean temperatures throughout Nigeria are consistently over 200C, with diurnal variations more pronounced than seasonal ones. Generally, temperatures are lower in the wet season than in the dry season and vary from the coast to inland areas. The wettest month in Nigeria is June in the south, and the most waterlogged area is the east coast, parts of which receive over 4000mm rainfall

annually. Regions along the coast in Southern Nigeria receive about 1800mm of rain annually, which decreases to about 500 to 1000mm in Northern Nigeria ((Nigerian Meteorological Agency, 2016). Kano and Lagos metropolises were selected because they are Nigeria's two most populated cities with diverse cultural attributes and religious beliefs. They both have distinct climatic features: Kano is located deep within the interiors and is influenced by its local steppe climate. In contrast, Lagos is located on a low-lying plain next to the Atlantic Ocean. The socio-economics differences are likely to affect residents' perception.

Kano metropolis is located in Northern Nigeria on latitude latitudes 11º25'N to 12º47'North of the Equator and longitude 8º22'E to 8º39'East of the Greenwich Meridian (NiMet, 2016). The climate is the Tropical wet and dry type, coded as Aw according to Koppen's classification, and the characteristics are typical of West African savannah. There are three distinct seasons based on temperature elements in Kano. A cold and dry season: It lasts from November to February. The mean monthly temperature is between 21 and 23° C with a diurnal range of 12-14°C. The harmattan winds prevail at this period. The period is followed by a hot and dry season from March to mid-May. The mean monthly temperature during this period is more than 300 C, and the daily range is up to 20° C (NiMet, 2016). The length of the season lasts from May to mid-September. The monthly average temperature during this period is about 25° C to 26°C with a daily minimum temperature of 20° C. Kano metropolis is typically very hot throughout the year, aside from December through February, when it is noticeably cooler. Nighttime temperatures are cold during December, January, and February, with average low temperatures ranging from 11° C to 14° C (Yakubu, 2010). The annual mean rainfall is between 800mm and 900mm, and variations in the annual mean values are up to ± 30% (Falola, 2002; Olofin, Nabegu, and Dambazau, 2008; Ibrahim, 2011). The rainy season has a moderate effect on temperature, which falls to the lowest in August with a mean monthly value of 24.5° C.

Lagos metropolis is located in Southern Nigeria. It lies approximately between latitudes 6o23′N and 6o41′ North of the Equator and longitudes 2º 42′E and 3º42′ 8º39'East of the Greenwich Meridian (NiMet, 2016). The Koppen's climate classification is the Tropical dry type/savannah, coded as Aw. Lagos experiences two rainy seasons: a long rainy season between April and July (the beginning of the rainy season and rain maximum) and a short rainy season between September and November (the ending of the rainy season). The wet season has two yearly rainfall peaks: July and September. There is a brief, relatively short dry season in August (break: a short period of ceasing in the rain). However, "August break" is generally observed in the last two weeks of August. There is also a more extended dry season, from December to March. The period witnessed the dominant influence of the dry and dusty northeast winds and the 'harmattan' conditions. Monthly rainfall between May and July averages over 300mm, while in August and September, it is down to 75 mm, and in January, it is as low as 35mm. The primary dry season, between December and early February, is accompanied by harmattan winds from the Sahara Desert. The average temperature in January is 27°C (79°F), while in July, it is 25°C (77°F). On average, the hottest month is March, with a mean temperature of 29°C (84°F), while July is the coldest month (Nigerian Meteorological Agency, 2016).

3.2 Sampling method

The multistage sampling technique was employed to collect primary data that captured the residents' perceptions. The first stage involves the purposive selection of two of the six ecological zones in Nigeria. The two ecological zones selected were the Sudano-Sahelian and Forest regions. The metropolitan areas of Kano and Lagos are chosen from the respective ecological zones. These two metropolises were selected because they were the most populous in Nigeria. Information from the Kano State Urban Development Board and Lagos Metropolitan Master Plan indicated 130 and 224 residential neighborhoods in Kano and Lagos metropolises, respectively. 39 (30%) in Kano and 47 (21%) in Lagos metropolis were surveyed.

In the second stage, the selected residential neighbourhood was stratified into the existing low, medium, and high residential densities. The third stage randomly selects 19 and 27 quarters in high density, 10 and 10 quarters in medium density, and 10 and 10 quarters in the low density of Kano and Lagos metropolis, respectively. A breakdown of residential density showed that there were 290, 180, and 110 in the respective high, medium, and low densities of the Kano metropolis, while in the Lagos metropolis, there were 605, 315, and 210 in the respective residential densities. The fourth stage systematically selects one of every five streets in the different residential densities. Using this method, the chosen number of streets in the respective high, medium, and low densities of Kano were 58, 36, and 22, as well as 121, 43, and 42 in the Lagos

metropolis. The reconnaissance survey revealed that there were 1174 and 2661 buildings in the high density, 703 and 1318 buildings in the medium density, and 447 and 812 buildings in the low density of the selected streets of Kano and Lagos metropolis, respectively. In the fifth stage, the oldest member of the household (usually the father or mother) in one of every ten buildings in Kano and Lagos metropolises was surveyed. Nature informed the choice of oldest respondent because the information required on climate change can be better attended to by those who have had a long period of experience with weather patterns over decades in Kano and Lagos metropolises. Using this survey method, 117 and 266 buildings in high density, 70 and 132 buildings in medium density, and 45 and 81 buildings in the low density of Kano and Lagos metropolises, respectively, were surveyed. A total of 711 copies of the questionnaire were administered, while 412 were retrieved (approximately 58%), comprising 134 in the Kano metropolis and 278 in the Lagos metropolis. Information required related to residents' climate change beliefs, among others. An interpreter who understood both the English Language and the local dialect spoken in the selected residential densities of the respondents tried to explain the various classes of climate change beliefs to them in the appropriate mother tongue. It was to assist the people in each residential neighbourhood in the selected states from each ecological zone to respond to the question appropriately. Data were analyzed using cross-tabulation table, ANOVA, chi-square, and bivariate correlations.

The socio-economic determinants of the climate change beliefs were categorized and dummied for easy analysis. These were age (reported using Faniran et al. (2017) taxonomy, recoded and dummied to range from 0 to 2: 0 is youth (< 30 years), 1 is young adult (31-55 years) and 2 is adults (> 56 years)), gender (dummy coded as 0 = female, 1 = male); ethnicity (dummy coded as 0 = non-indigene, 1=indigene: Indigene of Northern of Nigeria (Kano) are mostly Hausa speaking while that of Southwest (Lagos) are predominantly Yoruba speaking); employment status (dummy coded as 0 = unemployed, 1 = employed), parental status (dummy coded as 0 = no children, 1 = with children), religious belief (dummy coded as 0 = not religious, 1 = religious: it is presumed that Northern part of Nigeria (Kano) are mostly Muslims dominated while that of South (Lagos) are generally Christians dominated). Highest level of education (dummied to range from 0 to 4, where 0 is no education/not reported, 1 is the primary certificate, 2 is the secondary certificate, 3 is the tertiary certificate, and 4 is post-graduate certificate), and neighbourhood type (recoded and dummied to range from 0 to 2: 0 is high density, 1 is medium destiny and 2 is low density).

4. Results

As presented in Table I, the analysis of variance established that there were significant differences in age across the four classes of climate change beliefs in Kano (F=2.650, p =.073) and Lagos (F=10.591, p =.000) metropolises. The results showed that Climate believers (51.5%) and anthropogenic climate Skeptics (31.3%) dominated the Kano metropolis. In contrast, climate believers (52.2%) and undecided (30.2%) were the most prevalent in the Lagos metropolis. Similarly, the adults (older age) in Kano were more sceptical about both reality and human cause (90.0%; climate sceptics) and believed that climate change is occurring but not caused by human activity (59.5%; anthropogenic climate sceptics). However, in Lagos, the adults (older age) were more skeptical about reality and human cause (63.3%; climate sceptics). While young adults mostly believe that climate change is occurring but not caused by human activity (52.6%; anthropogenic climate sceptics). These findings agree with the study of Heath and Gifford (2006), that found that scepticism in climate change reality or its human causes is associated with older age.

As presented in Table I, significant differences were observed in the proportions of men and women in each class in Kano and Lagos (χ^2 = 5.699 and p =0.050) and Lagos (χ^2 = 18.531 and p =0.000) metropolises. The findings further showed that men are high climate sceptics (70.4%) and anthropogenic climate sceptics (63.6%). In comparison, women constituted most climate believers (53.7%) and undecided (52.7%) in the Kano metropolis. However, the proportion of women that were climate believers (68.6%), undecided (58.8%), and anthropogenic climate sceptics (56.3%) are in the majority, while men climate sceptics (59.1%) groups. The findings concur with the observations of Zelezny et al. (2000) and Korfiatis et al. (2004) that females are more environmentally concerned than males. Significant differences were observed in climate change beliefs in the demography of Kano (χ2=21.257, P = 0.000) and Lagos (χ2= 32.938, P = 0.000) metropolises. As such, the aggregated data established that anthropogenic climate sceptics were more dominant in Kano (57.5%) and Lagos (52.9%) metropolises. The Indigenes were skeptical regarding climate change reality and its human causes, with 63.4 and 81.8% indicating climate sceptics and anthropogenic climate sceptics beliefs in Kano and Lagos accounted

for 88.2% and 91.2% in the respective classes. These results are somewhat similar to the findings of Malka et al. (2009) that indigene is less likely to express climate change concern than non-indigene.

Regarding employment, we observed significant differences in proportions of unemployed and employed people across the four classes in Lagos ($\chi2$= 22.073, P = 0.000) metropolis (Kano is not reported as it is not statistically significant). However, the anthropogenic climate sceptics (53.9%) and the undecided (52.5%) showed slightly higher unemployment levels than the two other classes in Kano. Findings show that the majority of the respondent in Lagos were employed with a more significant proportion across the climate believers (72.0%), the undecided (73.2%), anthropogenic climate sceptics (69.3%), and the climate Skeptics (60.0%) classes. This finding implies that most unemployed believe in the reality of climate change but not in its human cause and are also likely to be undecided. According to Table I, the chi-square test established a statistically significant difference in the percentage of respondents with children and those without across the four classes in Kano (χ^2 = 17.551 and p =0.000) and Lagos (χ^2 = 27.998 and p =0.000) metropolises. However, respondents with children accounted for a more significant proportion of climate believers (69.1%), the undecided (66.7%), and anthropogenic climate sceptics (51.2%) in Kano, while the climate sceptics constituted about 78.6% of those without children. Findings also show that the majority of the respondent with children in Lagos accounted for a more significant proportion across the climate believers (70.4%), the undecided (73.7%), anthropogenic climate sceptics (81.8%), and the climate sceptics (78.9%), classes.

Furthermore, in terms of religious beliefs, no significant difference was observed across all four classes of climate change belief in Kano ($\chi2$= 0.038, P = 0.626) and Lagos ($\chi2$= 0.502, p =0 .227) metropolises. However, the proportions in the Muslim-dominated northern part of Nigeria (Kano) that are Climate Skeptics (72.7%) and Anthropogenic Climate Skeptics (86.6%) were in the majority. While in the Christian-dominated southern part of Nigeria (Lagos), proportions across the Climate Believers (41.9%), the Undecided (47.4%), Climate Skeptics (45.9%), and Anthropogenic Climate Skeptics (40.0%) were in the minority in all four classes. This finding indicates that most Muslims were sceptics regarding climate change reality and its human causes. It is because Muslims in the northern and southern parts of the country expressed denial that the climate is changing and disbelief in human causation despite the seasons of both parts of the country not being the same. Education attainment levels also differ.

Table I: Socio-economic Variables in the Study Areas across the Climate Change Belief Classes

	Kano				Lagos			
	A (%)	B (%)	C (%)	D (%)	A (%)	B (%)	C (%)	D (%)
Age	F= 2.650 and p =0.073*				F= 10.591 and p =0.000*			
Youth	39 (56.6)	2 (15.4)	-	7 (16.7)	37 (25.5)	12 (14.3)	10 (33.4)	5 (26.3)
Young Adult	13 (18.8)	11 (84.6)	1 (10.0)	10 (23.8)	29 (20.0)	31 (36.9)	1 (3.3)	10 (52.6)
Adult	17 (24.6)	-	9 (90.0)	25 (59.5)	79 (54.5)	41 (48.8)	19 (63.3)	4 (21.1)
Total	69 (51.5)	13 (9.7)	10 (7.5)	42 (31.3)	145 (52.2)	84 (30.2)	30 (10.8)	19 (6.8)
Gender	χ^2 = 5.699 and p =0.050*				χ^2 = 18.531 and p =0.000*			
Male	19 (46.3)	26 (47.3)	19 (70.4)	7 (63.6)	25 (31.4)	28 (41.2)	26 (59.1)	38 (43.7)
Female	22 (53.7)	29 (52.7)	8 (29.6)	4 (36.4)	54 (68.6)	40 (58.8)	18 (40.9)	49 (56.3)
Total	41 (30.7)	55 (41.0)	27 (20.1)	11 (8.2)	79 (28.4)	68 (24.5)	44 (15.8)	87 (31.3)
Ethnicity	$\chi2$=21.257, P = 0.000*				$\chi2$= 32.938, P = 0.000*			
Non-Indigene	7 (63.6)	4 (80.0)	15 (36.6)	14 (18.2)	23 (27.4)	10 (76.9)	4 (11.8)	13 (8.8)
Indigene	4 (36.4)	1 (20.0)	26 (63.4)	63 (81.8)	61 (72.6)	3 (23.1)	30 (88.2)	134 (91.2)
Total	11 (8.2)	5 (3.7)	41 (30.6)	77 (57.5)	84 (30.2)	13 (4.7)	34 (12.2)	147 (52.9)
Employment Status	$\chi2$= 0.375, P = 0.134				$\chi2$= 22.073, P = 0.000*			
Unemployed	3 (27.3)	21 (52.5)	7 (53.9)	21 (30.0)	7 (28.0)	11 (26.8)	39 (30.7)	34 (40.0)
Employed	8 (72.7)	19 (47.5)	6 (46.1)	49 (70.0)	18 (72.0)	30 (73.2)	88 (69.3)	51 (60.0)
Total	11 (8.2)	40 (29.9)	13 (9.7)	70 (52.2)	25 (9.0)	41 (14.6)	127 (45.8)	85 (30.6)
Parental Status	χ^2 = 17.551 and p =0.000*				χ^2 = 27.998 and p =0.000*			
No Children	21 (30.9)	3 (33.3)	11 (78.6)	21 (48.8)	50 (29.6)	5 (26.3)	6 (18.2)	12 (21.1)
With Children	47 (69.1)	6 (66.7)	3 (21.4)	22 (51.2)	119 (70.4)	14 (73.7)	27 (81.8)	45 (78.9)
Total	68 (50.7)	9 (6.7)	14 (10.5)	43 (32.1)	169 (60.9)	19 (6.7)	33 (11.9)	57 (20.5)
Religious Beliefs	$\chi2$= 0.038, P = 0.626				$\chi2$= 0.502, p =0 .227			
Not Religious	12 (80.0)	9 (60.0)	6 (27.3)	11 (13.4)	90 (58.1)	40 (52.6)	20 (54.1)	6 (60.0)
Religious	3 (20.0)	6 (40.0)	16 (72.7)	71 (86.6)	65 (41.9)	36 (47.4)	17 (45.9)	4 (40.0)
Total	15 (11.2)	15 (11.2)	22 (16.4)	82 (61.2)	155 (55.8)	76 (27.3)	37 (13.3)	10 (3.6)
Education Attainment	χ^2 = 31.580 and p = 0.000*				χ^2 = 13.519 and p = 0.035*			
No Education/Not Reported	-	-	16 (44.4)	19 (59.4)	-	-	13 (68.4)	-

Primary Degree	-	1 (7.6)	12 (33.3)	11 (34.4)	7 (4.7)	11 (45.8)	1 (5.3)	12 (14.0)
Secondary Degree	3 (5.6)	3 (23.2)	6 (16.7)	2 (6.2)	22 (14.8)	3 (12.5)	3 (15.8)	22 (25.6)
First Degree	17 (32.1)	5 (38.4)	2 (5.6)	-	37 (24.8)	10 (41.7)	2 (10.5)	41 (47.7)
Post-Graduate Degrees	33 (62.3)	4 (30.8)	-	-	83 (55.7)	-	-	11 (12.7)
Total	53 (39.7)	13 (9.7)	36 (26.8)	32 (23.8)	149 (53.6)	24 (8.6)	19 (6.8)	86 (31.0)
Neighbourhood Type	$\chi2$= 11.033, P = 0.019*				$\chi2$= 15.939, P = 0.000*			
High Density	14 (51.9)	6 (50.0)	31 (60.8)	17 (38.6)	43 (61.4)	19 (59.4)	25 (45.5)	67 (55.4)
Medium Destiny	6 (22.2)	2 (16.7)	11 (21.6)	21 (47.8)	16 (22.9)	13 (40.6)	17 (30.9)	31 (25.6)
Low Density	7 (25.9)	4 (33.3)	9 (17.6)	6 (13.6)	11 (15.7)	-	13 (23.6)	23 (19.0)
Total	27 (20.1)	12 (9.0)	51 (38.1)	44 (32.8)	70 (25.2)	32 (11.5)	55 (19.8)	121 (43.5)

Note: Group A is climate believers; B is undecided; C is climate sceptics, and D is anthropogenic climate sceptic.
* Statistically significant difference at $p < 0.05$

The highest levels of education were associated with Climate Believers (62.3%); those without formal education expressed scepticism in terms of climate change reality and its human causes, with 44.4 and 59.4% representing Climate Skeptics and Anthropogenic Climate Skeptics, respectively, in Kano. A similar trend in Lagos revealed that those with the highest levels of education were associated with Climate Believers (55.7%), and the majority without formal education were associated with Climate Skeptics (68.4%). The finding suggests that those who believe in the reality of climate change and its human cause tend to be more highly educated than those without or with lower levels of education. In the neighbourhoods of Kano ($\chi2$=11.033, P =0.019) and Lagos ($\chi2$=15.939, P =0.000) metropolises, significant differences in the opinions expressed about the classes of climate change beliefs existed.

5. Discussion and Conclusion

To ascertain the distinct climate change beliefs, a survey was conducted on residents' perception of climate change in two of the largest metropolitan cities in the sub-Saharan Africa region. Beliefs about the reality of climate change and its anthropogenic cause were examined in Kano and Lagos metropolises to identify the core socio-economic variables that explain the beliefs of climate change believers and deniers. The study established scepticism regarding climate change reality or its human causes with older age. It supports the finding of Saroar and Routray (2010), who posited that older people are more worried about climate change. However, earlier studies by Hines et al. (1987) negate this assertion by stating that younger individuals hold environmentally friendly positions than older individuals. Hence, it is clear that age influences the level of perception of climate change, but it is difficult to set with certainty whether the correlation is positive or negative. It suggests that environmental education and awareness initiatives that will shape people's beliefs and concerns must be broadened to all population segments if mitigation and adaptation are achieved.

Similarly, the study established that females are more associated with believing in climate change reality and its human causes than males. It supports previous findings showing that females tend to be more environmentally concerned than males (Korfiatis et al., 2004; Zelezny et al., 2000). Semenza et al. (2008) found that women in both Portland and Houston were significantly more concerned about climate change. In a Nigerian context, this perception pattern reflects that women are more vulnerable to climate change, given their homemakers' role in society, which forces them to interact with the environment directly.

The findings establish that those with higher educational qualifications were climate believers, compared to those without or lesser educational qualifications that are sceptic of climate change reality and its human. The results presented here are generally in accord with the prevailing global evidence, suggesting that individuals with high levels of education are more likely to be aware of climate change in Africa (Acquah, 2011; Hasan and Akhter, 2011; Olajide et al., 2011; Adebayo et al., 2013). Results in developed countries showed that educated individuals are more environmentally concerned and attribute greater importance to biocentric orientations than less educated individuals (Hines et al., 1987; Olofsson and Öhman, 2006). These assertions that educated individuals can obtain, process, utilize, understand, and interpret climate change information, which in turn shapes their perceptions of beliefs. The finding indicates that Muslims in Kano and Lagos expressed denial of climate change and disbelief in human causation despite experiencing different seasons. The results supported the notion that religion could have clouded these residents' minds, causing lean interest in the information that could have scientific persuasions. Thus, their belief that nothing can happen without God's permission and that prayers can mitigate climate change is understandable as they attracted no cost. This study has shown that religion influenced residents' perspectives on climate change reality and causation.

The study submitted that many Lagos metropolis hold neutral-to-high beliefs about climate change and its anthropogenic cause. In contrast, residents of the Kano metropolis were more anthropogenic skeptics-to-believers in the reality of climate change. These findings suggest that, although climate change believers and deniers differ in particular socio-demographic variables, age, parental status, and education significantly enhanced perception in Lagos and Kano metropolis. Thus, perception and beliefs of climate change in other climate belts of Nigeria must be studied and understood to generalize perceptions or beliefs in Nigeria. The results can inform the government's policies against or support sceptics' beliefs based on socio-economic variables. It will also guide residents in adapting or mitigating climate change effects. However, belief in climate change should be considered when considering the causal variables of climate change because some beliefs are attributable to issues beyond anthropogenic factors, while some are and can be mitigated. The study recommends that efforts should be made to organize workshops and disseminate information through formal and informal channels (radio and television programmes, community leaders, among others) that residents prefer sourcing information. Besides, incorporating local dialect will bring about effective utilization of research findings as the technicalities of scientific results will be explained to the understanding of the residents. An advantage of this giving back is that it gives a sense of fulfillment/achievement when residents know they were part of a process that brought solutions to the communities. Also, it will keep the residents in a better frame of mind to be more receptive to future researchers. Based on socio-economic status, the results can be used to determine the government's actions against or in support of residents' beliefs.

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