

Original Research Article

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

Abstract

The global impact of climate change remains a grave concern, 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 is driving people out of their homes and ushering in a world of poverty. The story remains gory as the world battle against the elements. 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 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 paper contends that a lot 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.

Comment [LH1]: add here: in Nigeria

Keywords

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

Comment [LH2]: In case this topic is going to be added in the Discussion, here we could end the Abstract with something like: "The potential contents of the climate change communication, such as actionable steps that are easy to be understood and relatively simple to be followed by citizens will be discussed"

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° Celsius rise in temperature. This increase has led to significant events worldwide, such as melting sea ice and sheet mass, rising sea levels, more prolonged and more intense heatwaves, 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 area 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 modifications directly or indirectly attributable to human activity, altering the global atmospheric composition to the natural climatic fluctuations for a relatively long time. The European Commission (2021) believes that human activities are the most significant contributors to the climate crisis because of their heavy contribution of CO₂ gas, leading to the greenhouse effect.

It was to forestall such an occurrence that 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 around the world came together to agree on a position concerning climate change (UNFCCC, 2021).

Three of the seventeen United Nations Sustainable Development Goals are closely linked to climate change. Goal number 7 focuses on affordable and clean energy, goal number 11 speaks to building sustainable cities and communities, while goal number 13 emphasises climate action. This paper is founded on the need for action as contained in goal number 13. 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, and integrate climate change measures into national policies, strategies, and planning.

Comment [LH3]: This section could be streamlined and shortened

Conceptualising Climate Change

Climate change 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 mainly centred on the cause more than anything else. While one school of thought believes climate change is caused by human activities (anthropogenic) such as deforestation, building, burning of fossil fuel and so on. 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 through a majority of existing climate studies that support the anthropogenic position that climate change is caused by humans. This includes 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 for a long term, such as decades or millions of years. Thus, changes over shorter periods may not be classified as climate change. 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 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 such as 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.

Despite the various views, one thing remains certain: climate change is no longer a topic to be avoided or swept under the carpet. 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 and scientists that show a strong correlation between climate change and its impact on almost every area of human endeavour, such as the economy (Dutse & Ibrahim, 2013), health (Lu, 2016; Hasegawa, Fujimori, Takahashi, Yokohata & Masui, 2016; Huerta Blanco, 2020), agriculture, food supply, security, tourism, energy sector, global economy and others (Haider, 2019; Olaniyi, Funmilayo, & Olutimehin, 2014; von Uexkull & Buhaug, 2021). Globally, 350 million and 600 million people may experience increased water stress due to

climate change by 2050(Dunne, 2020). The urban population, projected to increase by 800 million people, is likely to complicate urban poverty and access to essential services(USEPA, 2017).

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 percent of total deaths(Chen, et al., 2018) and that extreme heat would lead to a higher risk of death(Gao, et al., 2015). Furthermore, in a study on the relationship between flooding and mental health in Anhui province, flooding can increase the risk of depression and post-traumatic stress disorder (PTSD)(Zhong, et al., 2020). Furthermore, increased climatic variability resulted in a drinking water shortage in cities surrounding Lake Taihu(Qin, et al., 2010).Animal production, welfare and life expectancy are likely to be negatively impacted by decreased feed availability and quality(Godde, Mason-D'Croz, Mayberry, Thornton, & Herrero, 2021).

Africa is at high risk of climate change impact because of numerous exposures and low capacity for adaptation or 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, including 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). However, Nigeria, like most African nations, is unequipped 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, members of the host communities and herders. The incessant attacks on communities, killings, and destruction of life and property led to increased security tension nationwide. Consequently, some geopolitical zones in the country have resorted to their own security arrangement – the Amotekun in the South-West, Eastern Security Network (ESN) in the South-East, etc. are examples(Peterside, 2021).

Comment [LH4]: Maybe to include a sub-header here: "Climate change impact observed in Nigeria" or alike

In addition, flooding seems to be a reoccurring decimal in Nigeria. In 2012, over 2 million people were displaced, and 363 died(Ajijah, 2013); in 2015, more than 100,000 were displaced, with 53 deaths(Obahopo, 2015); in 2016, 92,000 were displaced, and 38 people died(Odifa, 2022); in 2017, 250,000 people were displaced(Olumhense, 2022); and in 2020, floods affected 320 local government areas in 35 states, and 129,000 persons were affected, with 63 deaths recorded(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).

Comment [LH5]: Section a bit too much detail, too many parameters from different sources - maybe to streamline by parameters

Healthwise, 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).

The effort of the Nigerian Government in Combating Climate Change

The Federal Government has established agencies to drive the climate change agenda for Nigeria. The indication, however, is that minimal effort, it seems, has gone into helping individuals, homes, communities, etc., implement government plans(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 through 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 in an inclusive manner (National Policy on Climate Change, 2013). The goals and objectives of the Department of Climate Change include raising awareness and 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). The NCCPRS was designed to achieve a climate change-resilient Nigeria for swift and sustainable socio-economic development. Furthermore, it seeks to strengthen national initiatives and adapts to and mitigate climate change in a participatory manner that involves all stakeholders, including the poor and other vulnerable groups (women, youths, etc.), 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 flag-off in 2020 of a tree-planting campaign as part of the commitment of the Presidency to fight climate change and to honour Nigeria's commitment to the Paris agreement. The noble objective of the campaign is to have 35 million trees planted in the country by 2020 (Federal Ministry of Environment, 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 has been designed to restore health to the land after the damage caused by gully erosion in the South-Eastern part of the country and land degradation in the North. The eight-year project is expected to finance state-led intervention measures to prevent and reverse further land degradation that threatens infrastructure and livelihoods in seven states: Abia, Anambra, Cross River, Ebonyi, Edo, Enugu, and Imo, and subsequently nationwide (Federal Ministry of Environment, 2020).

As laudable as these plans and the establishment of climate change-related agencies are, the awareness of this phenomenon 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. Sadly, ignorance of the impact of climate change does not mitigate climate change. Neither does it shield anyone from the looming danger. If anything, being unaware and unprepared leaves citizens more exposed 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 creates 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

In order 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

Comment [LH6]: This was 3 years ago - has this goal been achieved?

Comment [LH7]: may create...

Comment [LH8]: briefly give reason as to why the two theories were chosen?

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. Media, apart from whatever content is transmitted, impacts individuals and society.

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 place 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. Its usefulness as a framework does not depend on other frameworks. Goffman states that there are two distinctions within primary frameworks: natural and social. Both play the role of helping individuals interpret data. So that their experiences can be understood in a broader social context. It is believed that how messages are framed within the context of climate change significantly influences their acceptability among the target audience.

Comment [LH9]: believed by...? the authors or by Goffman (1974)?

Communication as a Critical Driver of Climate Change Consciousness among Citizens

Climate change communication focuses on teaching, informing, warning, persuading and mobilising the people on the causes, impact, and measures to be adopted in managing the effects of changes in the physical environment. Since people's opinion about climate change is often shaped by their experiences, mental and cultural inclinations, worldview and values (Yale Programme on Climate Change Communication, 2016), approaches to climate change communication must take cognisance of these factors. And this makes it a daunting task. Thus, the approaches adopted can hinder acceptance, participation, understanding 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. Most importantly, 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. This should be one of the most critical roles of communication when it comes to climate change (Olano, 2020).

Panos (2007) suggests that effective communication relies more on dialogue than the management of media, one-way communication approach and public relations. Instead, it must incorporate dialogue and leverage the knowledge obtained from such engagement to develop appropriate communication strategies. 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, strategies, and planning. When these policies are formed, communication will become the tool for interpreting them to the average person on the street.

Comment [LH10]: or: "should become..."

Proponents of development communication believe that effective communication should focus more on dialogue than "media management". 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).

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 rather 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. Data is presented in tables to provide a clear interpretation of results. Using the SPSS software from IBM, resulting data were analysed via multiple regression.

Findings and Discussions

This study seeks to assess the level of awareness of climate change challenges among Nigerians and investigate the attitude of the people towards climate change. It also uncovers the existing source of climate change communication with the aim of identifying 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 sets of 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 $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ and ε are constants.

Comment [LH11]: can we give reasons for why only 269 questionnaires returned, out of 1269 sent out? Follow up activities? Reasons for not replying? was survey monkey the right choice?

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.

$$CCLA = 1.32 + (-0.064) + (-0.017) + 0.010 + 0.022 + (-0.015) + 0.027 \dots 4.2$$

	C	BFF	DFR	NE	AGR	CBE	GD
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' level of 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 to improve the level of 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, despite the fact that 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 climate change. In order 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 $CCA = \beta_0 + \beta_1IRR + \beta_2IND + \beta_3AF + \beta_4PRG + \beta_5NARP + \varepsilon$ 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 R² (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
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 significant 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 something that affects them. About 2% of the population 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 actually happening. However, on the question 'Nothing I do makes any difference to climate change one way or another, the results show that a large percentage 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, how it affects them (AF), and their view of climate change 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 tend to ignore climate change information and may not be adequately informed about climate change. This further strengthens the argument for increased climate change communication (Tagbo, 2010; Balasubramanyam, Stanis, Morgan, & Ojewola, 2019). 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.

- Comment [LH12]:** This I find is one of the most interesting findings here - and we should take it as a chance to reflect in the Discussion part on the CONTENTS and direct applicability for those citizens picking up the climate change communication
- Comment [LH13]:** "...is not significant, meaningful or transferable into their daily life..."
- Comment [LH14]:** Not only "increasing" communication, rather should be more valuable, more applicable and more practicable for the citizens

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.

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

Where $\beta_0, \beta_1, \beta_2, \beta_3$, and ε 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 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.

$$CCCS = 1.58 + (-0.02) + (-0.01) + (-0.04) \dots\dots\dots 4.6$$

	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, it is indicated 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 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.

Further analysis using probability statistics and regression analysis indicates that social media is the most popular source of information, is where respondents spend most of their time and also where they would look for communication on climate change. This varies from results on existing sources of information on climate change. Since people spend most of their time on the identified channels, they can easily be sensitised on these same channels and encouraged to pay attention to climate change communication. This could also explain why mainstream media may not have effectively communicated climate change. This goes contrary to the study by Kakade, Hiremath, & Raut (2013), indicating that traditional media is the critical 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 the minds of the people because of their permanency.

The Place of Medium in Communicating Climate Change Challenges

Medium of communication emerged as a critical factor in the communication of 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

Comment [LH15]: In order to judge the meaning of the "school" and "social media" communication channels it would be helpful to have data on age distribution of the responders

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%).

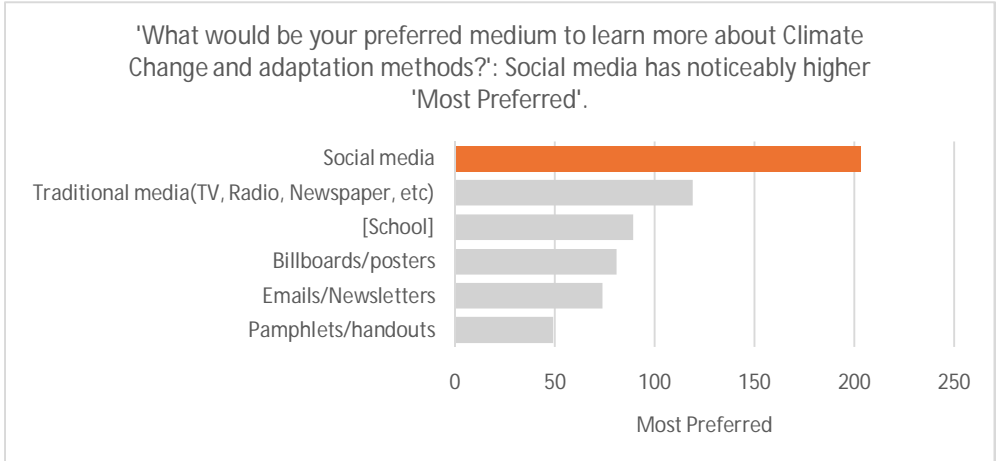


Chart 1: Respondent's choice of medium for climate change communication

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.

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

Where $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ and ε 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.

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

	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 a 6%, 9%, 6%, and 6% increase 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. Therefore, if appropriate measures are put in place towards increasing communication on climate change in schools (SCH), on social media (SM), and on billboards & posts (BPT), it will go a long way to raise 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 program.

Conclusion

While confirming that the awareness levels on climate change is low in Nigeria, this study identifies a gap the general understanding of the causes of climate change, attitude of respondents to climate change and channels for communicating climate change and where respondents would rather be served climate change communication. Consequently, the media has not done enough to promote climate change awareness. 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, this knowledge is not significantly evident. Curiously, schools which were the second highest identified source of

Comment [LH16]: ... to effectively promote climate change awareness and the resulting measures and actions that everybody may be able to take

Comment [LH17]: Age ranges of responders? did maybe preferably the younger population familiar with survey monkey reply to the questionnaires?

climate change information, remained consistent before and after all analysis as a source for climate change awareness and a source for receiving and communicating climate change.

Clearly, people would prefer to receive climate change communication through diverse, non-conventional means like social media, schools, billboards and posters in addition to traditional media of 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.

This study provides 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 as a way 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 the menace. With evidence indicating the media of falling 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.

Comment [LH18]: Missing discussion of contents of climate communication, the effectivity and applicability of it. This conclusion implies that it would only be the intensity of communication that would (automatically) result in climate awareness and behaviour. Whereas there may be ineffective communication, non practical hints and too far fetched climate change consequences given that simply may seem meaningless to citizens

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