Public Perception on the Level of Effectiveness of Climate Change Communication Channels in Ghana: A Cross-Sectional Survey

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ABSTRACT

Climate change communication remains a vital issue globally in view of the increasing concerns on the adverse impacts of climate change. Using a total of 327 Ghanaians, this research investigated public perception on the level of effectiveness of climate change communication channels in the country. Simple random and convenience sampling methods were employed to select respondents who filled a set of questionnaires. In analyzing the data, cross tabulation, means, standard deviations, Mann-Whitney U test and Kruskal Wallis test were employed. Though many respondents believed climate change is already harming local communities, they were dissatisfied with the existing institutional, legal and regulatory frameworks for addressing climate change impacts. Also, the respondents believed that local authorities, the media and political officeholders were not actively addressing climate change impacts. Radio, television, and social media platforms were perceived as generally effective climate change communication channels in Ghana. However, respondents were lowly satisfied with the overall level of effectiveness of climate change communication channels in the country. Significant differences existed in the views of respondents on the effectiveness of climate change communication channels used in Ghana based on gender (Z score=-2.022, p<0.5). Similarly, there were significant differences in the views of respondents on the effectiveness of climate change communication channels and their level of education (X^2 =23.763, p<0.05). The Ministry of Environment, Science and Innovation should team up with the Ministry of Local Government and Rural Development, and the Ministry of Information to develop a more comprehensive program aimed at promoting behavior and social change towards climate change adaptation and mitigation. The Metropolitan, Municipal and District Assemblies should liaise with community radios to come up with measures to promote the use of climate change communication channels based on the unique demographic characteristics and socio-cultural contexts of target audience.

Keywords: Climate Change, Climate Change Communication, Communication Channels, Perception

I. INTRODUCTION

Climate change has become a critical issue in development discourse. A changing climate system now constitutes a vitally critical challenge in the 21st century. It is increasingly recognized that the damage of global warming is becoming irreversible and catastrophic. Global actions need to be quickly taken to stabilize the rising temperatures on the surface of the earth (Intergovernmental Panel on Climate Change [IPCC], 2013). Generally, climate change is due to human factors (IPCC, 2013; Shi et al., 2015). There are growing perspectives on climate change concerns among scholars. Some scholars (Franzen & Meyer, 2010; Kemmelmeier et al., 2002; Schultz & Zelenzy, 2003) believe that concerns on climate change are due to country-specific factors including national progress, media coverage and reportage climate change issues (Brulle et al., 2012; Dumitrescu & Mughan, 2010), and political actions by key actors including governments and political elites (Brulle et al., 2012; Lorenzoni & Nicholson-Cole, 2007). Other researchers maintain that perceived threat of climate change is caused by individual factors. Notable among these individual factors are beliefs, political orientation, knowledge, and cultural worldviews (Lorenzoni & Nicholson-Cole, 2007; Kahan et al., 2012; Shi et al., 2015; Smith & Leiserowitz, 2012).

Literature on climate change (Safi et al, 2012) has shown that individuals who hold strong beliefs on climate change and the threats of climate change tend to observe a greater risk of climate change. Again, positive views about climate change significantly reduce risk perception (Shi et al., 2015), but doubts about climate change contribute to hostile attitudes towards climate change and strong opposition to climate change policies (McCright & Dunlap, 2011; Smith & Leiserowitz, 2012; Tobler et al., 2012a, 2012b). Chirisa et al. (2018) also contend that non-human factors such as spiritism are responsible for climate change. This notion is premised on indigenous knowledge system and it is borne out of the conviction that climate change is a manifestation of the anger of the gods towards humanity. This thinking appears to discredit the gravity of human factors which cause climate change.

Furthermore, in places such as the United States, citizens who have very liberal or democratic political views are generally very likely to provide reports on beliefs which conform to the scientific consensus and to express personal

concern about climate change as opposed to those who have conservative orientations (McCright & Dunlap, 2011; Shi et al., 2015). Besides, people's perceived psychological distance tends to predict concerns about climate change. The beliefs that climate change presents diverse impacts on the lives of local people, and the beliefs that climate change is very certain, all largely influence concerns about climate change (Spence et al., 2012). Other factors which affect climate change concerns include physical vulnerabilities associated with climate change, sensitivity, and adaptive capacities of people and nations, and their impacts on how people perceive climate change risk (Safi et al., 2012; Shi et a., 2015).

More so, demographic features including gender, age, income level and education level have been found to correlate with how people perceive climate change (Dunlap et al., 2002; Semenza et al., 2008a; 2008b; Stern et al., 1993). It is generally believed that females are more concerned about issues related to climate change than males (Stern et al., cited in Shi et al., 2015). Again, highly educated individuals and younger persons generally are more willing to change behaviors related to environmental concerns. Low-income earners tend to have low level awareness of climate change issues as compared to higher-income earners (Semenza et al., 2008a). Knowledge and cultural factors also tend to influence perception about climate change (Shi et al., 2015). Awareness about the causes and impacts of climate change has a significant positive relationship with climate change concerns but negative correlation with climate change skepticism (Tobler et al., 2012a; 2012b).

It is crucial for the public to better understand climate change issues. Knowledge and awareness of public perceptions of climate-change is essential for policy formulation, implementation of suitable and effective actions to avert negative impacts of climate change (Fosu et al., 2019; Kasuli, 2022). Tadesse (2010) defines climate change as the long-term alterations in average weather conditions covering all modifications in the climatic systems. Climate change focuses on the drivers of change itself, the changes themselves and their effects. It also deals with only human factors responsible for climate change (Tadesse, 2010). Indeed, public concerns are the prerequisites for effectively informing people about climate change issues and risk factors. Public perception about climate change potentially increases public's preparedness to change behaviors and attitudes about climate change and to support and accept climate change policy measures (Gadenne et al., 2011; Von Borgstede et al., 2013).

Communication is key to climate change adaptation. To effectively communicate climate change is a vital step towards creating a conducive environment for overall societal adaptation. Nevertheless, little attention has been given to measures to ensure effective communication of climate change for adaptation in semi-arid regions, despite their uniqueness (McGahey & Lumosi, 2018). Effective climate change communication is generally emphasized as a crucial element which affects climate change adaptation responses by stakeholders (Filho, 2009, Moser, 2014; Moser & Ekstrom, 2010). Effective communication helps to close the gaps in physical science-actions on climate change. It also helps individuals and communities to appreciate the enormity of the problem, and raise awareness about climate change (Moser & Dilling, 2012; McGahey & Lumosi, 2018; Nerlich et al., 2010).

A significant factor in effective climate change communication is the channel used. Different target audiences may require different climate change communication channels. Various channels of communicating climate change information and messages have been identified by scholars. They include community gathering, television, radio, mobile phones, online approaches and print media (Gambhir & Kumar, 2013; Kalungu et al., 2013; Mamun et al., 2013). Accessing climate communication approaches, channels, learning processes or methods of knowledge transmission greatly varies. For example, the marginalized may have different access to climate communication channels. This is more pronounced in developing nations which have histories of marginalization and acute human vulnerabilities to climate change (Tucker et al., 2015; Wilby et al. 2009).

Additionally, there are concerns about the effectiveness of current climate change communications in the global south. The concerns include the fact that too much focus is placed on Western scientific approach to climate change issues (File et al., 2021). There are also concerns on the mismatch between climate knowledge production and utilization (Dilling & Lemos, 2011). There are concerns about the climate change communication techniques stakeholder adopt. These concerns largely influence changes in perception, behavior and social change on climate change adaptation. The value of social and behavior change to climate change communication is evident in literature (McGahey & Lumosi, 2018; Moser & Dilling, 2012; Nerlich et al., 2010). The place of social and behavior change in climate change communication is further validated by the theory of reasoned action. According to the theory of reasoned action, people's behaviors are often directed by their intentions. If a person's intentions to perform a given behavior increase, he or she is likely to perform that behavior. Peoples' intentions are directly a function of their attitudes toward the said behavior and the subjective norms (Ryan & Worthington, 2021). Yzer, as cited in Kasuli (2022), argues that behavioral intentions which are explained as individuals' readiness to act or perform a particular behavior are the most direct determinant of behaviors. This indicates that for people and communities to modify their behaviors towards climate change adaptation and mitigation depends on their readiness to perform the new behaviors to aid climate change adaptation and mitigation. Literature (Kuruppu & Liverman, 2011; Pringle & Conway, 2012) suggested that local communities play a major role

in the success of climate change adaptation strategies. However, for this to happen requires more participatory and inclusive communication techniques.

Although Africa is seriously feeling the negative impacts of climate change in diverse ways, it appears not much commitment has been shown in addressing climate change impacts (Tadesse, 2010). For example, there are concerns regarding efforts towards climate change communication in Africa. Climate change communication has received insufficient attention in the continent. Again, there is very little focus on long-term climate change communication strategy for behavior change. Also, there are concerns on the adequacy of participatory communication tools for climate change communication in Africa (ICPAC, 2020). As a result, providing information on climate change and its importance to decision-makers in climate-sensitive sectors is a major challenge that must be met in the continent. Moreover, recognizing the need for decision making amidst uncertainty, and bridging the gaps between scientific and traditional perceptions of climate change have become indispensable in Africa (Chirisa et al., 2018; Tadesse, 2010).

Ghana is already experiencing the unfortunate impacts of climate change commonly found in constant changes in rainfall variability, and disturbing heat waves, flooding and droughts across the nation. Key sectors of Ghana's economy including the agriculture, mining, oil and forestry. These sectors climate-sensitive sectors which have all been undesirably impacted by climate change. The agricultural sector is the most exposed sector climate-induced vulnerabilities due to its over-reliance on hydro-climate factors which have become very unreliable in recent times (Arhin, 2022; Government of Ghana [GoG], 2021). As a strategy to manage climate change impacts, Ghana has formulated various policies. For instance, the country has developed the National Climate Change Policy (NCCP), the National Action Plan to Combat Desertification and National Biodiversity Strategy and Action Plan to give meaning to the Rio Conventions. There is also the Nationally Determined Contributions (NDC) document under the Paris Agreement which highlights Ghana's long-term goals for mitigation and adaptation and how they offer synergetic avenues to decrease sector-wide vulnerabilities, build resilience, and enhance overall efforts towards a green economy and a climate-resilient sustainable development (GoG, 2021). Again, the National Climate Change Committee (NCCC) was formed about ten years ago to coordinate communication, stakeholder engagement and coordination support mechanism across government ministries, departments and sectors (Arhin, 2022).

Besides, Ghana has a National Adaptation Planning (NAP) which captures her vision for adaptation. It also establishes the roadmap for implementation and stakeholder management plan required for promoting adaptation measures (GoG, 2021). In spite of the measures taken, there are concerns regarding climate change adaptation and mitigation efforts in Ghana. It is widely contended that Ghana needs to do a lot more in addressing climate change across various sectors and contexts at all levels. Awareness creation and education need to be intensified since knowledge on climate change remains generally low in the country (GoG, 2021; Odonkor et al., 2020). There are calls for a newer communication strategy to help promote climate change adaptation in Ghana (Odonkor et al., 2020). However, conversations on a newer climate change communication for the country will remain incomplete without a fuller appreciation of how the general public perceive climate change and the channels used in communicating it. In other words, a critical issue which ought to engage the attention of stakeholders concerns public perception on climate change and the effectiveness or otherwise of the climate change communication channels in Ghana. Moreover, though some studies (Anaafo, 2019, Fosu et al., 2019; Kasuli, 2022; Odonkor et al., 2020; Ofoegbu & New, 2021) have been done on climate change communication in Ghana, not much attention has been placed on interrogating the level of effectiveness of climate change communication channels used in the country. This constitutes a vital research gap which requires filling. Thus, this study purposely sought to interrogate public perception on the level of effectiveness of the channels used in communicating climate change in Ghana. The study, specifically, examined (1) the general views of Ghanaians on climate change, (2) the frequency level regarding the everyday sources of information and message, and (3) the perception of Ghanaians on the level of effectiveness of climate change communication channels in Ghana.

II. METHODOLOGY

The research adopted the descriptive survey design. Data was obtained from Ghanaians who were 18 years or above. Simple random and convenience sampling techniques were used to select 327 Ghanaians to participate in the study. Questionnaire was employed to collect relevant data from the respondents. Two main strategies characterized the questionnaire administration. First, it was randomly distributed via Google Form to Ghanaians who were interested in the study and were ready to provide data to fill the form. In doing so, the Google form was distributed to the respondents through different social media platforms including WhatsApp and e-mail. Respondents who received the form were encouraged to complete and forward it to the other Ghanaians on diverse social media platforms for those who were interested in the issues and were willing to be part of the study to fill it. A total 231 Ghanaians completed the Google Form. Second, the researcher administered the questionnaire on Ghanaians who did not fill out the Google Form but had expressed interest in the study. A total of 96 Ghanaians were conveniently selected to fill out printed copies of the

questionnaire. A total of 327 Ghanaians took part in the study. Cronbach's alpha was calculated on the items and a coefficient of 0.839 obtained showed that the instrument was highly reliable.

In analyzing the data, frequencies, percentages, cross tabulation, means, standard deviations, Mann Whitney U, and Kruskal Wallis tests were used. Cross tabulation was used to analyze the demographic data. Frequencies and percentages were adopted to analyze the general views of Ghanaians on climate change. Means and standard deviations were relied on to analyze the sources of obtaining and receiving information among Ghanaians. Similar tools were used to analyze the level of effectiveness of climate change communication channels in the country. Mann Whitney U test was used to determine the differences in the views of male and female respondents on the level of effectiveness of climate change communication channels in Ghana. Kruskal Wallis test was conducted to examine the differences in the views of respondents on the level of effectiveness of climate change communication channels. Ethical issues considered in this study include obtaining informed consent of participants prior to data collection and provision of information on voluntary participation. Besides, respondents were assured that information they provide would be kept confidential. Finally, it should be noted that the use of only quantitative measures could hinder in-depth examination of the issues since the respondents could not get the chance to provide more detailed views on the issues. Yet the results are relevant especially to Ghana and Africa in a time when climate-induced vulnerabilities continue to threaten the very existence of humanity.

III. FINDINGS & DISCUSSIONS

The results are presented and discussed based on the demographic features of respondents and the study objectives. Table 1 presents demographic features of respondents.

Table 1

Cross Tabulation of Gender, Educational Level and Religious Affiliation

Count			**Religious affiliation**				
			Christianity	**Islam**	**Traditional Africa**	**Others**	**Total**
Gender		**Educational level**					
Male		Basic education	4	0	0	0	4
		Secondary education	0	8	2	0	10
		Tertiary education	109	15	1	9	134
	Total		113	23	3	9	148
Female		Secondary education	0	0		2	2
		Tertiary education	166	10		1	177
	Total		166	10		3	179
Total		Basic education	4	0	0	0	4
		Secondary education	0	8	2	2	12
		Tertiary education	275	25	1	10	311
	Total		279	33	3	12	327

The findings as presented in Table 1 show that 109 respondents who were males and Christians had obtained tertiary education. Also, 166 respondents who were females and Christians had education up to the tertiary level whilst only 15 of them who were males and Moslems had education up to the tertiary level. Clearly, there were more Christians who took part in the study, with most of them having tertiary education. The findings on demographic features are relevant because age, gender and education correlate with perceptions about climate change (Dunlap et al., 2002; Semenza et al., 2008; Stern et al., 1993). Again, Naab et al., as cited in Kasuli (2022), observed that educational level of people significantly influences how they employ channels when communicating climate change messages and information. Where many people lack adequate formal education, it becomes very difficult in communicating climate change issues to them in a language other than their native language.

Perceptions about climate change tend to affect communication around climate change. In support of this assertion, Moser (2014) underscores that understanding perceptions around risks associated with climate change and adaptation measures needed is a critical step for promoting climate change communication. The study first ascertained the perception of Ghanaians on climate change in the country as shown in Table 2.

Table 2

General Views of Respondents on Climate Change

Item	Yes F (%)	No F (%)	Not Sure F (%)
Do you think that climate change is already harming your country?	274(83.8)	24(7.3)	29(8.9)
Do you believe that climate change is already harming humanity in general?	270(82.6)	25(7.6)	32(9.8)
Are you worried about the impact of climate change for your community?	285(87.2)	24(7.3)	18(5.5)
Are you worried about the impact of climate change for you personally?	258(78.9)	37(11.3)	32(9.8)
Are you worried about the impact of climate change for future generations?	281(85.9)	22(6.7)	24(7.3)
Do you believe climate change is caused by human factors?	256(78.3)	24(7.3)	47(14.4)
Do you believe climate change is caused by non-human factors (spiritual forces) as a way of nature punishing evil committed by mankind?	89(27.2)	203(62.7)	35(10.7)
Do you think Ghana has adequate legal and regulatory measures for dealing with climate change issues?	54(16.5)	169(51.7)	104(31.8)
Do you believe state agencies and institutions are appropriately responding to climate change issues and challenges in Ghana?	53(16.2)	176(53.8)	98(30.0)
Do you believe the local authorities (the assemblies) are actively participating in addressing climate change issues and challenges in Ghana?	32(9.8)	212(64.8)	83(25.4)
Do you think the media are actively participating in addressing climate change issues and challenges in the country?	85(26.0)	170(52.0)	72(22.0)
Do you believe Ghana has shown adequate socio-political will to addressing climate change issues?	35(10.7)	203(62.7)	89(27.2)
Do you think behavioral and social change is critical to addressing climate change issues in Ghana?	231(70.6)	43(13.1)	53(16.2)
Do you think you can do something on your own to prevent climate change from harming Ghana?	231(70.8)	43(13.1)	53(16.2)
Do you think citizens have adequate knowledge and awareness about climate change in Ghana?	25(7.6)	218(66.7)	84(25.7)
Do you think citizens should hold political officeholders accountable on their commitment to addressing climate change issues in Ghana?	206(63)	68(20.8)	53(16.2)
Do you think Ghana should continue addressing climate change issues and problems?	206(63)	68(20.8)	53(16.2)

Various views, as shown in Table 2, were expressed by respondents on climate change. For example, 83.8%, 82.6% and 87.2% of the respondents respectively stated that climate change is already harming the country, the entire human race and their communities. The revelations on the impact of climate change support Tadesse's (2010) assertion which indicated that climate change is already harming African countries. Again, 78.9% of the respondents were apprehensive about the effect of climate change on them personally and 85.9% believed future generations are impacted negatively because of climate change. This reflects a position held by Tadesse (2010) which suggests that climate change is already impacting Africans. There are fears that climate change will melt efforts Africa is making to reduce poverty unless drastic measures are put in place in terms of adaptation, compensation and mitigation (Tadesse, 2010). All African nations face the global climate change challenge, and this continues to threaten the gains they make in development (The World Bank, 2010).

Again, most (78.3%) of the respondents said that human factors cause climate change which converges with earlier assertion that climate change is caused by human factors (IPCC, 2013). Though many respondents did not think non-human factors (spiritual forces) cause climate change in the country, a good number of them (27.2%) believed non-human factors could be responsible for climate change. This revelation reflects a study by Odonkor et al. (2020) which reported that Ghanaians believed that climate change is an act of God. The present study further reinforces earlier claims which asserted that climate change concerns are caused by non-human factors such as beliefs and other cultural features (Kahan et al., 2012; Lorenzoni et al., 2007; Poortinga et al., 2011). Nonetheless the result on human factors as the cause of climate change as expressed by many of the respondents aligns with literature (Shi et al., 2015) which seems to favor human factors as the cause of climate change.

In addition, many (51.7%) of the respondents thought that Ghana lacks adequate legal and regulatory measures for dealing with climate change impact coupled with 53.8% of them who said that state agencies and institutions are not appropriately responding to climate change impacts. On participation, 64.8% of the respondents mentioned that local authorities are not showing active participation when dealing with climate change in the country whereas 52% believed that the Ghanaians media are not actively participating in tackling climate change in the country. Schultz and Zelezny (2003), and Kemmelmeier et al. (2002) contended that the media play a critical role in the concerns people have on the causal elements of climate change. The authors maintained that media coverage of climate change issues has a huge influence on people's concerns about climate change. In support, Nisbet, as cited in Kasuli (2022), opines that the media have an important role to play in climate change issues. The author submits that how the mass media frame climate change issues largely influence how the general public interpret and understand the issues.

Besides, 62.7% of the respondents felt that Ghana has not shown adequate socio-political will in addressing climate change impacts, with 63% of them stating that citizens should hold political officeholders accountable on their commitment to addressing climate change issues. The findings on political factors and regulatory framework corroborate earlier studies (Brulle et al., 2012; Lorenzoni et al., 2007) which observed that political actions and governmental factors have influence on public concern about climate change. Finally, though 70.6 of Ghanaians thought that behavioral and social change is critical to addressing climate change issues in the country about 67% admitted that the level of public awareness and knowledge of climate change issues is low in the country. The validity of the result on behavior and social change is expressed in the theory of reasoned action which states that behavioral intention which is regarded as a person's readiness to act or perform a given behavior is the most critical element of behavior.

The study also examined the frequency with which respondents relied on everyday sources of information and messages (Table 3).

Table 3

Frequency Level Regarding the Use of Sources of Obtaining Information and Message

Source	Minimum	Maximum	Mean	Std. Dev.
Community gathering and for a	1.00	4.00	1.80	0.81
Posters and banners	1.00	4.00	2.04	0.94
Exhibitions and documentaries	1.00	4.00	2.25	0.95
Newspapers	1.00	4.00	2.26	0.92
Mobile phone wireless texting (SMS)	1.00	4.00	2.58	1.13
Radio	1.00	4.00	2.71	0.98
Television	1.00	4.00	2.89	0.95
Social media platforms	1.00	4.00	3.28	0.99
Internet sources (e.g., google website)	1.00	4.00	3.29	0.92

The researcher, as shown in Table 3, first identified sources respondents commonly rely on for of information and messages. Various sources were identified including radio, television, newspapers, social media platforms, mobile phones wireless texting and online sources. Again, the study examined the frequency with which respondents used these sources for information and messages. It was revealed that social media (M=3.28), and internet sources (M=3.29) were moderately used. Also, television (M=2.89) and radio (M=2.71) were the common sources of information and messages among the respondents. The findings on radio and television as common sources of obtaining information reinforce previous research (Akinlolu et al., 2017) in Nigeria which found that radio and television are common sources of information and messages in the country. The frequency level with which respondents sourced information and messages from posters and banners (M=2.04), exhibitions and documentaries (M=2.25), and community gatherings (M=1.80) was found to be low. Similarly, newspapers (M=2.6) were lowly relied on for information and messages by the respondents. Another striking revelation was that mobile phones wireless texting (M=2.58) was found to be a common source of obtaining information and messages than newspapers and community gathering.

The study further explored the perception of respondents on the effectiveness of climate change communication channels used in Ghana. To address this objective, the researcher first identified the climate change communication channels used in the country. With this, it was discovered that television broadcast (68.8%), radio (72.5%), and internet approaches (77.4%) were channel used in Ghana. Other channels used are social media platforms (82.4%), mobile phone wireless (63.6%), newspapers (57.7%), posters and banners (53.6%), exhibition and documentaries (52.5%), and public gatherings/ community fora (48.7%). The various channels found in this study mirror previous research (McGahey & Lumosi, 2018). Having identified the channels adopted, the researcher further examined the perception of respondents on the level of effectiveness of climate change communication channels used in Ghana. These channels can have

implications on the people's behaviors and intentions towards climate adaptation as espoused by the theory of reasoned action (Ryan & Worthington, 2021).

Secondly, respondents were provided with various climate change communication channels for them to indicate how effective those channels were used for communicating climate change issues as seen in Table 4. Table 4 shows that posters and banners (M=2.18); community gatherings (M=2.23); newspapers (M=2.42); and exhibitions and documentaries (M=2.44) were found to be lowly effective channels used for communicating climate change issues in Ghana. Again, movie, videos and animations (M=2.53), and mobile phone wireless texting (M=2.54) were found to be lowly effective channels used for communicating climate change issues in the country. The results on community gatherings, newspapers and posters and banners depart from earlier studies (Gambhir & Kumar, 2013; Kalungu et al., 2013; Mamun et al., 2013) that suggested that community gathering and printed media are among the dominant climate change communication channels in Africa.

Table 4

Perception on the Effectiveness of Climate Change Communication Channels in Ghana

Channel of climate change communication	N	Minimum	Maximum	Mean	Std. Dev.
Posters and banners	327	1.00	4.00	2.18	0.90
Community gathering and open for a	327	1.00	4.00	2.23	0.92
Newspapers	327	1.00	4.00	2.42	0.93
Exhibitions and documentaries	327	1.00	4.00	2.44	0.94
Movie/ videos and animations	327	1.00	4.00	2.53	1.05
Mobile phone wireless texting (SMS)	327	1.00	4.00	2.54	1.00
Radio	327	1.00	4.00	2.71	0.95
Television broadcast	327	1.00	4.00	2.95	0.97
Internet approaches (e.g., google website)	327	1.00	4.00	3.10	0.97
Social media platforms	327	1.00	4.00	3.24	0.94
Total				2.63	0.86

Also, radio (M=2.71) was moderately effective channel for communicating issues about climate change in the country that confirms revelations by Afrobarometer (2018) which established that radio is a commonly used communication channel in Ghana. In a study by Kasuli (2022) in Ghana, it was revealed that radio is one of the commonest climate change communication channels in Ghana. However, Kasuli's (2022) study could not measure the level of effectiveness of radio as a climate change communication channel in Ghana. Nevertheless, radio is one of the technology-centered climate communication channels which reach rural communities in most African nations (BBC World Service Trust, 2010a; Churi et al., 2012; Hansen et al., 2011; Kalungu et al., 2013). Radio has transmission signal which can simply reach a wider audience and with much information (Arid Lands Information Network [ALIN], 2013; Mittal, 2012). However, it is believed that several local radio stations in Africa have small ranges (Jost, 2013; Tall et al., 2014) which downplays the impact of radio as a channel of communicating climate change issues in the continent. More so, the study found that television (M=2.95) was generally an effective channel for communicating climate change issues in Ghana.

Generally, the result on television agrees with that of Odoom et al. (2023) which showed that television is a common communication channel in Ghana. Furthermore, internet approaches (M=3.10), and social media platforms (M=3.24) were seen as moderately effective channels for communicating issues about climate change in the country which aligns with other scholars (Gambhir & Kumar, 2013; Kalungu et al., 2013; Mamun et al., 2013) who discovered that television, radio, and online approaches are among the dominant channels for communicating climate change issues in Africa. Akinlolu et al. (2017) believed there is the need to improve the use of social media as a communication channel in Africa. However, McGahey and Lumosi (2018) feared that limited access to reliable electricity and poverty in Africa impede the efficacy of television and online approaches as climate change communication channels.

The study again determined the overall satisfaction of respondents with the effectiveness of climate change communication channels used in Ghana. It was found that 55.7% of respondents stated that they were lowly satisfied with the effectiveness of climate change communication channels used in the country whilst 28.4% of them said they were moderately satisfied with the effectiveness of climate change communication channels used in Ghana. Also, 8.6% of them stated that they were highly satisfied with the effectiveness of climate change communication channels used but 7.3 remained neutral in respect of the issue. Thus, majority (55.7%) of respondents were lowly satisfied with the effectiveness of climate change communication channels used in the country. The result on low satisfaction could impede social and behavior change required in climate change adaptation. This is because satisfaction level of people

can influence their intentions to embrace new climate change behaviors as envisaged by the theory of reasoned action. It can be inferred from the theory that if the intentions of respondents to put up favorable climate-sensitive behaviors increase, they are likely to perform those behaviors (Ryan & Worthington, 2021).

A Mann-Whitney U-test was used to examine the differences between in the mean scores of male and female Ghanaians based on their views on the level of effectiveness of climate change communication channels (Table 5). The Z value of -2.045 and the p-value of 0.043 which is lower than the alpha value of 0.05 means that significant differences manifested in the views of male and female respondents in respect of their overall views on the level of effectiveness of climate change communication channels used in the country. The female respondents had higher mean rank (173.59) than their male counterparts (154.40). By implication, male and female Ghanaians had different views on the level of effectiveness of climate change communication channels. The significance of this finding manifests in other studies (Dunlap et al., 2002; Semenza et al., 2008a) which established that gender influences perceptions about climate change issues.

Table 5

Mann-Whitney U test for Level of Effectiveness of Climate Change Communication Channels in Ghana for Male and Female Respondents

Sex	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
Male	148	152.40	22554.50	11528.500	22554.500	-2.022	.043
Female	179	173.59	31073.50				
Total	327						

A Kruskal Wallis test was used to determine the differences between educational levels of respondents and their overall views on level of effectiveness of climate change communication channels. Table 6 shows that based on a p-value of 0.000 and an alpha level of 0.05 significant differences existed between educational levels of respondents and their views on level of effectiveness of climate change communication channels. A careful analysis of the mean ranks implies that respondents who had obtained tertiary education had the highest views on the level of level of effectiveness of climate change communication channels whilst those who had basic education recorded the lowest views on the level of effectiveness of climate change communication channels. This conclusion does not depart from what exists in literature (Dunlap et al., 2002; Semenza et al., 2008a; Semenza et al., 2008b; Stern et al., 1993) on the relationship between education level and views of people on climate change issues.

Table 6

Kruskal Wallis Test for Level of Education of Respondents and Level of Effectiveness of Climate Change Communication Channels

Educational level	N	Mean Rank	X^2	df	Asymp. Sig. (2-tailed)
Basic education	4	7.00	23.763	2	0.000
Secondary education	12	71.25			
Tertiary education	311	169.00			
Total	327				

IV. CONCLUSIONS & RECOMMENDATIONS

Ghanaians have various perceptions about climate change which tend to affect communication around climate change. They think that climate change is already harming the country, the entire human race, their communities, and future generations. Many Ghanaians think that climate change is caused by human factors, and a good number of them believe non-human factors (spiritual forces) cause climate change in the country. They believe the country does not have adequate legal and regulatory measures for dealing with climate change coupled with the fact that state agencies and institutions are appropriately responding to climate change issues and challenges in Ghana. Generally, local authorities, the media and political officeholders have not been actively involved in addressing climate change issues in the country. Again, they think that Ghana has not shown adequate socio-political will in addressing climate change issues. Nonetheless, they recognize that they have a vital role to play in dealing with climate change, and that behavioral and social change is critical to addressing climate change impacts in the country.

However, Ghanaians bemoan that the public do not have adequate knowledge and awareness of climate change issues is low in the country. Largely, Ghanaians rely on communication channels including social media, radio,

television, and internet sources for information and messages. Ghanaians are lowly satisfied with the effectiveness of climate change communication channels used in the country. Posters and banners, community gatherings, newspapers, and exhibitions and documentaries are lowly effective channels of communicating climate change. Also, radio, television, internet approaches, and social media platforms are seen as generally effective channels for communicating issues about climate change in the country. Significant differences exist in the views of male and female Ghanaians regarding the level of effectiveness of climate change communication channels used in the country. Similarly, significant differences manifest in the views of Ghanaians on the effectiveness of climate change communication channels adopted based on their educational level.

The findings present various implications for climate change communication strategies and practice in Ghana and beyond. The belief in non-human factors as causes of climate change potentially undermines scientific explanations of climate change. This will further lead to a reluctant acceptance of adaptation and mitigation measures which are science-based. It is recommended that a lot more public education and sensitization programs should be done by the government and other stakeholders including the media and civil society organizations at all levels to increase understanding about climate change. It is also recommended that indigenous communication techniques need to be adopted when communicating climate change. Communication strategies which are based on local contexts and experiences can lead to behavior change. Concerns about Ghana not having adequate legal and regulatory measures for dealing with climate change and the fact that state agencies and institutions are appropriately responding to climate change issues and challenges in Ghana suggests that the country needs to re-look at its legal and institutional frameworks guiding climate change. It also means that Ghana needs to show more commitment in implementing climate change laws and regulations. State agencies and institutions need to be adequately strengthened to effectively play their roles in combating the adverse impact of climate change.

Moreover, concerns with the nature of commitment shown by local authorities, the media and political officeholders in addressing climate change issues in Ghana imply that leadership at all levels needs to action-oriented commitment towards climate change. Ghanaians recognize that the role they have to play in dealing with climate change including behavioral and social change. It is recommended that the District Assemblies, the National Commission for Civic Education and the Ministry of Information should liaise and come out with a more comprehensive program aimed at promoting behavior and social change towards climate change adaptation and mitigation. Ghana should consider adopting multiple communication channels which are well-targeted when communicating climate change. The revelation that radio, television, internet approaches, and social media platforms are seen as generally effective platforms means that both the country needs to vigorously focus on both traditional and new media platforms when communicating climate change. The role of the media and the Ministry of Information in this regard is extremely important.

Finally, climate change communication channels employed in the country should consider the differences in gender, ages, and educational level of the target audience. For example, whilst the younger generation commonly prefer social media and online platforms the older generations may prefer newspapers, community gathering and other channels. Likewise, whereas the less educated may tend to rely more on radio and television stations which use local language, the more educated persons may prefer platforms which use English language as a medium of communication.

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