Communication and Raising Citizen's Consciousness of Climate Change Challenges and Adaptation in Nigeria

Abstract

The global impact of climate change remains a grave concern to every nation, from severe droughts in East Africa to wildfires in Australia and extreme floods and landslides in India, Nepal and Bangladesh, and, recently, the devastating floods witnessed in Nigeria, climate change challenges continue to escalate. Climate change is driving people out of their homes and ushering in a world of poverty. Extant literature avers that at the centre of mitigating the adverse effects of climate change and stimulating the desired action is communication. Consequently, this paper seeks to interrogate the centrality of communication as a tool in the hands of policymakers, the media and international donor agencies in stimulating public consciousness in Nigeria towards climate change challenges and adaptation. Leveraging a quantitative and exploratory approach and using surveys with structured and unstructured questionnaire questions, the study exposed gaps in citizens' knowledge of the causes of climate change and revealed the level of awareness of climate change challenges, people's attitudes to climate change, sources of information, and desired medium of communication among the Nigerian public. The study highlights the interplay between the contents of climate change communication and actionable steps that are easy to be understood and relatively simple to be followed by citizens. Finally, the paper contends that much more needs to be done in sensitising citizens on climate change while suggesting a combination of alternative communication strategies that promise to stimulate citizens' awareness of climate change challenges and adaptation in Nigeria.

Keywords

Climate change; Environmental degradation; Global warming; Climate change adaptation; Strategic communication

Introduction

The environmental crisis happening around the world today makes it difficult for anyone to deny that climate change is happening. In the hundred years between 1920 and 2020, the earth experienced about 2^0 Celsius rise in temperature (Greene & Jacobs, 2021). This increase has led to significant events worldwide, such as melting sea ice and sheet mass, rising sea levels, more prolonged and more intense heat waves, floods, and changes in plant and animal habitations, amongst others (Greene & Jacobs, 2021). Climate change poses one of the greatest threats to human existence today. The impact of climate change can be felt in every sphere of life, from health to agriculture, food, natural resources, security, and immigration, among others (von Uexkull & Buhaug, 2021). There are predictions that the earth might become unbearable for humans before the end of this century if something is not done (Figueres & Rivett-Carnac, 2020). The United Nations Framework for Climate Change Communication (1992) defines climate change as environmental changes caused by human activity that alter the global atmospheric composition to natural climatic fluctuations for an extended period. The European Commission (2021) believes that human activities are the most significant contributors to the climate crisis because of their heavy contribution of CO_2 gas, which increases the greenhouse effect on society.

To forestall the severe destruction of the world by greenhouse effects, 196 countries came together at the 2015 Climate Change Conference in Paris to sign what is popularly called the Paris Agreement. The treaty focused on three key areas: limit global warming around the world to about 2 or 1.5

degrees Celsius by the middle of the century; find ways to support less developed nations that would be the most impacted by climate change; and find a way to generate contributions from developed nations to fight climate change (IPCC, 2018). This was the first time countries came together to take a stance on climate change (UNFCC, 2021). Furthermore, goal number 13 of the United Nations Sustainable Development Goals (SDGs) emphasises climate action. Consequently, this paper is founded on the need for action as contained in goal number 13 of the SDGs. According to the United Nations Development Programme (2022), two key objectives of this goal are to improve education, awareness-raising, and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning. Furthermore, it seeks to incorporate climate change mitigation measures into national policies, strategies, and planning.

Conceptualising Climate Change

Climate change generally refers to an increase in average global temperatures (Olaniyi, Funmilayo, & Olutimehin, 2014). It is believed to be responsible for rising coastal floods, sea levels and other environmental risks that call for mitigation and adaptation strategies (Ngo, Poortvliet, & Feindt, 2020). The debate around climate change is primarily centred on causality more than anything else (Johnson, Affolter, Inkenbrandt, & Mosher, 2021). While one school of thought believes climate change is caused by human activities (anthropogenic) such as deforestation, building, and burning of fossil fuel, the other school of thought (natural) holds that climate change is caused by natural events such as volcanic reactions, extreme temperatures and the like (Johnson, Affolter, Inkenbrandt, & Mosher, 2021). According to Johnson et al. (2021), there is overwhelming evidence from existing climate studies that support the anthropogenic position that humans cause climate change. These include a report by the National Oceanic and Atmospheric Administration that shows that 97 per cent of climate scientists agree that climate warming is from human activities.

However, Nwankwoala (2015) argues that rather than focus on who or what is causing climate change, it would be better to focus on the timing under which a climate crisis qualifies as climate change. In this regard, the statistical distribution of weather patterns can also be viewed as changing when this change lasts long. A temporary or sudden change that leaves little or no lasting impact on the weather may not qualify as climate change. MacMillan and Turrentine (2021) agree with Nwankwoala's (2015) position on the length of time being a principal constituent of climate change. They view climate change as a significant variation of typical weather conditions becoming warmer, wetter or even drier — over several decades or more. It is this longer-term trend that differentiates climate change from natural weather variability.

Regardless of one's point of view, one thing is certain: climate change is no longer a topic to be avoided or swept under the rug. The impact of climate change on almost every aspect of development – social, economic, and environmental – is now a primary concern for economists and scientists. And achieving a good understanding of the associated environmental risks and the potential impacts of climate change is crucial and should be addressed through climate change communication (Ngo, Poortvliet, & Feindt, 2020).

The Negative Impact of Climate Change on Humanity

There is a growing body of evidence by scholars that indicate a strong correlation between climate change and its impact on human endeavour: economy (Dutse & Ibrahim, 2013), health (Lu, 2016; Hasegawa, Fujimori, Takahashi, Yokohata & Masui, 2016), agriculture, food supply, security, tourism, energy sector, and global economy (Haider, 2019; Olaniyi, Funmilayo, & Olutimehin, 2014; von Uexkull & Buhaug, 2021). Globally, between 350 and 600 million people may experience increased water stress due to climate change by 2050 (Dunne, 2020). As a significant global player in human-caused climate change, China is vulnerable to the adverse impacts of climate change. A study of 272 Chinese counties found that abnormal temperature was responsible for 14.33 per cent of total deaths (Chen, et al., 2018) and that extreme heat would lead to a higher risk of death (Gao, et al., 2015). Furthermore, increased climatic variability resulted in a drinking water shortage in cities surrounding Lake Taihu in China (Qin, et al., 2010).

Elsewhere, the World Health Organization projected a 9.8% increase in diarrhoeal deaths connected to climate change among children 15 years and under to about 76,000 by 2030. Also, heat-related deaths in older adults of 65 years and above are predicted to increase by 15 deaths per 100,000 in

2080 and by the year 2070, about 400 million people will be at risk of malaria. Morbidity and mortality connected to climate change could lead to frequent outbreaks of endemic diseases, from water-borne and vector-borne infectious diseases such as cholera and Lassa fever, injuries and mortality that follow extreme weather events, like heatwaves and floods (World Health Organization, 2020).

Africa is not exempted and remains at risk of climate change impact because of the low capacity for adaptation and mitigation (IPCC, 2007; UNFCC, 2020; Awojobi & Tetteh, 2017). The projection is that by the end of the 21st century, Africa will experience sea level rise that will affect low-lying coastal areas with large populations, such as Senegal, Liberia, Mozambique, and Nigeria (Schaeffer, et al., 2013). Nigeria is high on the list of most susceptible nations prone to climate change effects (Olaniyi, Funmilayo, & Olutimehin, 2014). Like most African nations, Nigeria is ill-equipped and unprepared to tackle the challenges of climate change (Oyedele, 2015) due to low awareness, a lack of clarity on the implications of climate change, absence of sustainable policies, little or no stakeholder engagement, poor communication and low media coverage (Tagbo, 2010; Nwankwoala, 2015).

In Nigeria, the devastating effect of climate change is evident in the protracted farmer-herder crisis, which has claimed over 8,343 lives since 2005 (Yakubu, 2021). It is believed that desertification in the Sahel has forced herders down South in their search for grazing land. This movement has caused tension between farmers and herders. The incessant attacks on communities, killings, and destruction of life and property led to increased security tension nationwide. In addition, flooding seems to be a reoccurring decimal in Nigeria. From 2012 to 2017, over 2.5 million people were displaced, with more than 517 deaths due to flooding (Ajijah, 2013; Obahopo, 2015; Odifa, 2022; Olumhese, 2022; National Emergency Management Agency (NEMA), 2020). Most recently, the Nigeria Meteorological Agency (NiMeT), in August 2022, issued an alert on possible flooding in 20 states across Nigeria, requesting that the State Emergency Management Agencies intensify adaptive, mitigative and response mechanisms and step-up awareness campaigns. Not much was done with this warning. By 20 October 2022, reports indicated that 603 people had died, more than 2.5 million were affected, 1.3 million people were displaced, and over 108,393 hectares of farmlands had been destroyed by floods (Ominabo, 2022).

The Nigerian Government and Combating Climate Change

In a bid to mitigate the adverse effects of climate change, the Nigerian government has established agencies to drive the climate change agenda for Nigeria. However, evidence shows these efforts have suffered from poor implementation (Offiong, 2019). There is the Department of Climate Change under the Federal Ministry of Environment, with the critical role of driving the climate change agenda for Nigeria by implementing the Climate Change Convention and the Kyoto Protocol using the National Policy on Climate Change (NPCC) as a vehicle. The NPCC envisions a climate change-resilient Nigeria and seeks to strengthen national initiatives to adapt to and mitigate climate change inclusively (National Policy on Climate Change, 2013). The goals and objectives of the Department of Climate Change include raising awareness of climate change and, most importantly, the involvement of the private sector participation in addressing and strengthening national institutions and mechanisms (policy, legislative and economic) to establish a suitable and functional framework for climate change governance, amongst others. Under the same Department of Climate Change, there is also the National Climate Change Policy Response and Strategy (NCCPRS), designed to achieve a climate change-resilient Nigeria for swift and sustainable socio-economic development. Furthermore, the initiative aims to strengthen national initiatives that facilitate adapting to and mitigating climate change in a participatory manner that includes all stakeholders, including the poor and other vulnerable groups (women, youths, and so on), in order to advance sustainable development in Nigeria (National Policy on Climate Change, 2013).

In addition to the relevant agencies set up at the Federal level to drive Nigeria's climate change agenda, the government has activated a few other plans. One of these was the Federal Ministry of Environment's launch of a tree-planting campaign in 2020 as part of the Presidency's commitment to combating climate change and honouring Nigeria's commitment to the Paris Agreement. The noble objective of the campaign is to have 25 million trees planted in the country by 2020 (Federal Ministry of Environment, 2020). Report indicates that as of October 2020, over 15 million trees were planted across different states in Nigeria (Bolaji, 2020).

The environmental challenges of gully erosion and land degradation across the country are also being addressed through the Federal Ministry of Environment's partnership with the World Bank that has yielded the Nigeria Erosion and Watershed Management Project (NEWMAP). This project was created to help the land recover from the damage caused by gully erosion in the South-East and land degradation in the north. The eight-year project is expected to fund state-led intervention measures in seven states to prevent and reverse further land degradation, threatening infrastructure and livelihoods. These include Abia, Anambra, Cross River, Ebonyi, Edo, Enugu, Imo, and, subsequently, nationwide (Federal Ministry of Environment, 2020).

As laudable as these plans are, the awareness level seems low. This perceived low level of awareness could be attributed to inadequate attention paid by the media on the subject (Nwabueze, Nnaemeka, Umeora, & Okika, 2015), absence of supporting policies, low literacy levels and a generally poor attitude towards the environment. Unfortunately, ignorance of the impact of climate change does not mitigate it. It also does not protect anyone from impending danger. In fact, citizens who are unaware and unprepared are more vulnerable to the risks of climate change, with little or no knowledge of how to protect themselves. The seeming absence of citizen engagement that will elicit the desired response may create a vacuum that leaves citizens vulnerable, unprepared, and unable to contribute to preserving their environment. If citizens are expected to take specific actions towards protecting the environment, it is vital to drive into their consciousness information and knowledge of climate change and its implication. Consequently, this study aims to assess the level of awareness of climate change among Nigerians, investigate the attitude of the citizenry towards climate change, investigate the existing source of climate change communication, and, from the prism of the masses, identify the preferred means of receiving climate change communication.

Theoretical Framework

To interrogate the research objectives, this study adopts two main theories - the medium theory of McLuhan (1964) and the Framing theory of Goffman (1974). McLuhan (1964) challenged conventional definitions when he claimed that the medium is the message. With this claim, he stressed how channels differ, not only in terms of their content but also in how they awaken and alter thoughts and senses. He distinguished media by the cognitive processes each required and popularised the idea that channels are a dominant force that must be understood to know how the media influence society and culture. The medium theory focuses on the characteristics of the medium itself (like in media richness theory) rather than on what it conveys or how information is received. In this context, a medium is not simply a newspaper, the Internet, a digital camera and so forth. Instead, it is the symbolic environment of any communicative act.

McLuhan's thesis is that people adapt to their environment through a certain balance or ratio of the senses, and the primary medium of the period we live in brings out a particular sense ratio, thereby affecting perception. The theory examines physical, psychological and social variables as the senses that are required to attend to the medium, whether the communication is bi-directional or uni-directional, how quickly messages can be disseminated, whether learning to encode and decode in the medium is complicated or simple, how many people can attend to the same message at the exact moment, and so forth. Medium theorists argue that such variables influence the medium's use and its social, political, and psychological impact. This theory brings to the fore the importance of the mediums utilised and their efficacy in climate change communication.

The basis of framing theory (Goffman, 1974) is that the media focuses attention on specific events and then places them within a field of meaning. In essence, framing theory suggests that how something is presented to the audience (called "the frame") influences people's choices about processing that information. Frames are abstractions that work to organise or structure message meaning. The most common use of frames is in terms of the frame the news or media places on the information they convey. They are thought to influence the perception of the news by the audience in this way that it could be construed as a form of second-level agenda-setting. They not only tell the audience what to think about (agenda-setting theory) but also how to think about that issue. Goffman (1974) contends that people interpret what is happening around their world through their primary framework. This framework is regarded as primary as it is taken for granted by the user.

These two theories agree that how a message is presented and the medium through which it is disseminated influence, to a large extent, how the audience receives that message. Thus, it is believed that within the context of climate change communication, the media should pay attention to how messages are presented to the target audience and the medium of communication. This, we believe, will encourage acceptability and participation.

Communication as a Critical Driver of Climate Change Consciousness among Citizens

Climate change communication focuses on educating, informing, warning, persuading and mobilising people about the causes, impacts, and measures to be taken to mitigate the effects of physical environmental changes. Because people's opinions about climate change are frequently shaped by their experiences, mental and cultural inclinations, worldview, and values (Yale Programme on Climate Change Communication, 2016), climate change communication approaches must consider these factors. Specifically, the communication approaches utilised may impede acceptance, participation, comprehension, or even the desired change in behaviour. For instance, the scientific terminology used to describe the effect of climate change and even the images used to depict climate change can be abstract for most people (Olano, 2020). The heteroglossic nature of our communities makes it imperative to communicate to the citizens in the language they understand, whether verbal, nonverbal or written. Interestingly, most communication on climate change focuses more on the dangers and possible harm that could come to people but very little on how to move people to action (Olano, 2020). Eliciting the desired response should be one of the most critical roles of communication when it comes to climate change.

According to Panos (2007), effective communication should rely more on dialogue than media management, one-way communication, and public relations. It must incorporate dialogue and leverage the knowledge obtained from such engagement to develop appropriate communication strategies. Communication in the context of sustainable development, therefore, involves promoting dialogue in which powerholders listen to, consider and use the knowledge and views of their citizens to develop communication strategies that will lead to participation. According to Quebral (2012), development communication is focused on transitioning communities and strengthening individual potential. It is also about understanding the needs of individuals and communities and developing context-specific solutions to overcome challenges that hinder the adoption of desired behaviours (UNICEF, 2017).

Communication should help to simplify climate change. Sometimes people's understanding of climate change ends at awareness, leaving out critical areas such as adaptation, mitigation, and personal responsibility. A crucial goal of climate action, as contained in the SDGs, is to integrate climate change measures into national policies. When these policies are formed, communication should become the tool for interpreting them to the average person on the street.

Community-based adaptation to climate change, therefore, requires the use of participatory communication processes, strategies and media for knowledge sharing and information among all stakeholders within a specific context that enhances people's resilience and capacity to cope with diverse livelihood options. Given this background, it is therefore essential to understand how people make decisions about their behaviour, the social context in which these decisions are made, and the environmental drivers or enablers that promote the adoption of desired practices towards facilitating social change and finding new solutions.

Materials and Methods

This study adopted a quantitative and exploratory approach and leveraged a survey as a research method that utilised structured and unstructured questionnaire questions to expose the level of awareness of climate change challenges, attitudes, source of information, and desired medium of communication. The questionnaire was divided into five sections. The first section focused on the demography of respondents, such as their age and gender. The second section sought to interrogate respondents' knowledge of climate change, provide the answer to research question one and also

address the first research objective. The third and fourth sections were designed to investigate attitudes and respondents' existing sources of information on climate change. Both sections were to help identify if respondents' significant sources of information differed from where they would instead be informed about climate change and also provide answers to research question two and the second research objective. Then the fifth section, which is the key focus of this study, investigates respondents' preferred media of communication on climate change. A stratified, multistage random sampling technique was used to select respondents from the Nigerian population of over 218.8 million (National Population Commission, 2022). Questionnaires were disseminated using the survey monkey application. A total of 269 valid questionnaires were returned and analysed. 55% of the respondents were male, while females constitute 45%.

Furthermore, 43.5% of the respondents are within the 18 – 31 age bracket, with the remaining 56.5% falling within the 32 years upwards. It should be noted that, due to the medium of distribution of the questionnaires (digital medium), most respondents are familiar with social media and other digital communication platforms, as opposed to people living in rural communities. Data are presented in tables to provide a clear interpretation of the results. Using the SPSS software from IBM, resulting data were analysed using Ordinary Least Square (OLS) simple regression technique.

Result and Discussions

This study seeks to assess the level of awareness of climate change challenges among Nigerians and investigate the people's attitudes towards climate change. It also unearths the existing source of climate change communication to identify the preferred medium of receiving information on climate change. In analysing the data collected, Ordinary Least Square (OLS) simple regression technique was used. The research objectives were labelled as models with dependent and independent variables. The dependent variables include respondents' climate change level of awareness (CCLA), respondents' climate change attitude (CCA), respondents' climate change communication source (CCCS) and respondents' climate change information medium (CCIM). The independent variables for the level of awareness include burning fossil fuel (BFF), deforestation (DFR), natural events (NE), agricultural causes (AGR), carbon emission (CBE), and God (GD), among others. The other variables are stated in the analysis below. The result of the regression estimates was analysed using E-Views (version 10).

Assessing the Level of Awareness of Climate Change among Nigerians

In assessing the level of awareness of climate change among citizens, the following model equation was utilised: $CCLA = \beta_0 + \beta_1 BFF + \beta_2 DFR + \beta_3 NE + \beta_4 AGR + \beta_5 CBE + \beta_6 GD + \varepsilon$ .....4.1, where $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6 \text{ and } \varepsilon \text{ are constants}.$

Dependent Variable: CCLA
Method: Least Squares
Date: 08/28/21 Time: 13:58
Sample: 1 269
Included observations: 269

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.321560	0.163263	8.094671	0.0000
BFF	-0.064120	0.055352	-1.158401	0.2478
DFR	-0.016890	0.044264	-0.381566	0.7031
NE	0.102979	0.031102	3.311007	0.0011
AGR	0.022148	0.028980	0.764262	0.4454
CBE	-0.014792	0.049467	-0.299021	0.7652
GD	0.026656	0.025722	1.036338	0.3010

R-squared	0.060548	Mean dependent var	1.449814
Adjusted R-squared	0.039034	S.D. dependent var	0.498402
S.E. of regression	0.488578	Akaike info criterion	1.431043
Sum squared resid	62.54168	Schwarz criterion	1.524586
Log likelihood	-185.4753	Hannan-Quinn criter.	1.468610
F-statistic	2.814318	Durbin-Watson stat	2.035392

Prob(F-statistic)	0.011361

Table 1: Regression analysis for Model 1. Source: E-Views v10 (2021)

The result reveals that R^2 (0.0605) was lower than Durbin-Watson statistics (2.0353) which implies that there was no spurious regression.

$CCLA$ = 1.32 + (−0.064) + (−0.017) + 0.010 + 0.022 + (−0.015) + 0.027 ….4.2

		C		BFF		DFR		NE		AGR	CBE	GD
$\boldsymbol{CCLA}$	=	1.32	+	(−0.06)	+	(−0.02)	+	0.01	+	0.02	+ (−0.02)	+ 0.03
S.E.	=	0.16		0.06		0.04		0.03		0.03	0.05	0.03
(t)	=	8.09		-1.16		-0.38		3.31		0.76	-0.29	1.04

Table 2: Researcher's computation from E-Views v.10 (2021)

(i) Signs of the coefficient
(ii) Magnitude (Std. Error)
(iii) Test Statistical significance (T-statistic)

The data presented above indicate that a 1% increase in the response rate to BFF, DFR, and CBE will bring about a 6%, 2%, and 2% decrease in respondents' awareness of climate change (CCLA), respectively. This shows that BFF, DFR, and CBE relate negatively with CCLA and are statistically significant at a 5% level, as seen in the t-values of -116%, -38%, and -29%, respectively. However, a 1% increase in NE, AGR, and GD contributes 1%, 2%, and 3% increase to respondents' level of awareness of climate change (CCLA). Thus, if appropriate measures are put in place to adequately sensitise people on the phenomenon surrounding the effect of BFF, DFR, and CBE on climate change, it can help improve the awareness of climate change among Nigerians.

The coefficient of the determinant of R^2 shows that only 6% of the total variation in CCLA is jointly explained by fossil fuel burning (BFF), deforestation (DFR), natural event (NE), agricultural causes (AGR), carbon emission (CBE), and God (GD). This implies that although these variables put together have not significantly contributed to respondents' level of awareness of climate change, NE, AGR and GD contribute to respondents' level of awareness of climate change at only about 1%, 2%, and 3%. Thus, more sensitisation is needed to increase further public awareness of the impact of these factors on climate change. In other words, even though all these phenomena, in one way or another, contribute to climate change, their occurrences do not significantly inform the respondents' level of awareness of climate change.

Although probability statistics showed that respondents have a high level of awareness, however, further probing using the causes of climate change as variables did not return the same result. In other words, the percentage of people who say they have heard of climate change was not significant enough to conclude that climate change awareness is high. The implication of this, therefore, is that more sensitisation is required to increase further public awareness of climate change, its causes and its impact. This aligns with the position of extant literature (Fatuase, 2016; Tagbo, 2010; Oyero, Oyesomi, Abioye, Ajiboye, & Kayode-Adedeji, 2018) on the need for enhanced enlightenment of the people on climate change awareness. Even though a significant percentage of respondents claim awareness of climate change, they had little knowledge of the community risk associated with it. To address this challenge, there is a need to refocus on how messages about climate change should be framed, such that it takes into consideration the people's worldview generally and those terms and approaches they are comfortable with

The attitude of Nigerians Towards Climate Change

For the dependent variable respondents' climate change attitude (CCA), the following independent variable was considered; perception of climate change information as irrelevant (IRR), indifference (IND), climate change as foreign propaganda (PRG), and as not a real problem (NARP). The model equation used is $CCA = \beta_0 + \beta_1 IRR + \beta_2 IND + \beta_3 AF + \beta_4 PRG + \beta_5 NARP + \varepsilon$ ……4.3,

Dependent Variable: CCA
Method: Least Squares
Date: 08/28/21 Time: 14:04
Sample: 1 269
Included observations: 269

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.500243	0.186995	8.022918	0.0000
IRR	-0.100865	0.032742	-3.080572	0.0023
IND	-0.002598	0.031840	-0.081599	0.9350
AF	0.101626	0.071969	1.412079	0.1591
PRG	0.019417	0.034557	0.561877	0.5747
NARP	0.048668	0.036742	1.324589	0.1865

R-squared	0.042081	Mean dependent var	1.449814
Adjusted R-squared	0.023870	S.D. dependent var	0.498402
S.E. of regression	0.492418	Akaike info criterion	1.443075
Sum squared resid	63.77105	Schwarz criterion	1.523254
Log likelihood	-188.0935	Hannan-Quinn criter.	1.475275
F-statistic	2.310702	Durbin-Watson stat	2.136549
Prob(F-statistic)	0.044500		

Table 3: Regression analysis on citizens' adaptation to climate change. Source: E-Views v10 (2021)

The result reveals that R^2 (0.0421) was lower than Durbin-Watson statistics (2.1365) which implies that there was no spurious regression.

CCA = 1.50 + (−0.10) + (−0.00) + 0.10 + 0.02 + 0.05 …….... 4.4

		C		1RR		IND		AF		PRG	NARP
$\boldsymbol{CCA}$	=	1.50	+	(−0.10)	+	(−0.00)	+	0.10	+	0.02	+ 0.05
S.E.	=	0.19		0.03		0.03		0.07		0.04	0.04
(t)	=	8.02		-3.08		-0.08		1.41		0.56	1.33

Table 4: Computation from E-Views v.10 (2021)

(i) Signs of the coefficient
(ii) Magnitude (Std. Error)
(iii) Test Statistical significance (T-statistic)

As shown above, a 1% increase in IRR and IND corresponds with a -10% and -0% decrease in respondents' attitudes towards climate change (CCA), respectively. This shows that IRR and IND relate negatively with CCA and are statistically significant at a 5% level, as seen in the t-values of -308% and -8%, respectively. This implies a considerable possibility that the majority of the respondents perceive climate change information as irrelevant and are indifferent towards it. However, a 1% increase in AF, PRG and NARP contributes 10%, 2% and 5% increase to respondents' attitudes towards climate change (CCA), respectively. This implies that though some of the respondents perceive climate change information as irrelevant (IRR) to them, a significant portion (10%) of the population perceive climate change information as affecting them. About 2% of the sample perceived it as foreign propaganda (PRG), while about 5% perceived it as not a real problem (NARP).

On the outcome of respondents' attitude to climate change, most respondents believe that climate change affects them personally and that climate change is happening. However, on the question 'Nothing I do makes any difference to climate change one way or another', the results show that many

respondents are indifferent about how their actions affect the environment. This was further tested using regression analysis on respondents' perceptions of climate change. The outcome was statistically significant. However, the coefficient determinant of R^2 shows that only 3% of the total variation in CCA is jointly explained by respondents' perception of climate change information as irrelevant (IRR), their indifference (IND), how it affects them (AF), as foreign propaganda (PRG) and not as a real problem (NARP). These were not statistically significant to respondents' attitudes to climate change communication. This implies that the attitude of most respondents to climate change information is not significant enough to make them perceive climate change as a problem. In other words, the majority ignore climate change information and may not be adequately informed about climate change. This further strengthens the argument for not just increased climate change communication (Tagbo, 2010; Balasubramanyam, Stanis, Morgan, & Ojewola, 2019) but also making such communication more applicable and more practicable for the citizens. For communication about climate change to be impactful, it must be designed in such a way that the dangers inherent are apparent and the direct effect on individuals brought to the fore.

Existing Source of Information on Climate Change among Nigerians

In analysing the predominant source of information on climate change, the dependent variable, climate change communication source (CCCS), was measured against the independent variables: respondent's sources of information (SIM), where respondents spend most of their time (TS), and respondent's source of climate change information (CCS). The model equation is shown below.

$CCCS = \beta_0 + \beta_1 SM + \beta_2 TS + \beta_3 CCS + \varepsilon$ 4.5

Where $\beta_0, \beta_1, \beta_2, \beta_3, and\ \varepsilon\ are\ constants.$

Dependent Variable: CCCS
Method: Least Squares
Date: 08/28/21 Time: 14:07
Sample: 1 269
Included observations: 269

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CCCS	1.578588	0.067880	23.25545	0.0000
SIM	-0.022218	0.022617	-0.982355	0.3268
TS	-0.008195	0.032787	-0.249965	0.8028
CCS	-0.038841	0.029455	-1.318641	0.1884

R-squared	0.018874	Mean dependent var	1.449814
Adjusted R-squared	0.007767	S.D. dependent var	0.498402
S.E. of regression	0.496463	Akaike info criterion	1.452142
Sum squared resid	65.31598	Schwarz criterion	1.505595
Log likelihood	-191.3131	Hannan-Quinn criter.	1.473609
F-statistic	1.699301	Durbin-Watson stat	2.050285
Prob(F-statistic)	0.167528		

Table 5: Regression analysis for the existing source of climate change information. Source: E-Views v10 (2021)

The result reveals that R^2 (0.0188) was greater than Durbin-Watson statistics (2.0502) which implies that there was no spurious regression.

$CCCS$ = 1.58 + (−0.02) + (−0.01) + (−0.04) 4.6

		C		SIM		TS		CCS
$CCCS$	=	1.58	+	(−0.02)	+	(−0.04)	+	(−0.01)

S.E.	=	0.06	0.02	0.03	0.02
(t)	=	23.26	-0.98	-0.25	-1.32

Table 6: Researcher's computation from E-Views v.10 (2021)

(i) Signs of the coefficient

(ii) Magnitude (Std. Error)

(iii) Test Statistical significance (T-statistic)

As shown above, a 1% increase in SIM, TS, and CCS makes up about -2%, -4%, and -1% decrease in respondents' source of climate change communication (CCCS), respectively. This shows that SIM, TS, and CCS relate negatively with CCCS and are statistically significant at a 5% level, as seen in the t-values of -98%, -25%, and -132%, respectively. This implies that if adequate measures are put in place to effectively utilise appropriate sources of information (SIM) to sensitise respondents' population about climate change and to channel most of the time they spend (TS) on climate change discussions, and at the same time, productively get them engaged with climate change sources of information (CCS), it will improve the effectiveness of climate change communication. The coefficient of determination R^2 shows that only 2% of the total variation in CCCS is jointly explained by SIM, TS, and CCS. This indicates that all these sources of climate change communication have not been adequately utilised by appropriate authorities to sensitise the public on climate change. This further suggests that effective utilisation of all these sources of information can better communicate climate change phenomenon, help increase public outreach and get more people informed about the phenomenon.

Analysis using probability statistics and regression analysis indicates that social media is the most popular source of information, as it is where respondents spend most of their time and where they would look for communication on climate change. This may also explain why the mainstream media has failed to communicate climate change effectively and contradicts the findings of Kakade, Hiremath, and Raut (2013), who found that traditional media is the most important source of climate change communication in India.

Further analyses suggest that even though social media remains the most popular medium of communication, the immediacy and fleeting nature of messages on social media make it inadequate in achieving the desired level of adaptation to climate change. In simple terms, it might be difficult for individuals to sieve out messages on climate change on social media and dwell on the messages long enough to internalise their importance to the extent that it elicits the desired behaviour change. Consequently, even though people spend more time on social media, messages on traditional media might trigger a longer-lasting impression on people's minds because of their permanency.

The Place of Medium in Communicating Climate Change Challenges

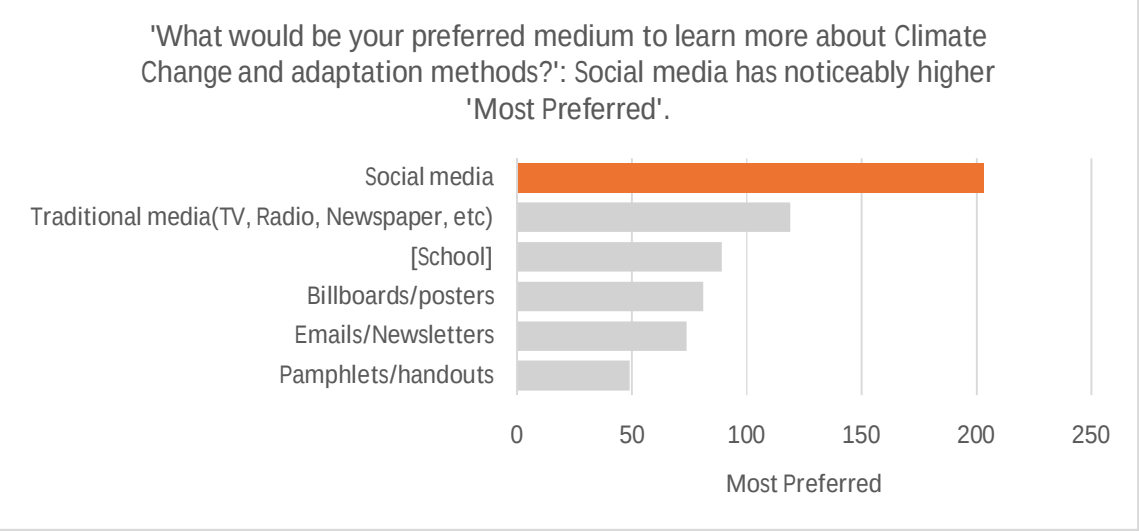
Medium of communication emerged as a critical factor in communicating the causes, impact and adaptation to climate change. The table below captures the results of the analysis of respondents' views on the desired medium through which information on climate change should be disseminated.

	Most Preferred	**Preferred**	**Least Preferred**	**Mean**	**Std. Deviation**
What would be your preferred medium to learn more about Climate Change and adaptation methods? [Traditional media(TV, Radio, Newspaper, etc)]	119(44.2)	123(45.7)	27(10.0)	2.34	.654

What would be your preferred medium to learn more about Climate Change and adaptation methods? School]	89(32.0)	131(48.7)	52(19.3)	2.13	.706
What would be your preferred medium to learn more about Climate Change and adaptation methods? [Social media]	203(75.5)	60(22.3)	6(2.2)	2.73	.491
What would be your preferred medium to learn more about Climate Change and adaptation methods? [Emails/Newsletters]	74(27.5)	114(42.4)	81(30.1)	1.97	.760
What would be your preferred medium to learn more about Climate Change and adaptation methods? [Billboards/posters]	81(30.1)	136(50.6)	52(19.3)	2.11	.696
What would be your preferred medium to learn more about Climate Change and adaptation methods? [Pamphlets/handouts]	49(18.2)	116(43.1)	104(38.7)	1.80	.727

Table 7: Results from analysis of respondent's medium of choice for climate change communication

Table 7 above presents the respondents' views on the most preferred medium to learn about climate change and adaptation methods. Responses showed that social media is the most preferred medium at 203 respondents (75.5%), followed by traditional media at 119 respondents (44.2%), school with 89 respondents (32.0%), billboards and posters with 81 respondents (30.1%) then pamphlets and handouts with 49 respondents (18.2%).



Chat 1: Respondent's choice of medium for climate change communication

Further analysis was carried out on the respondents' preferred medium of climate change communication using respondents' preferred medium for climate change information (CCIM) as the dependent variable and considering the following independent variables: traditional media (TRM),

school (SCH), social media (SM), email/newsletters (ENW), billboard/posters (BPT), and pamphlets/ handbooks (PHD). The model equation is shown below.

$$CCIM = \beta_0 + \beta_1 TRM + \beta_2 SCH + \beta_3 SM + \beta_4 ENW + \beta_5 BPT + \beta_6 PHD + \varepsilon \ldots\ldots\ldots 4.7$$

Where $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6 \; and \; \varepsilon \; are \; constants.$

Dependent Variable: CCIM
Method: Least Squares
Date: 08/28/21 Time: 14:13
Sample: 1 269
Included observations: 269

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.472224	0.218235	6.746037	0.0000
TRM	-0.092200	0.048927	-1.884451	0.0606
SCH	0.062354	0.049713	1.254285	0.2109
SM	0.088960	0.062696	1.418917	0.1571
ENW	-0.052412	0.042358	-1.237370	0.2171
BPT	0.058265	0.053005	1.099233	0.2727
PHD	-0.112214	0.053780	-2.086552	0.0379

R-squared	0.055040	Mean dependent var	1.449814
Adjusted R-squared	0.033400	S.D. dependent var	0.498402
S.E. of regression	0.490008	Akaike info criterion	1.436889
Sum squared resid	62.90833	Schwarz criterion	1.530432
Log likelihood	-186.2616	Hannan-Quinn criter.	1.474456
F-statistic	2.543411	Durbin-Watson stat	2.038276
Prob(F-statistic)	0.020689		

Table 8: Regression analysis for the preferred medium of communication. Source: E-Views v10 (2021)

The result reveals that R^2 (0.0550) was greater than Durbin-Watson statistics (2.0382) which implies that there was no spurious regression.

$$CCIM = 1.47 + (-0.09) + 0.06 + 0.09 + (-0.05) + 0.06 + (-0.11) + \varepsilon \ldots\ldots\ldots 4.8$$

	C	TRM	SCH	SM	ENW	BPT	PHD
CCIM	= 1.47 +	(−0.09) +	0.06 +	0.09	+ (−0.05)	+ 0.06	+ (−0.11)
S.E.	= 0.22	0.05	0.05	0.06	0.04	0.05	0.05
(t)	= 6.75	-1.88	1.25	1.42	-1.24	1.09	-2.09

Table 9: Researcher's computation from E-Views v.10 (2021)

(i) Signs of the coefficient
(ii) Magnitude (Std. Error)
(iii) Test Statistical significance (T-statistic)

As shown above, a 1% increase in TRM, ENW, and PHD makes up about -9%, -5% and -11% decrease in respondents' preferred means of receiving climate change communication (CCIM), respectively. This shows that TRM, ENW, and PHD relate negatively with CCIM and are statistically significant at the 5% level, as seen in the t-values of -188%, -124%, and -209%, respectively. This suggests that PHD and TRM are relatively the least preferred means of receiving climate change

communication (CCIM) and may not be very effective for public sensitisation on climate change. However, a 1% increase in SCH, SM, and BPT contributed 6%, 9%, 6%, and 6% to respondents' preferred means of receiving climate change communication (CCIM), respectively. This implies that the majority of the respondents prefer school (SCH), social media (SM), and billboards & posters (BPT) as the most preferred means of receiving climate change communication (CCIM). In other words, SCH, SM, and BPT contribute to respondents' awareness at 125%, 142%, and 109%, respectively. As a result, implementing appropriate measures to increase climate change communication in schools (SCH), social media (SM), and billboards and posts (BPT) will go a long way toward increasing respondents' climate change awareness levels. This brings to the fore the import of McLuhan's medium theory, which emphasises the centrality of the medium of communication in communicative acts. Furthermore, it aligns with his view that communication channels are a dominant force that must be understood to know how the media influence society and culture (McLuhan, 1964).

However, other means of communication such as TRM, ENW and PHD should also not be neglected or underutilised. The coefficient of determination R^2 shows that only 6% of the total variation in CCIM is jointly explained by TRM, SCH, SM, ENW, BPT and PHD. This implies that all these means of climate change communication have not been adequately utilised for communicating climate change information, affirming the position of Tagbo (2010) that media reportage on climate change was low in Nigeria and that media needed to do more on climate change reporting. As suggested by Murphy (2021), this result confirms the need for a harmonious and adequate utilisation of various means of communication to enhance communication on climate change and keep people informed. The results also align with the position of Nwankwoala (2015); Akpomi & Vipene (2016); Oppenheimer & Anttila-Hughes, 2016) that underlines the need to include climate change as part of the school curriculum.

Conclusion

While confirming that the awareness levels of climate change are low in Nigeria, this study identifies a gap in the general understanding of the causes of climate change, the attitude of respondents to climate change adaptation, and the channels for communicating climate change. Clearly, the media has not done enough to effectively promote climate change awareness and the resulting measures and actions that every citizen may be able to relate with. Although 40.8% of respondents indicated that they heard of climate change on TV, when tested further under the lens of causes of climate change, their claims were not significantly evident. Schools remained consistent as the second-highest sources of climate change information. This may be attributable to the demographics of the survey respondents, where over 43% represent people who are likely to be students.

It also became clear that people would prefer to receive climate change communication through non-traditional channels such as social media, schools, billboards, and posters rather than traditional media such as TV, radio, newspapers, and magazines. In addition, this study established the need to translate the awareness of climate change among Nigerians into actionable knowledge that will lead to behavioural change. The use of alternative media would be critical to making this a reality. To this end, consideration of the theoretical framework for the study and the age distribution of respondents would serve efforts aimed at achieving the desired outcome. Thus, a strategic communication approach that considers the audience and medium of communication would be more effective in climate change communication.

Analysis of the results obtained should provide the government with an inroad on designing an optimal communication strategy, of which the execution will appeal to the target audience and address the challenge of climate change. From the foregoing, there is an immediate need for government to consider multiple channels of information dissemination in future climate change communication campaigns. Also, the government should consider making climate change part of the school's curriculum to raise the desired awareness among students. This, it is believed, will deepen the people's appreciation of the challenges posed by climate change and adaptation to its effects. With evidence indicating that the media has fallen short of its responsibilities, this paper recommends that the media should review media portrayal of climate change and consider the use of alternative channels in reaching out to the public on climate change. Of great importance is the content and context of such communication, the language of communication and how effective such communication is with respect to applicability. As the saying goes, 'content is king'.

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