Developing Climate Change Communication Framework for Improved Adaptation in Ghana: A Narrative Review Approach

[1] Daniel Odoom
Email: dodoom@unimac.edu.gh
ORCID: https://orcid.org/0000-0002-6093-7474

[2.] Christopher Dick-Sagoe
Email: dicksagoe@gmail.com
ORCID: https://orcid.org/0000-0001-5295-252X

[3.]Lawrencia Agyepong
ORCID: https://orcid.org/0000-0002-0512-3427
Email: lagyepong@unimac.edu.gh

[4] Christiana Hammond
ORCID: https://orcid.org/0000-0001-8124-1751
Email: chammond@unimac.edu.gh

[5] Joseph Obeng-Baah
Email: jobeng-baah@unimacj.edu.gh
ORCID: https://orcid.org/0009-0007-0512-3427

[1,3,4,5.] Department of Communication,
University of Media, Arts and Communication, Ghana

[2]Department of Development Studies,
University of South Africa, South Africa
[1.] Corresponding Author: dodoom@unimac.edu.gh

Abstract

Climate change has become one of the greatest threats to human life globally. Increasingly, stakeholders, including governments and researchers, are called upon to contribute efforts to promote climate adaptation. Indeed, conversations around climate change adaptation are incomplete without effective communication, Climate Change Communication (CCC) is, thus, key to reducing climate-induced vulnerabilities. Despite the critical role of communication in effective climate adaptation, it appears no clearly defined CCC frameworks exist to guide climate change communicators in Ghana. Based on a narrative review approach with data sourced from Google Scholar, Scopus, Semantic Scholar, African Journals Online, Academia.edu. and ResearchGate, *this paper proposes a framework to guide the development of CCC strategies. The framework highlights critical issues which stakeholders, including policymakers and communicators at both local and national levels, can consider in designing CCC strategies for improved adaptation in Ghana. The paper provides key recommendations for policy reconceptualization.*

Journal of Policy and Development Studies (JPDS)
Vol. 20 Issue 6 (2026)
ISSN(p) 1597-9385
ISSN (e) 2813-1091
Home page:
https://www.ajol.info/index.php/jpds
ARTICLE INFO:

Keywords:
Climate change, climate communication, climate change adaptation, communication

Received: 18 May 2026
Revised: 06 September 2026
Accepted: 24 September 2026

DOI
https://dx.doi.org/10.4314/jpds.v20i6.4

1. Introduction

Climate change has become an important issue throughout the world due to climate-induced vulnerabilities. Climate change is now one of the greatest threats in recent decades. It presents a tougher challenge to human life and livelihoods (McGahey & Lumosi, 2018; Odoom & Fosu, 2023). For example, climate change destroys fisheries, crops and farmlands, and humidity among others leaving people and the environment poorer than desired. (Food & Agriculture Organization [FAO], 2015). Poor individual and household incomes coupled with food insecurity have become the natural consequences of climate change. Additionally, the social, economic and environmental impacts of climate change remain inestimably high. Comprehensive and integrated strategies are, therefore, required to help address the adverse consequences of climate change. Increasingly, nations are called upon to institute adequate measures to promote climate change adaptation and mitigation (Moser, 2014; Odoom & Fosu, 2023).

A significant part of mechanisms to promote climate change adaptation is climate change literacy. However, climate change literacy is very low among stakeholders including media practitioners, policymakers and citizens. The problem of low climate change literacy is often complicated by cultural and linguistic barriers resulting in inaccurate and misleading climate change information (Treen et al., 2020). Consequently, effective integration of climate information is undermined and concerns into policy and planning especially in developing countries become an international priority (Pringle & Conway, 2012). Additionally, inadequate awareness of climate change issues impedes the implementation of effective climate change mitigation and adaption strategies, thereby worsening the vulnerability of countries to climate-related disasters (Ofori et al., 2023).

A central part of the efforts towards climate change literacy and adaptation is communication (Filho, 2009; Fosu et al., 2019; Kudjordji, 2024). Appropriate and effective communication of climate change is increasingly seen as an essential factor influencing climate change adaptation. Different audiences need appropriate CCC to enhance adaptation (Filho, 2009, Moser, 2014; Moser & Ekstrom, 2010; Odoom & Fosu, 2023). Effective communication strategies can help to bridge the science-action gap in climate change. Effective communication enables individuals and communities to understand the extent of climate-induced problems, raise awareness about them, encourage dialogue among stakeholders and ultimately influence climate-sensitive behavior change (Moser & Dilling, 2012; Nerlich et al. 2010).

In recent decades, conscious efforts have been made to integrate climate information and concerns into development planning and policy decisions especially in developing countries. Yet the integration of climate information into adaptation planning has been very slow (Pringle & Conway, 2012; Wilby et al., 2009). Again, till date, the proliferation of sectoral impact assessments in adaptation research reflects the dominance and appeal of physical science approaches for planners. Similarly, climate communication has often been led by physical science methodologies and approaches. Very little attention is paid to climate communication from a more nuanced social science perspective (Tschakert, 2007). The physical science approaches have been questioned widely because they often result in the top-down generation of overly technical climate information, with very limited local level perspectives and culture-sensitive factors in the approaches (McGahey & Lumosi, 2018; Paavola & Adger, 2006; Pringle & Conway; Tshakert, 2007). Consequently, there are increasing calls for a determined shift towards more people-centered climate communication to help to effectively deal with climate change risks (McGahey & Lumosi, 2018; Odoom & Fosu, 2023; Paavola & Adger, 2006; Pringle & Conway; Tshakert, 2007).

Despite the importance of climate communication, it remains a major challenge, especially, in the developing world, where climate change communicators face not only the complex convergence of scientific, practitioner and traditional knowledge systems (Kihupi et al., 2003; Naess, 2013) but also grave sensitivities surrounding power and agency dynamics especially among the rural poor. It is believed that some climate communication techniques and processes can unintentionally legitimize or prioritize certain

forms of knowledge and by so doing reinforce structural power relationships (Harvey et al., 2012). Again, there are concerns about climate communication channels, learning processes or modes of knowledge transmission through which marginalized groups access climate-sensitive information. The situation is worse in areas where there are cases of extreme marginalization and intense human vulnerability to climate change (Tucker et al., 2015; Wilby et al., 2009).

There are also concerns about the level of public awareness of factors affecting community adaptation. For example, how communities themselves cognitively conceive and perceive the process of climate change adaptation appears challenging (Kuruppu & Liverman, 2011; Pringle & Conway, 2012). Ifeanyi-Obi et al. (2017) raised concerns about public awareness of climate change adaptation and mitigation mechanisms and efforts in the continent. Kalafatis et al. (2015) advocated improving the bidirectional flow of information between information providers and users. In addition to these concerns is the issue of how the current CCC is influencing change in perception and social change remains a major challenge (McGahey & Lumosi, 2018). There is a growing need for people and communities to become aware of how to effectively communicate climate change to facilitate social and behavioral change especially in developing countries (McGahey & Lumosi, 2018; Odonkor, Dei & Sella, 2020). Literature has revealed that effective climate change communications go beyond merely providing information to include raising awareness and promoting active public engagement (Center for Research on Environmental Decisions [CRED], 2009; Gbetibouo et al., 2017).

There have been persistent calls for new approaches to CCC to promote sensitivity and adaptation. It is widely accepted that new approaches to CCCs should not focus on overtly technocratic and top-down dissemination of climate knowledge with limited local-level usability in developing countries. Rather, the new approaches should target increasing collaborations between the fields of climate science and social sciences (Pringle & Conway, 2012). New approaches to CCC should contain messages and information packaged ways that are easily accessible to the target audience. They should encompass traditional and historical observations together with science-based measurements (Gbetibouo et al., 2017). Also, new approaches should promote interactive communication to foster dialogue and public engagement with stakeholders to enhance the understanding of climate change and adaptation solutions and improve the likelihood of behavioral change (Lumosi & McGahey, 2016). By engaging local communities and focusing on their needs, climate change information can be co-created and can become usable and relevant (Lumosi & McGahey, 2016; Moser, 2010).

Like many developing countries, the situation in Ghana is pronounced because of persistent CCC challenges, which undermine effective climate communication. The literature suggests that key government and policy officials are unaware of the national climate change policy documents and critical issues affecting Ghana's adaptation and mitigation efforts (Tetteh et al., 2014). Also, huge disparities exist between the availability of climate information and the demand for such information amongst citizens especially in the global south (Owusu, Ma, Renwick & Emuah, 2020). Gadzepko, Tietaah and Segtub (2018) observed that although media practitioners are highly aware of climate change issues and their significance, they generally lack a comprehensive understanding to enable them actively lead agenda for improved climate adaptation. The urgent need for effective CCC strategies has been highlighted by Odonkor et al. (2020) who maintained that most educated Ghanaians have little knowledge and understanding of climate change and its effects, which impedes climate adaptation in the country.

Several factors explain why there is very low awareness among Ghanaians on climate change issues. They include limited access to information, low levels of education, cultural and linguistic barriers, low media coverage, too much use of scientific language in climate change communication, and the reluctance of Ghanaians to consider issues affecting them beyond their immediate needs which surpasses concerns about climate change (Agyemang et al., 2019; EPA, 2019; Mbatia et al., 2018; Okali et al., 2014). Kudjordji (2024) called for more structured communication strategies by climate change organizations to achieve

consistent public engagement and behavior change. Studies (Dumenu & Obeng, 2016; Kudjordji, 2024; Odonkor et al., 2020; Odoom & Fosu, 2023) have argued for a newer approach to climate communication in Ghana for improved adaptation outcomes. Needless to state that Ghana urgently needs effective CCC strategies for improved climate change adaptation in the country. Effective CCC strategies increase climate change awareness campaigns led by state agencies in the country (Odonkor et al., 2020).

Clearly, there is the need for a newer approach to communicating climate change in Ghana. Studies (Agyemang et al., 2019; Asare, 2013) have observed that climate communication in Ghana is usually linear. Existing climate communication strategies in Ghana focus largely on the transmission of climate information through radio and television with very limited opportunities for dialogue and feedback (Agyemang et al., 2019; Asare, 2013). However, to effectively communicate climate change for improved adaptation communicators need a clear framework to guide climate communication. It is the position of this paper that although some scholarly efforts have been made on the promotion of CCC in Ghana, a well-defined CCC framework as a guide for communicators and other stakeholders appears non-existent. This paper contends that to enhance climate change adaptation, there is the need for stakeholders including academics to help develop a framework to guide CCC strategies and efforts in Ghana. Consequently, based on a narrative literature approach, this paper proposes a framework to guide climate communication in the country. The paper is structured into five main sections: introduction, methodology, review of related literature, key observations and proposed framework, and conclusion. The study concludes with a conceptual framework developed to clearly illustrate the relationships between core climate change issues and climate change communication.

2. Methodology

This study relied on a narrative literature review designed to examine existing scholarship on climate change communication (CCC) in Ghana. Particularly, the study focused on climate change adaptation, climate change mitigation, climate change information, climate change literacy, climate change policy and climate change communication strategies. A narrative review was deemed appropriate for the research because the researchers sought to integrate diverse conceptual and empirical perspectives on climate change communication to enable the seamless identification of key issues, emerging insights and knowledge gaps which informed the proposed framework for CCC.

The review was informed by the principles underlining narrative literature review as outlined by Pautasso (2013). According to Pautasso (2013), a narrative literature review involves clearly defining the review topic, conducting a comprehensive search of relevant literature on the topic, critically evaluating selected sources, organizing the literature thematically, synthesizing key observations and obtaining scholarly insights into the review. Importantly, the narrative literature review approach enabled the researchers to go beyond simple descriptions of previous studies by comparing diverse scholarly perspectives and discovering areas of convergence and divergence in existing literature.

A comprehensive search of the relevant literature was conducted using search engine databases including Google Scholar, Scopus, ResearchGate, Semantic Scholar, African Journals Online and Academia.edu. These sources and databases were selected to provide access to a wide range of scholarly works on climate change and CCC. The search adopted combinations of keywords and phrases related to the aim of the review. The key search terms included climate change, climate change communication, climate change adaptation, climate change mitigation, climate change literacy, climate change information, climate change adaptation strategies, climate change policy, and climate change communication strategies. A combination of keywords related to the research using Boolean operators, such as “and” and “or”, were employed, to

clearly identify relevant empirical and conceptual literature to address the different dimensions of the topic under consideration.

The initial search identified ninety-seven (97) publications deemed potentially relevant to the review. The publications were subsequently screened using their titles, abstracts and the full texts, where appropriate, to determine their relevance to the focus of the study. After the screening of the ninety-five (97) papers, seventy-one (71) of them were selected for thorough analysis. Thus, twenty-six (26) of the retrieved publications were excluded for their inability to meet the inclusion criteria of the research.

The selection of literature was based on clearly defined inclusion and exclusion criteria. The researchers included publications which addressed one or more of the following issues: climate change adaptation, climate change mitigation, CCC, climate change policy, CCC strategies, climate change information, climate change literacy, public awareness, stakeholder engagement, and behavioral responses to climate change. The researchers excluded publications when climate change and CCC were mentioned only superficially or when the scholarly work failed to provide adequate insights into the communication elements of climate change. Materials that were considered clearly irrelevant to the aim of the review were also excluded from the analysis. In essence, inclusion for this study was not merely determined by the presence of climate change-related terminologies, but by the degree to which scholarly works contributed theoretically, conceptually or empirically to the understanding of climate communication.

The seventy-one (71) publications purposively selected for the study were subjected to comprehensive analysis aimed at identifying the main theoretical and conceptual insights, ideas, arguments, methodological approaches and results in the literature. Attention was paid to areas of agreement and disagreement among scholars including repeated themes, emerging perspectives and limitations. In line with the requirements of narrative literature review, the study did not simply summarize individual publications but iteratively compared and integrated key ideas, results and conclusions from different scholarly works with a view to establishing major patterns and relationships within the existing literature. The analysis particularly considered how communication contributes to climate change awareness, literacy, adaptation, mitigation, policy engagement, and stakeholder participation.

Subsequently, the results from the reviewed literature were organized into major thematic areas serving as the basis for identifying major observations for the development of the proposed Climate Change Communication (CCC) framework. Thus, the proposed framework represents a vital conceptual synthesis of the key issues, ideas and relationships identified in the literature rather than an empirically tested model.

Finally, to ensure the trustworthiness of the data and further enrich the study, the review was subjected to feedback from colleagues with expertise in climate change issues and climate change communication. These expert comments were used to solidify the review, improve the organization of the literature, synchronize and amplify convergence and divergence issues, clarify omissions and strengthen arguments advanced in the paper.

3. Review of Related Literature

Conceptual Review

Climate change

As a concept, climate change is defined as the long-term change in the statistical distribution of weather patterns including temperature and precipitation over decades to million years (Rahman, 2012). The UNFCCC (2012) also explained climate change as any variation of climate which can be directly or indirectly attributed to human actions that change the structure of the total atmosphere and are observed over a particular period. According to the IPCC (2001), climate change refers to any alteration in the climate over time whether due to natural variability or because of human activity. The UNFCCC in its definition distinguishes between climate change which is ascribable to human activities varying the atmospheric composition of the globe and climate variability that is due to natural causes. Likewise, the IPCC in its definition took a wider look at climate change and stressed that climate change can occur due to natural variability and human activity. Kasuli (2022) defines climate change as a variation of climate of a place because of direct or indirect human activities which alter the structure of the global atmosphere over a long period of time. However, Kasuli (2022) admits that natural factors also trigger climate change. Climate change is also defined as the rise in the average weather of a place (Kasuli, 2022).

Climate change adaptation

Adaptation refers to the process through which organisms make behavioral changes or adjustments that will facilitate their reproductive success and survival in their environments (Bate, 2005). In the natural science parlance, adaptation mainly refers to the change of genetic or social features that makes an organism or a system deal with ecological or environmental changes to survive and reproduce (Futuyama, 1979; Kitano, 2002; Winterhalder, 1980). According to the United Kingdom Climate Impact Program (UKCIP 2003), climate change adaptation is defined as the procedure or outcomes of a procedure that reduces the harm or risk or leads to the realization of benefits that accompanies climate variability and climate change. The United Nations Development Program [UNDP] (2005) conceived climate change adaptation as a systematic process through which measures to manage, cope with, and take advantage of the impacts of climatic issues are designed, developed, implemented and improved. The IPCC described climate change adaptation as the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects which moderates harm or exploit beneficial opportunities (Corner & Clarke, 2018). The IPCC grouped climate adaptation under proactive adaptation, planned adaptation, reactive adaptation, autonomous adaptation, private adaptation, public adaptation (Corner & Clarke, 2018; Kasuli, 2022).

Proactive adaptation is also called *Anticipatory adaptation.* It is the adaptation that is done before the observance of the impacts of climate change (Corner & Clarke, 2018). On the other hand, autonomous adaptation is the type of climate adaptation which is often created by a conscious response to climatic stimuli. This form of climate adaptation is often caused by environmental changes in natural systems (Corner & Clarke 2018). The IPCC described reactive adaptation as the adaptation that is done after the effects of climate change have already been felt (Corner & Clarke, 2018). According to the IPCC, the climate adaptation that results from the deliberate policy outcome is due to the recognition that circumstances have changed or are about changing and so action needs to be taken to achieve the desired condition (Corner & Clarke, 2018). Again, private adaptation is where an individual, a household, or a business entity initiates and implements an adaptation based on self-interest (Corner & Clarke 2018). Public adaptation of climate change is where the central government initiates and implements adaptation measures from the national to local levels (Corner & Clarke, 2018; Kasuli, 2022). Public adaptation is generally motivated by shared needs of the public (Corner & Clarke, 2018; Kasuli, 2022). Climate change adaptation is the adjustment in natural or human systems as a result of the real or anticipated climatic stimuli or their effects, which controls harm and exploits useful opportunities with a dynamic process of economic development' (NCCP, 2013).

Climate change mitigation

This is defined as actions to reduce the flow of heat-trapping greenhouse gas emissions mainly from sources such as factories, cars, power plants and farms. It entails actions including halting deforestation, using land sustainably and restoring nature till we reach the point where the release of greenhouse gas emissions into the atmosphere is balanced with the capture and storage of these emissions (European Environment Agency, 2023).

Climate change communication

CCC is a science that seeks to engage people through information sharing and deliberations to enhance the behavioral changes required to reduce and adjust to cumulative climate variability (Harvey et al., 2012). It is a science-based discipline which seeks to facilitate a two-way dialogue between stakeholders, sharing information, and fostering deliberations to enhance understanding, build consensus, and inspire behavior change, leading to reduced climate risk and improved resilience in the face of climate variability (Harvey et al., 2012). According to Van der Linden (2014), CCC involves various techniques and strategies employed to inform, educate, and influence public opinions and policies related to climate change. Indeed, CCC is seen as a vital mechanism for addressing environmental challenges (Benevento, 2023). Moser (2010) suggested that the heart of CCC is the translation of scientific data into more accessible language which seeks to address misconceptions and foster effective dialogues on climate risks and solutions.

Promoting climate change communication: Key issues

Effective CCC requires meaningful participation from all stakeholders. This means that people-centered approaches to climate communication facilitate face-to-face interaction, personal interactive feedback sessions (such as through intermediaries, or formal stakeholder engagement at community meetings and workshops) and are most preferred and valued among local communities in SARs in Africa and Asia (Bisht & Ahluwalia, 2014; Hansen et al., 2007; Luseno et al., 2003; Njuki, 2013). This is because they promote direct engagement of community members with experts, scientists and practitioners and thus support social learning and faster understanding and uptake of climate change adaptation practices. In Kenya, Njuki (2013) reported that while access to climate forecast information enabled timely decisions and on-farm actions, farmers rated face-to-face information exchange and access as their preferred method, over radio or mobile phone-based communication channels (McGahey & Lumosi, 2018). However, other studies from Kenya's drylands found that face-to-face dissemination of climate information for adaptation by local opinion leaders can be inadequate and confusing. It is believed that through improved training and support face-to-face communication can be highly effective at promoting climate change adaptation (McGahey & Lumosi, 2018; Muchunku et al., 2014).

Stakeholder engagement is key in climate change communication and climate adaptation. Achieving climate adaptation is a shared responsibility. Thus, in designing CCC strategies it is vital to consider the views, interests and characteristics of different stakeholders to achieve improved adaptation (Kihupi et al., 2003; McGahey & Lumosi, 2018; Naess, 2013; Odonkor, Dei & Sella, 2020; Odoom & Fosu, 2023). Stakeholder engagement towards climate change adaptation has become problematic for various reasons including the presence of misinformation and skepticism about climate change, people's typical reactions to uncertainties, and variations in the capacity for long-term planning. This situation reinforces the critical role of communication in promoting stakeholder engagement for improved climate change adaptation (Gardner et al., 2009). Stakeholders such as governments, state agencies, policy makers, civil society, the media and the business community all have roles to play in promoting climate adaptation. Communication is critical to ensuring understanding among stakeholders and the roles they must play in climate adaptation.

Knowledge gaps and research priorities in CCC include better understanding of the importance of different messengers for different audiences; the promise and limits and most appropriate use of new media or innovative forms of cultural expression for different types of public engagement; the effective and ethical use of visualization to convey climate change information; and greater understanding on how the public

perceive the issue of adaptation (Moser, 2010; 2016). However, despite growing interest in the wider topic of climate communications for adaptation, much less is known about effective communications for decision making and societal adaptation in developing countries (McGahey & Lumosi, 2018). In support of the importance of research to CCC, Odoom and Fosu (2023) submit that effective CCC is data driven. The authors contend that without appropriate research, it will be impossible to effectively communicate climate change to ensure adaptation.

Another essential factor to effective CCC is the definition of goals. Moser (2010) amplifies this point and asserts that specific CCC goals influence the selection of the most appropriate communication approaches as well as enhance outcomes. It is therefore incumbent on stakeholders to clearly define goals and adopt the most appropriate communication approaches based on the target audience. In other words, choices in communication goals are vital in achieving the desired outcomes (Moser, 2010). Importantly, a well-defined CCC goal will influence the kind of communication approaches required (Harvey et al., 2012; Moser, 2010). Various forms of communication approaches exist for adoption. They include approaches that aim to inform and educate individuals about climate change; approaches that achieve some type and level of social engagement or action; and approaches that seek to bring about changes in social norms and cultural values (Harvey et al., 2012; Moser, 2010). The approaches range from an upfront "information dissemination" model, to more process-focused approaches designed to promote social learning (p.20). Moser (2010) grouped CCC approach into: technology centered; people centered; and mixed approaches which lie along the continuum of CCC (Harvey et al., 2012; McGahey & Lumosi, 2018; Moser, 2010).

Inherent in effective communication approaches is the communication channels used. In other words, effective CCC depends on the selection of appropriate communication channels. Various communication channels exist for communicating climate change. The channels include radio broadcasts, religious leaders, chiefs, and local groups such as farmer-based organizations (FBOs) and Community-Based Extension Agents (CBEAs). Local radio stations, community durbars, funerals, festivals, local markets, farmer-to-farmer extension and farmer field schools are used to disseminate information to people especially women and farmers to facilitate climate change adaptation (Gbetibouo et al., 2017; McGahey & Lumosi, 2018; Muchunku et al., 2014).

Corner et al. (2018) identified certain principles critical to CCC and emphasize that climate communicators should build trust among their audience by communicating confidently and authentically. They argued that climate communicators with scientific knowledge and control over the subject should also have the professional capacity to clearly articulate expert information on issues of climate change. Again, climate change communicators are mandated to lead conversations on mutual grounds, using simple language and expressions including examples that the target audiences could easily relate. Essentially, Corner et al., emphasize that climate communicators should always frame their messages with their target audiences in mind. Corner et al. (2018) further states that the basis of the realities of scientific information should be based on shared principles and that connecting with widely shared public principles, in their communication and public engagement will make it more likely for their messages to be accepted. When climate communicators have information concerning the kind of things their audience could be interested in and start their discussion on terms the audiences are familiar with, they will get the attention of the audience than presenting their information using science and explaining how relevant it is to the audience.

A lot of people appreciate the world through stories and not figures and charts (Isik, 2025). Storytelling and narrative techniques are effective in bridging the gap between scientific data and human experience, making climate change more relatable and understandable. In communicating climate change, communicators should be targeting descriptive structures and display the human face that follows the scientific information when giving the massage. The use of narratives helps the audience to understand complex and intellectual issues. It also makes scientific information easier to recollect and process as compared to the use of graphs, charts and figures (Corner et al., 2018; Dahlstrom, 2014). Dealing with what is already known to the

audience before you discuss uncertainties is a method that will help in ensuring that uncertainties do not disrupt a compelling story (Corner et al., 2018). Corner et al. (2018) entreat climate change communicators to concentrate on what is known to the audience before they discuss what is unknown and place emphasis on areas where there is strong scientific agreement about a theme. Selecting imageries and diagrams is as significant in evidence-based communication as verbal and written communication. Using climate visuals serves as useful tools on how to communicate effectively in a visual medium. Climate communicators must ensure that the creation of awareness on climate change should not discourage the responsibility for adapting to climate change. Climate communicators must adopt evidence-based imageries that exhibit people in real-life situations to respond appropriately to the effects of climate change (Corner et al., 2018).

The Center for Research on Environmental Decisions (CRED) also came out with eight (8) principles that should be used in communicating climate change. As a guide to experts, media personnel, educationists, politicians and other concerned individuals, CRED believed that CCC, like any other communication, will be more effective when those principles are followed. First, CRED (2009) noted that climate change communicators should do well and understand who their audience is. To know the audience CRED (2009) advised climate change communicators to try and identify the misunderstandings their audience is likely to have in mind concerning climate change. When this is done, the communicators now must remove the inaccurate information they have about climate change and then give them the correct information. Second, climate change communicators can get the attention of their audience when the message is well framed. CRED (2009) noted that people feel better and more optimistic about attaining their goals when the information is presented in a way that they are comfortable with. Third, CRED (2009) noted that there is low comprehension or interest in communication that is full of scientific language, a situation that can contribute to the lack of public action on climate change. To overcome this, CRED (2009) recommended that climate change communicators should consciously translate scientific information to concrete knowledge for the local audience to understand and respond. They can achieve this by using experimental materials like clear images in films when making a presentation on climate change; avoiding the use of jargon, complex scientific terms and abbreviations during discussions with the public. Rather, use words that the audiences understand; and by explaining technical terms used carefully to the audience.

Effective CCC techniques have clearly defined goals from the outset to help guide choices regarding relevant approaches to communication. Again, understanding the audience and conveying climate information through credible messengers, and engaging people emotionally or ensuring appropriate framing of the message are key to any successful CCC (Moser, 2010; Nerlich et al. 2010). Though Nerlich et al. (2010) see no direct correlation between communication and behavior change, they admit that a mix of measures, alongside communication enhances behavior change. Moser (2014) argued that communicating adaptation is a unique challenge, since it involves progressive and continual change with long lag times and uncertainties. As a response to this unique problem, public engagement on adaptation through small-scale interactions such as workshops is stressed as an effective means to increase knowledge, foster deeper dialogue and transcend political, social or cultural differences (McGahey & Lumosi, 2018).

Lewandowsky (2021), however, observed that climate change communication is a difficult and an unpredictable terrain, requiring skillful attention to avoid misconceptions, misinformation and polarization. Other strategies include providing more balanced information which can cause an emotional reaction with more logical information to make a mark on any part of the brain to the audience. Communicators should also make a balance between pre-existing fears about issues concerning climate change to discuss. They can also do this by asking the audience to know their level of awareness of climate change through the media and exposing them to documented pictures of climate change and taking note of their reactions (CRED, 2009). Additionally, CRED (2009) stressed that people will better appreciate climate information when the information is presented to them for discussion as a group. Group processes offer individuals the opportunity to share knowledge, skills and personal experience in diverse ways. CRED (2009) recommended that climate change communicators present climate information to informal groups. This will

allow the group members to ask questions and express their opinions. CRED (2009) recommended that climate communicators should present the information by tapping into various groups that the audience represents and encourage the audience's sense of affiliation with group members, their immediate environment and the wider society that enjoys the benefits of their natural resources. Additionally, the communicator should elicit the support of someone locally known to their audience to introduce you if you are an outsider. Messengers who are closer to the audience may get a stronger reaction to calls for action on climate change as compared to those who are not closer to the audience. People will act when there is a sense of belongingness to the individual or society that is making those demands (CRED, 2009).

CRED (2009) explained further that many environmental decisions are group decisions and so climate communicators need to appreciate the way people take part in group situations. Moreover, group values are imperative since they regulate who should speak, when to speak, the way the message should be presented and how members can disagree. Thus, climate change communicators are to break the large group into smaller groups to help initiate discussions and encourage early participation from various stakeholders. This is because when stakeholders have the feeling that they are actively involved in the decision-making process, chances are that they will support the final decision. Finally, CRED (2009) advised CCC practitioners to make behavior change easy by using the default effect. This inspires listeners to change their behavior which goes a long way to reducing the effects of climate change. Climate change communicators also need to give their audiences instant motivation to make behavior change easy.

Empirical Review

Studies (Green et al., 2007; Jones et al., 2005; Nguyen, 2015; Smith,1998) illustrate the impact of messaging on knowledge transfer, behavior influence, and decision-making processes. Radio, in particular, has been identified as an effective medium for reaching rural communities, where access to other forms of media is limited (Agyeman et al., 2020). Additionally, social media platforms, such as Facebook and Twitter, are increasingly being utilized to share climate change information and engage citizens in climate change discussions (Kwakye et al., 2022). A study by Lewenstein (2003) on models of public communication of science and technology proposed participatory and dialogue-based approach to communicating climate change to arrive at more sustainable and accepted solutions.

Hurlstone et al. (2014) observed that improving climate change communication requires a newer approach. Hurlstone et al. (2014) argued for the use of narrative communication by stakeholders to ensure proper transmission of stories about climate impacts or mitigation efforts since narrative communication resonates more than abstract data as they engage emotions, aiding in overcoming skepticism. Corner et al. (2014) asserted that message framing is key to effective climate change communication. Corner et al. (2014) believed that effective message framing can help to create communication around stories from affected communities or how successful adaptation projects have been impactful in line with audience's preferences and values. Maibach et al. (2016) have recommended the use of trusted messengers such as local community leaders, religious figures, or even peers as crucial in effective climate communication.

In a study in Zambia, Harbinson, Mugara and Chawla (2006) found that editors and journalists have little interest in reporting climate change adaptation due to inadequate knowledge on the issue and the low literacy levels of the intended recipients. Also in Mozambique, Patt and Schroter (2008) observed large disparities in how farmers and policy makers perceive climate risks leading to differences in perceptions and willingness to take action. Hurlstone et al. (2014) recommend the use of narrative communication to transmit stories about climate impacts or mitigation efforts because narrative communication resonates more than abstract data as they engage emotions, aiding in overcoming skepticism. In their research on climate change, Stevenson et al. (2014) discovered that effective CCC cannot happen when people are skeptical about climate change adaptation.

McGahey and Lumosi (2018) revealed that having effective communication channels is critical to promoting CCC for improved adaptation. Studies have identified various channels for communicating climate change. The dominant communication channels often used in the dissemination of climate information in Africa and Asia include radio, television, print media, community gatherings and online approaches (Gambhir & Kumar, 2013; Kalungu, Filho & Harris, 2013; Mamun, Stoll & Whitehead, 2013). However, previous studies (Bisht & Ahluwalia, 2014; Harvey, 2011) have shown that radio and mobile phone are effective means of reaching far higher geographical areas and greater target audiences in sub-Saharan Africa and Asia compared to other forms of mass media communication technologies such as television or online approaches.

Asante and Amuakwa-Mensah's (2014) study on climate change and variability in Ghana revealed that climate change poses critical threats to Ghana's development in the health, agriculture and energy sectors. Through a quantitative research on the socioeconomic impact of climate change of smallholder farmers in Upper White Volta Basin of Ghana, Amikuzuno (2017) revealed that climate change affects the economic well-being of farmers in varying degrees. Amikuzuno (2017), however, observed that adaption to climate change significantly reduced the severity of its negative impacts, demonstrating the value of resilience and adaptation in mitigating the economic impacts of climate change on farmers. Also, Amikuzuno (2017) found that increased climate change adaptation among farmers had increased farmers' productivity, their income level, and led to a reduction of poverty rate in Ghana.

In their mixed-method study on climate change and social vulnerability in Ghana, Dumenu and Obeng (2016) found that socioeconomic conditions including high illiteracy levels, heavy dependence on climate-sensitive livelihoods, less diversification of income sources and limited access to climate information exposes Ghana's Savannah communities to adverse effects of climate change. Similarly, a study on knowledge, attitudes and adaptations to climate change in Ghana by Odonkor et al. (2020) found that most educated Ghanaians have little knowledge and understanding of climate change and its effects. Odonkor et al. (2020) called for heightened climate change awareness campaigns by state agencies in the country. In a quantitative study involving 327 Ghanaians, Odoom (2024) observed that though climate change is already harming local communities, stakeholders have not yet made much effort addressing climate change impacts.

In their study on CCC in Ghana, Odoom and Fosu (2023) found that incorporating more community mobilization and behavioral change techniques into CCC, empowering citizens, and adequately resourcing institutions mandated to deal with climate change are key to achieving climate change adaptation in the country. Again, Odoom and Fosu (2023) found that creating stories, folklores and music around climate change based on local language will enhance indigenous knowledge about climate change which will lead to increased adaptation. Besides, policymakers need to embed climate change issues in all levels of formal education. The study also observed that ensuring that information and messages about climate change are well-targeted to the audience, communicating clear, necessary and useful facts and information about the causes and effects of climate change to the public, and communicating messages and information about climate change in a more understandable way are vital strategies to promote CCC in Ghana.

In Ghana, state agencies including the Ministry of Environment, Science, and Technology, the Forestry Commission, and the Environmental Protection Agency (EPA) engage in climate change communication. These state agencies are mandated to design and implement policies and programs to effectively tackle environmental challenges and promote sustainable practices. These agencies often employ various communication channels such as traditional media, digital platforms and community engagement techniques, to disseminate information about climate change adaptation and mitigation. These state institutions are expected to adopt tailor-made climate messages for diverse audiences to foster public awareness, behavioral change, and support for climate-related policies (Kodjurdzi, 2024).

Other strategies identified include selection of climate change brand ambassadors and local voluntary groups and change agents, involvement of CCC experts, collaboration with the media, and development of sector-specific CCC plans will foster effective CCC (Odoom & Fosu, 2023). The authors concluded that effective CCC depends on adequate CCC research and clear national CCC policies which are anchored on participatory communication, indigenous communication techniques and modern technologies. On channels of climate communication, Odoom (2024) found that radio, television, and social media platforms are effective CCC channels in Ghana. This means that stakeholders require multi-channel communication for effective climate communication.

4. Key Observations and Proposed Framework for Promoting Climate Change Communication

It is clear from the review that climate change is a major concern to the world. It is equally clear from the review that effective communication is essential to climate change adaptation and mitigation. The review has revealed that effective CCC is a shared responsibility. This is because climate change is a multi-sectoral issue multiple stakeholders are needed to achieve sustainable CCC outcomes. It is lucid from the review that to achieve effective climate change adaptation stakeholders need to have knowledge of the characteristics of the target audience and provide well-targeted messages and information. Importantly, effective CCC requires clear and factual messages and information, and increased participation of all stakeholders. It is also seen in the review that effective CCC cannot occur without paying attention to the channels for communicating climate change. Stakeholders need to adopt channels that can promote citizen empowerment. Stakeholders consciously need to ensure the inclusion of climate communication issues in the formal education curriculum at all levels. While climate change-related topics are generally explored in certain subjects at the basic and secondary education levels and some courses and programs at the tertiary education level, very little attention has been given to the communication dimensions of climate change in Ghana's educational curriculum. There are also challenges stakeholders face in their efforts to effectively communicate climate change for improved adaptation. They include government's commitment to having climate change as very critical on national agenda. If governments consider climate change issues very critical on their national agenda, they tend to become more committed to addressing them. Also, the review has shown that effectively resourcing state institutions and agencies mandated to deal with climate change can enhance CCC. Besides, data is key to effective climate change communication. Effective CCC strategy is data driven. Where there is poor data on climate change and CCC, achieving adaptation becomes difficult.

Based on the review, the researchers proposed a framework to help promote CCC (Figure 1). The goal of effective CCC strategies is to improve climate change adaptation. However, to be able to develop a viable CCC strategy communicators need to appreciate several factors and the interplay of these factors. First, the researchers maintain that communicators need to clearly identify relevant stakeholders and their roles. Effective CCC cannot happen without a vivid identification of all relevant stakeholders. This means that a critical part of any effective CCC strategy is for communicators to identify all stakeholders. Governments, state agencies, policy makers, civil society organizations, and the media play a major role in CCC strategy. For example, governments enact laws and regulations to guide climate change and CCC strategies. Likewise, state agencies have a responsibility to enforce laws and regulations on climate change. Also, traditional leaders, community members and opinion leaders are stakeholders for climate change. Thus, recognizing all stakeholders and their roles in communicating climate change could effectively influence CCC for improved adaption. This should necessarily occur at all levels where CCC strategies are required.

Again, the study argues that an appropriate CCC framework should pay attention to the relevant channels of communication for climate adaptation. It is worthy to state that channels such as direct or interpersonal communication channels including public hearings, community durbar, etc.; conventional print and electronic media such as newspapers, radio, television, etc.; as well as the new media and multimedia including social media are critical to the success of CCC and should be encouraged. These channels offer varying climate communication outcomes by virtue of their targeted goals and audiences and therefore enable improved behavior change. For example, communication channels which are more participatory and

context-specific are likely to generate positive results than those which are less participatory and not context-specific. Indigenous communication channels and community mobilization techniques which are more participatory need to be considered in CCC. In the same vein, communication channels which recognize modern technologies can help to reach out to a very large audience than channels which hardly utilize the amazing influence of modern technologies. However, the different stakeholders and audiences also impact the channels required for communicating climate change issues. It is imperative for communicators to ensure that relevant communication channels are utilized to effectively reach out to all people considering contexts and culture-sensitive issues involved at all levels.

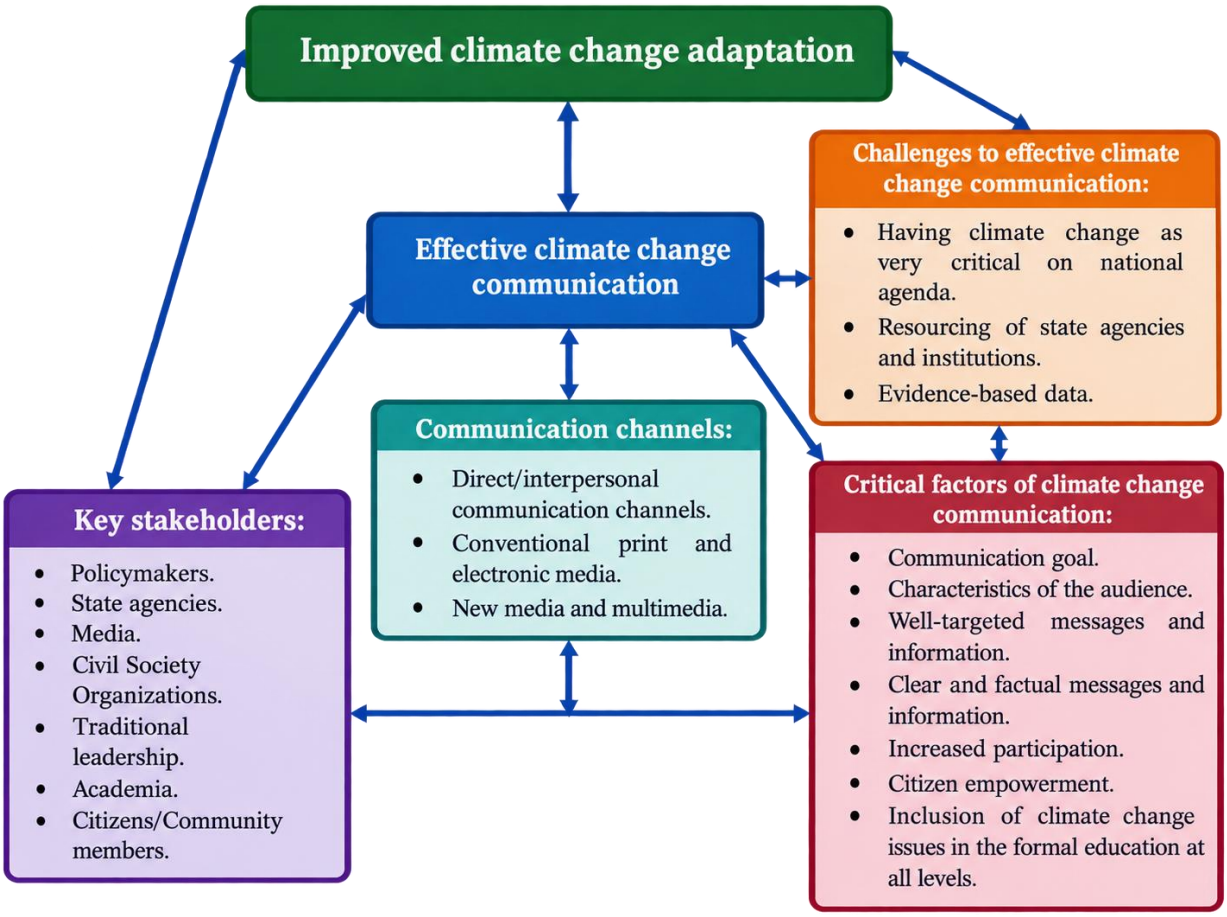


Figure 1: A climate change communication framework for improved adaptation in Ghana
Source: Authors' construct, 2026

Beyond the above issues, the researchers submit that stakeholders involved in climate communication need to consider essential factors which affect the success or otherwise of CCC. These factors include having clear CCC goal, knowledge of the characteristics of the target audience, well-targeted messages and information, clear and factual messages and information, and increased participation of all stakeholders. Others are citizen empowerment, and inclusion of climate change issues in formal education at all levels. Efforts to promote climate change adaptation cannot be overemphasized if climate change messages and information are not clearly defined and communicated. Similarly, where there is lack of stakeholder participation in CCC, it has been observed to be difficult to achieve desired results. Again, research has shown that community participation in promoting CCC leads to a sense of ownership and increased adaptation. In essence, when citizens are empowered to actively participate in CCC, they contribute meaningfully to achieving effortless adaptation successes. It is worthy of note that education has a major

role in climate change adaptation. Understanding of CCC initiatives could be empowering if it is still considered as a key component of the curricula of formal education at all levels. For example, incorporating CCC issues into the country's formal education right from the basic school is a long-term approach to climate adaptation. Though the existing educational curricular contain climate change topics, issues of CCC appear non-existent. Educational institutions at all levels can help learners to appreciate the central of communication in climate change and the communication strategies which can be adopted for improved climate change adaptation. Organizations mandated to promote climate change adaptation need to constantly make efforts to effectively communicate climate change issues to the public.

In addition, improved climate change adaptation cannot occur without stakeholders including communicators appreciating the challenges involved, especially given the multi-sectoral nature of climate change. An awareness of certain key challenges and how to consciously address them will significantly contribute to adaptation. The challenges include the commitment on the part of government to have climate change as very critical on national agenda. The extent to which climate change issues are regarded as critical on national agenda affects the level of commitment towards addressing them. If governments consider climate change issues very critical on their national agenda, they tend to become more committed to addressing them. Thus, climate change adaptation and indeed CCC will be vigorously pursued if governments consider them as very critical on their agenda. Again, adequately resourcing state agencies and institutions to effectively deliver their mandates is a major challenge to achieving the desired results. For improved climate change adaptation to occur there is the need for all relevant state agencies and institutions to perform their roles effectively. However, this can only happen when these state agencies and institutions are adequately resourced. Where they are poorly resourced, they only become ineffective in discharging their mandates. In all this, data on climate change and climate change adaptation is critical to effective communication. Stakeholders need evidence-based data to ground their strategies on climate change. They require research findings on ways to effectively communicate climate change issues at all levels of society. Where there is inadequate data on climate change and CCC, achieving adaptation becomes very difficult. The role of academia and other research institutions in effective CCC becomes inevitably essential. In effect, where there is poor commitment towards ensuring that climate change is critical on national agenda, low commitment to adequately resource state agencies, and poor data on climate change and how to communicate climate change issues, achieving climate adaptation will become a mirage.

In essence, Figure 1 is premised on the conviction that with a clear identification of all key stakeholders and a good understanding of their roles, more participatory and context-specific CCC channels coupled with an increased awareness of the critical success factors and the likely challenges, there is bound to be effective CCC for improved adaptation. The framework is useful for developing effective CCC strategies and plans at all levels which are underpinned by increased awareness of the roles of multiple stakeholders, critical success factors, effective communication channels, adequate resources and evidence-based data.

5. Conclusions and Recommendations

The goal of an effective CCC strategy at all levels is to improve climate change adaptation. However, achieving climate change adaptation requires the deployment of clearly defined strategies. Essentially, it requires clearly defined frameworks to spell out the means-end relationships among all variables. A good CCC framework should highlight the interplay of factors influencing CCC strategies. Thus, this paper has proposed a framework to guide the development of CCC strategies in Ghana. It underscores the need for communicators to clearly identify stakeholders involved in CCC and their specific roles. There is no effective CCC strategy without a vivid understanding of relevant stakeholders and a fuller awareness of their roles. Again, a good CCC framework should outline the relevance of communication approaches and channels required for disseminating climate change issues and messages for effective adaptation. Channels such as direct or interpersonal communication channels including public hearings, community durbar, etc.;

conventional print and electronic media such as newspapers, radio, television, etc., as well as the new media and multimedia including social media are critical to the success of CCC. In addition, an effective CCC framework requires change agents to pay attention to factors which are critical to the success of CCC. Factors including clear definitions of CCC goals, knowledge of the characteristics of the target audience, well-targeted messages and information, clear and factual messages and information, increased participation of all stakeholders, citizen empowerment, and inclusion of climate change issues in the formal education at all levels are central to CCC. Of course, achieving improved climate change adaptation cannot occur without challenges, especially given its multi-sectoral nature. An awareness of certain key challenges and how to consciously address them will significantly contribute to climate change adaptation. Adequately resourcing state agencies and institutions is key to enhancing CCC. Besides, stakeholders need evidence-based data to ground their climate change communication strategies. The framework is useful for developing CCC strategies at all levels which are underpinned by increased awareness of the roles of multiple stakeholders, effective communication approaches and channels which are participatory, localized, evidence-based data and context-specific. The usefulness of the proposed CCC framework extends beyond Ghana. Other settings which share similar characteristics and contextual situations with Ghana can equally benefit from the framework. An obvious limitation of this paper is that the proposed CCC framework was not based on empirically tested model. Nevertheless, the researchers are of strong conviction that the core arguments of the framework are very useful for improving climate communication in Ghana and beyond.

Based on the conclusions of the paper, the following recommendations have been provided:

First, the Ministry of Environment, Science and Technology and the Ministry of Lands and Natural Resources should collaborate with relevant agencies including the Ghana Meteorological Agency, the Forestry Commission and the Environmental Protection Agency to develop a more comprehensive National Climate Change Communication policy framework. The National Climate Change Communication policy should provide clear guidance for translating national climate policies into context-specific communication strategies at regional, district, and community levels.

Second, the Ministry of Environment, Science and Technology should collaborate with relevant ministries including the Ministry of Lands and Natural Resources and other state institutions to re-examine the National Climate Change Adaptation Strategy to ensure that it contains very clear mechanisms for coordination among government institutions, local authorities, civil society organizations, traditional authorities, academia, media organizations, development partners, and local communities. A clear coordination mechanism will enhance climate communication once it explicitly defines the roles and responsibilities of all key actors in CCC to reduce possible duplication of communication efforts.

Third, key stakeholders, including the Ministry of Lands and Natural Resources and the Ministry of Environment, Science and Technology, should ensure that climate communication policies prioritize participatory communication approaches which allow local communities to contribute to the identification of climate risks, communication gaps, and locally appropriate climate adaptation responses. Efforts should be made to ensure proper integration of traditional communication techniques, including public hearings, community durbars, modern communication channels as well as local leadership structures and community-based organizations for improved adaptation.

Fourth, the District Assemblies should effectively liaise with traditional actors, opinion leaders, community-based organizations and development partners to support the development of climate change messages

which reflect the cultural, linguistic, environmental and socioeconomic characteristics of various communities.

Fifth, state institutions including the Ministry of Environment, Science and Technology and the Ministry of Lands and Natural Resources should team up with the Bureau of Ghana Languages, the Institute of Languages of the University of Media, Arts and Communication, and climate communication researchers to design climate communication materials in appropriate local languages to enable people to effectively connect climate change issues with their everyday experiences and unique realities.

Sixth, the media should form stronger collaboration between them and climate change institutions to improve climate reporting and public understanding. Media organizations should re-examine their programs to ensure that television, radio, community information centers, newspapers, and social media platforms are strategically integrated into climate communication instead of treating them as separate communication channels.

Seventh, the National Commission for Civic Education, civil society organizations, media organizations, teachers, extension officers, community leaders, and other change agents should invest in continuous training in climate science, audience analysis, risk communication, digital communication, participatory communication, and techniques for developing culture-sensitive messages for improved climate change adaptation.

Eight, the Ministry of Education, and the Ghana Tertiary Education Commission should liaise with relevant educational institutions to design climate communication programs and courses at the tertiary level. Similarly, the Ghana Education Service should consider introducing climate communication topics into relevant subjects such as Integrated Science and Social Studies at the basic and secondary education levels. Making provisions for climate communication in the formal education system can help to ensure a more sustainable approach to enhancing climate communication for improved climate adaptation.

Lastly, adequate funding is critical to sustainable climate communication. The government should collaborate with relevant stakeholders, including corporate bodies and development partners, to provide sustainable funding for CCC activities. This will help to provide a more reliable and dedicated budget for CCC to promote climate communication research, message development, media productions, and community engagement. Ensuring demonstrable commitment to providing clear CCC funding strategies will also help to fund capacity development programs, digital communications, and monitoring and evaluation in climate communication for improved adaptation.

References

Agyemang, I., Owusu-Ansah, E., Agyare, W. A., & Osei-Amponsah, C. (2019). Climate change communication strategies in Ghana: A review. Environmental Development, 33, 100535. https://doi.org/10.1016/j.envdev.2019.100535

Amikuzuno, J. (2017). Socioeconomic Impacts of Climate Change on the Livelihood and Adaptation Strategies of Smallholder Farmers in the Upper White Volta Basin of Ghana. *Strategies for Building Resilience against Climate and Ecosystem Changes in Sub-Saharan Africa*, 79–91. https://doi.org/10.1007/978-981-10-4796-1_5

Archie, I., Hayward, C. N., Yoshinobu, S., & Laursen, S. L. (2022). Investigating the linkage between professional development and mathematics instructors' use of teaching practice using the theory of planned behavior. PLOS ONE, 17(14), e0257097. DOI: https://doi.org/10.1371/journal.pone.0267097

Asante, F., & Amuakwa-Mensah, F. (2014). Climate Change and Variability in Ghana: Stocktaking.

Climate, *3*(1), 78–99. https://doi.org/10.3390/cli3010078

Asare, K. (2013). Strategies for climate change communication in Ghana: The case of the Ghana News Agency. Journal of Journalism and Mass Communication, 3(3), 131–138.

Benevento, S. V. (2022). Communicating Climate Change Risk to Children: A Thematic Analysis of Children's Literature. *Early Childhood Education Journal*, *51(2)*, 201–210. https://doi.org/10.1007/s10643-021-01294-y

Bisht, H., & Ahluwalia, N. (2014). Community Radios and Climate Change Communication: Mapping Grassroots Experiences of the "Shubh Kal"Project in Bundelkhand, Central India.

Collins, J. A., & Fauser, B. (2005). Balancing the strengths of systematic and narrative reviews. *Hum Reprod. Update, 11,* 103-104.

Corner, A. (2011*). Communicating climate change in Uganda: Challenges and Opportunities.* Cardiff University.

Corner, A., Markowitz, E., & Pidgeon, N. (2014). Public engagement with climate change: the role of human values. *WIREs Climate Change, 5(*3), 411-422. DOI: 10.1002/wcc.269.

Corner, A., Shaw, C., & Clarke, J. (2018). *Principles for effective communication and public engagement on climate change: A Handbook for IPCC authors.* Oxford: Climate Outreach.

CRED. (2009). *The psychology of climate change communication*. CRED.

Cronin, P., Ryan, F., & Coughlan, M. (2008). Undertaking a literature review: a step-by-step approach. *Br J Nurs., 17,* 38-43.

Dahlstrom, M. F. (2014). Using narratives and storytelling to communicate science with nonexpert audiences. *Proceedings of the National Academy of Sciences*, *111*(Supplement_4), 13614–13620. https://doi.org/10.1073/pnas.1320645111

Dumenu, W. K., & Obeng, E. A. (2016). Climate change and rural communities in Ghana: Social vulnerability, impacts, adaptations and policy implications. *Environmental Science & Policy*, *55,* 208–217. https://doi.org/10.1016/j.envsci.2015.10.010

FAO. (2015). Assessing climate change vulnerability in fisheries and aquaculture. Available methodologies and their relevance for the sector. FAO and Fisheries Aquaculture Technical Paper, 598.

European Environment Agency. (2023). Climate change mitigation: reducing emissions. European Environment Agency.

Fosu, M., Quashigah, T., & Kuranchie, P. (2019). Broaching Agenda for Climate Change in Africa: A Perspective on Media Engagement with Climate Issues in Ghana. *Climate Change, Media & Culture: Critical Issues in Global Environmental Communication,* 93-111.

Gadzekpo, A., Tietaah, G. K. M., & Segtub, M. (2018). Mediating the Climate Change Message: Knowledge, Attitudes and Practices (KAP) of Media Practitioners in Ghana. *African Journalism Studies*, *39*(3), 1–23. https://doi.org/10.1080/23743670.2018.1467838

Gambhir, V., & Kumar, P., 2013. India: How the people of India live with climate change and what communication can do (Project Report), Climate Asia Project. BBC Media Action, London, UK.

Gardner, J, Dowd, A-M., Mason, C., & Ashworth, P. (2009). A framework for stakeholder engagement on climate adaptation. CSIRO Climate Adaptation Flagship Working paper No.3. http://www.csiro.au/resources/CAF-working-papers.html.

Gasparyan, A. Y., Ayvazyan, L., Blackmore, H., & Kitas, G. (2011). Writing a narrative biomedical review: considerations for authors, peer reviewers, and editors. *Rheumatol Int., 31,* 1409-1417.

Gbetibouo, G., Courtney Hill, A. J., Mills, A., Snyman, D., & Huyser, O. (2017). *Impact assessment of climate information services for community-based adaptation to climate change. Ghana Country Report*. CARE International.

Government of Ghana. (2021). Ghana's Adaptation Communication to the United Nations Framework Convention on Climate Change. November 2021 Report. Accra: Environmental Protection Agency.

Green, B. N., Johnson, C. D., & Adams, A. (2001). Writing narrative literature reviews for peer-reviewed journals: secrets of the trade. *J. Sport Chiropract Rehabil., 15,* 5-19.

Gregory, A. T., & Dennis, A. R. (2018). An Introduction to Writing Narrative and Systematic Reviews-

Tasks, Tips and Traps for Aspiring Authors. HOW-TO-DO-IT, 27(7), 893-898.

Gulpinar, O., & Gucliu, A. G. (2013). How to write article? *Turk J Urol., 39*, 44-48.

Harbinson, R., Mugara, R, & Chawla, A. (2006). *Whatever the weather: media attitudes to reporting on climate change.* London: Panos Institute.

Harvey, B. (2011). Climate Airwaves: Community Radio, Action Research and Advocacy for Climate Justice in Ghana. *Int. J. Commun. 5*, 24.

Harvey, B., Ensor, J., Liz Carlile, Garside, B., Patterson, Z., & Naess, L. O. (2012). *Climate change communication and social learning - Review and strategy development for CCAF. Working Paper No. 22.* Climate Change, Agriculture and Food Security (CCAFS).

Hurlstone, M. J., Lewandowsky, S., Newell, B. R., & Sewell, B. (2014). The Effect of Framing and Normative Messages in Building Support for Climate Policies. *PLoS ONE*, *9*(12), e114335. https://doi.org/10.1371/journal.pone.0114335

Ifeanyi-Obi, C. C., Togun, A. O. Lamboll, R. Adesope, O. M., & Arokoyu, S. B. (2017). Challenges faced by cocoyam farmers in adapting to climate change in Southeast Nigeria. *Climate Risk Management, 17*, 155-164. DOI: 10.1016/j.crm.2017.04.002.

IPCC. (2013). Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK and New York, NY: Cambridge University Press 2013.
DOI: 10.1080/2331186X.2022.2046241.

Isik, O. (2025). The Power of Stories: Understanding Human Experience Through Qualitative Research. *Int. J of Eng. Lit. and Soc. Sci. 10*(3), 622-630. https://dx.doi.org/10.22161/ijels.103.90

Johnson, B. (2011). *Climate change communication: A provocative inquiry into motives, meanings, and means. Risk Analysis,* doi: 10.1111/j.1539–6924.2011.01731.x

Jones, M. D. (2014). Communicating Climate Change: Are Stories Better than "Just the Facts"?. *Policy Studies Journal*, *42*(4), 644–673. https://doi.org/10.1111/psj.12072

Kalafatis, S.E., Lemos, M.C., Lo, Y.-J., & Frank, K.A. (2015). Increasing information usability for climate adaptation: The role of knowledge networks and communities of practice. *Glob. Environ. Change 32,* 30–39.

Kalungu, J.W., Filho, W.L., & Harris, D. (2013). Smallholder Farmers' Perception of the Impacts of Climate Change and Variability on Rain-fed Agricultural Practices in Semi-arid and Sub-humid Regions of Kenya. *J. Environ. Earth Sci. 3,* 129–140.

Kasuli, M. F. (2022). The role of climate change communication on the adoption of climate-smart agriculture by smallholder farmers in the Northern Region of Ghana. MPhil Thesis, Tamale, University of Development Studies.

Kihupi, N., Kingamkono, R., Dihenga, H., & Kingamkono, M. (2003). Integrating indigenous knowledge and climate forecasts in Tanzania. In: O'Brien K, Vogel C, eds. *Coping with Climate Variability: The Use of Seasonal Climate Forecasts in Southern Africa.* Hampshire: Ashgate Publishing.

Kudjordji, S. (2024). Breaking the Science: Interrogating the Application of Communication in Climate Change Mitigation Efforts in Ghana. An MPhil Thesis, University of Media, Arts and Communication, Ghana,

Kuruppu, N., & Liverman, D. (2011). Mental preparation for climate adaptation: The role of cognition and culture in enhancing adaptive capacity of water management in Kiribati. *Glob. Environ. Change, 21*(2), 657-699.

Lewandowsky, S. (2020). Climate Change, Disinformation, and How to Combat It. *Annual Review of Public Health, 42*(1), 1–21. https://doi.org/10.1146/annurev-publhealth-090419-102409

Lewenstein, B. V. (2003). Models of public communication of science and technology. *Ecommons.cornell.edu*, 1–11. Retrieved from https://hdl.handle.net/1813/58743

Maibach, E., Nisbet, M., & Weathers, M. (2019). Conveying the human implications of climate change: A climate change communication primer for public health professionals. *George Mason University Centre for Climate Change Communication, 35(1),* 1–11.

Mamun, M.A.A., Stoll, N., & Whitehead, S. (2013). Bangladesh: How the people of Bangladesh live with climate change and what communication can do (Project Report), Climate Asia Project. BBC Media Action, London, UK.

McGahey, D. G., & Lumosi, C. K. (2018). Climate change communication for adaptation: Mapping communication pathways in semi-arid regions to identify research priorities**.** *Journal of Sustainable Development in Africa, 20*(1), 84-107.

Moser, S. C. (2010). Communicating climate change: history, challenges, process and future directions. *Wiley Interdiscip. Rev. Clim. Change, 1,* 31–53.

Moser, S. C. (2014). Communicating adaptation to climate change: the art and science of public engagement when climate change comes home: Communicating adaptation to climate change. *Wiley Interdiscip. Rev. Clim. Change, 5*, 337–358.

Moser, S. C. (2016). Reflections on climate change communication research and practice in the second decade of 21st century: What more is there to say? *Wiley Interdiscip. Rev. Clim. Change, 7*(2), 161-313.

Moser, S. C., & Dilling, L., (eds.) (2007). *Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change.* Cambridge, UK: Cambridge University Press.

Moser, S. C., & Dilling, L. (2010). Climate Change: Opportunities and Challenges for Closing the Science-Action Gap. In: *The Oxford Handbook of Climate Change and Society*, Richard Norgaard, David Schlosberg, John Dryzek eds., in press.

Moser, S. C., & Dilling, L. (2012). Communicating Climate Change: Closing the Science-Action Gap. Oxford Handbooks Online. In: Dryzek, Norgaard, Schlosberg (Eds.), Communicating Climate Change: Closing the Science-Action Gap. Oxford University Press.

Moser, S.C., & Ekstrom, J.A. (2010). A framework to diagnose barriers to climate change adaptation. *Proc. Natl. Acad. Sci. 107,* 22026–22031.

Muchunku, I. G., Mberia, H. K., & Ndati, N. (2014). Evaluating Opinion Leadership Strategies Used to Communicate Adaptive Climate Change Information to Residents of Arid and Semi Arid Areas in Kenya. *Int. J. Sci. Res. Publ., 4,* 6.

Naess, L. O. (2013). The role of local knowledge in adaptation to climate change. *Wiley Interdiscip. Rev. Clim. Change, 4*, 99–106.

Nerlich, B., Koteyko, N., & Brown, B. (2010). Theory and language of climate change communication. *Wiley Interdiscip. Rev. Clim. Change, 1*, 97–110.

Odoom, D. (2024). Public Perception on the Level of Effectiveness of Climate Change Communication Channels in Ghana: A Cross-Sectional Survey. *African Journal of Empirical Research*, *5*(1), 24–35. https://doi.org/10.51867/ajernet.5.1.3

Odoom, D., & Fosu, M. (2023). Towards promoting climate change communication for improved adaptation in Africa: A Ghanaian perspective. *Journal of Policy and Development Studies, 14*(1), 156-174.

Ofori, B. Y., Evans, Ohemeng, F., Yahaya Musah, Quartey, J. K., & Owusu, E. H. (2023). Climate change knowledge, attitude and perception of undergraduate students in Ghana. *PLOS Climate*, *2*(6), e0000215–e0000215. https://doi.org/10.1371/journal.pclm.0000215

Owusu, V., Ma, W., Renwick, A., & Emuah, D. (2020). Does the use of climate information contribute to climate change adaptation? Evidence from Ghana. *Climate and Development*, *13(7)*, 616–629. https://doi.org/10.1080/17565529.2020.1844612

Paavola, J., & Adger, W. N. (2006). Fair adaptation to climate change. *Ecol. Econ. 56*, 594–609.

Pringle, P., & Conway, D. (2012). Voices from the frontline: the role of community-generated information in delivering climate adaptation and development objectives at project level. *Clim. Dev., 4*, 104–113.

Pautasso, M. (2013). Ten simple rules for writing a literature review. PLoS Comput Biol., 9(7), 9e1003149

Ryan, M. J., & Worthington, A. K. (2021). *Persuasion theory in action: An open educational resource.* Alaska: University of Alaska Anchorage.

Stevenson, K., Peterson, M. N., Bondell, H., Moore, S., & Carrier, S. (2014). Overcoming skepticism with education: Interacting influences of worldview and climate change knowledge on perceived climate change risk among adolescents. *Climatic Change, 126*(3–4), 293–304.

Tadesse, D. (2010). *The impact of climate change in Africa.* Institute for Security Studies Paper No. 220 November 2010.

Tetteh, E., Opareh, N. O., Ampadu, R., & Antwi, B. (2014). Impact of Climate Change: Views and Perceptions of Policy Makers on Smallholder Agriculture in Ghana. *International Journal of Sciences: Basic and Applied Research*, *13*(1), 79–89.

The World Bank. (2010). *World Bank development report 2010: development and climate change*. Accessed on 16-07-23 at: http://www.ameinfo.com/211919.

The World Bank. (2021). *Climate Risk Profile.* New York: The World Bank Group.

Treen, K. M. d'I., Williams, H. T. P., & O'Neill, S. J. (2020). Online misinformation about climate change. *WIREs Climate Change*, *11*(5). https://doi.org/10.1002/wcc.665

Tschakert, P. (2007). Views from the vulnerable: Understanding climatic and other stressors in the Sahel. *Glob. Environ. Change, 17*, 381–396.

Tucker, J., Daoud, M., Oates, N., Few, R., Conway, D., Mtisi, S., & Matheson, S. (2015). Social vulnerability in three high-poverty climate change hot spots: What does the climate change literature tell us?' *Regional Environmental Change, 15*, 783-800.

van der Linden, S. (2014). Towards a new model for communicating climate change. In S. Cohen, J. Highman, P. Peeters, & S. Gössling (Eds.), *Understanding and governing sustainable tourism mobility: Psychological and behavioural approaches* (pp. 243–275). Routledge: Taylor and Francis Group.

UNESCO. (2022). Climate Change Communication in Ghana. Monitoring and Evaluating Climate Communication and Evaluation Project. UNESCO.

United Nations. (2023). Communicating on climate change. Accessed on 06-06-23 at: https://www.un.org/en/climatechange/communicating-climate-change.

Wilby, R.L., Troni, J., Biot, Y., Tedd, L., Hewitson, B.C., Smith, D.M., & Sutton, R.T. (2009). A review of climate risk information for adaptation and development planning. *Int. J. Climatol.* 29, 1193–1215.