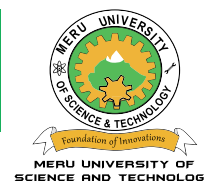




AFRICAN JOURNAL OF SCIENCE, TECHNOLOGY AND SOCIAL SCIENCES

Journal website: <https://journals.must.ac.ke>



A publication of Meru University of Science and Technology

The Role of Citizen Journalism in Documenting and Reporting Climate Change and Adaptation Efforts

Mildred Zipporah Mwendwa^{1*}, Paul Mutethia Diki², Henry Nkoru Nabea¹

¹Chuka University, ²Meru University of Science and Technology, Meru, Kenya

ARTICLE INFO

Keywords

Citizen Journalism
Climate Change Reporting
Digital Platforms
Community Resilience
Participatory Communication

ABSTRACT

Citizen journalism has emerged as a pivotal force in documenting and reporting climate change and adaptation efforts. This phenomenon leverages the accessibility and immediacy of digital platforms, enabling ordinary individuals to contribute valuable data and narratives that complement traditional media and scientific discourse. This paper explores the multifaceted roles of citizen journalists in climate change documentation, highlighting its contributions to raising awareness, providing real-time data, and influencing policy through grassroots engagement and fostering community resilience. By leveraging social media platforms and digital tools, citizens can document environmental changes, and share local ad-

aptation strategies. This paper therefore examines case studies, highlighting the effectiveness and challenges of citizen journalism in climate reporting. It concludes with recommendations for enhancing the credibility and impact of citizen-driven climate narratives. The study is grounded in the theories of participatory communication and public sphere. Participatory communication theory posits that inclusive and active involvement of community members in communication processes leads to more democratic and effective outcomes. This aligns with the role of citizen journalism, where community members actively document and report on climate change. Public sphere provides a framework for understanding how citizen journalism creates a platform for public discourse, enabling the exchange of ideas and fostering democratic engagement in climate change discussions. The study will adopt a descriptive survey design using both quantitative and qualitative approaches. Data will be collected using Focus Group Discussions (FDGs), Key Informant Interviews (KIIs), Questionnaires, Observations, Secondary Data, and Digital Data Analysis. Data will be analyzed using both descriptive and inferential statistics. The study acknowledges numerous potential limitations such as generalizability since findings may not be generalizable across different contexts due to cultural, social, and environmental differences, transferability of findings may be limited by lack of infrastructure, internet accessibility and community engagement levels. The findings will be disseminated through learned conferences, seminars, and workshops.

*Corresponding author: Mwendwa Mildred Zipporah

Email: mmwendwa@must.ac.ke

<https://doi.org/10.58506/ajstss.v3i2.267>

AFRICAN JOURNAL OF SCIENCE, TECHNOLOGY AND SOCIAL SCIENCES. ISSN:2958:0560

<https://journals.must.ac.ke> © 2024 The Authors. Published by Meru University of Science and Technology

This article is published on an open access license as under the CC BY SA 4.0 license



Introduction

Climate change represents one of the greatest challenges and significant threat of the 21st century, particularly to developing nations. As its impacts and the prevalent effects become increasingly evident this has necessitated comprehensive documentation and immediate reporting to inform public understanding and policy-making. Digitization has allowed for citizen journalism and the digitization of the content sourcing tools such as cameras, voice recorders and other computer-based technologies. Digitization has made capturing multimedia content including images, video, text and audio possible (Pavlik, 2011; MCK, 2016). Citizen journalism refers to the act of ordinary individuals, who are not professional journalists, collecting, reporting, and distributing news and information, often using digital platforms like blogs, social media, and personal websites. This type of journalism democratizes information dissemination, allowing people from various backgrounds to share their perspectives on events and issues. It plays a significant role in covering stories that might be overlooked by mainstream media, and it often provides real-time updates from the scene of events. Citizen journalism can include various forms such as text, photos, videos, and live streams, offering a more grassroots and diverse viewpoint. Allan, S. (2013).

Traditional journalism has played a crucial role in informing the public and policymakers about climate issues but often lack the resources or willingness to cover the nuances and local impacts of climate change, creating a gap that citizen journalists are increasingly filling. Citizen journalism where ordinary individuals report news and events has become a powerful complement to mainstream media, particularly in documenting and reporting on climate change and adaptation. While traditional media and scientific research have been central to this effort citizen journalism has gained prominence as a complementary force. This shift has been driven by the proliferation of digital tools and social media platforms, enabling individuals to share their observations and experiences related to climate change in real-time. Citizen journalists, equipped with smartphones and social media, provide on-the-ground perspectives and real-time updates that traditional outlets may overlook. (Harcup, Tony 2021)

This phenomenon aligns with participatory communication theory, which emphasizes the active involvement of community members in communication processes, and public sphere theory, which views citizen journalism as a platform for public discourse and democratic engagement.

The objective of this study is to evaluate the impact of citizen journalism on documenting and reporting climate change and adaptation efforts, analyzing its effectiveness in raising awareness, influencing public opinion, and driving policy changes as well as highlighting its significance and the challenges it faces.

Objectives of this study.

i.To analyze the contributions of citizen journalism in raising awareness, providing real-time data, and influencing policy regarding climate change and adaptation efforts.

ii.To examine the effectiveness and challenges of citizen journalism in climate reporting through the analysis of case studies, and to provide recommendations for enhancing the credibility and impact of citizen-driven climate narratives.

Statement of the Problem

Despite the critical importance of documenting and reporting climate change and adaptation efforts, traditional media and scientific institutions often fall short in adequately covering local and global climate-related issues. This is occasioned by restricted access to remote areas, limited resources, and delays in disseminating real time information. Consequently, there is a significant gap in effectively capturing the immediate localized impacts of climate change, as well as the diverse adaptation strategies employed by communities. This gap necessitates an exploration of alternative forms of journalism, such as citizen journalism, which has the potential to fill this void by allowing ordinary individuals to document and share valuable data and narratives while providing real-time, ground-level reporting on climate change and adaptation initiatives.

Review of related literature

Introduction

Citizen journalism has emerged as a powerful force in the digital age, enabling ordinary people to document and report on critical issues, including cli-

mate change. As traditional media sometimes fail to cover the full scope of environmental changes and adaptation strategies, citizen journalists fill the gaps by providing localized, immediate, and diverse perspectives. This literature review examines the role of citizen journalism in documenting and reporting climate change and adaptation efforts.

Citizen journalism has become an influential component of climate change documentation, offering a platform for the public to engage directly with environmental issues. The concept of citizen journalism is rooted in the broader framework of participatory media, where individuals without formal journalistic training utilize digital tools to report on events and issues significant to their communities (Gillmor, 2006). This democratization of information dissemination has empowered ordinary citizens to contribute to the global narrative on climate change, filling gaps often left by traditional media (Allan, 2013). Key drivers of this phenomenon include the proliferation of smartphones, social media platforms, and the increasing accessibility of digital tools for content creation and distribution (Allan, 2013). These advancements have democratized information production and challenged traditional media monopolies (Gillmor, 2006).

One of the key contributions of citizen journalism is its role in raising awareness about climate change. Digital platforms, mainly social media, have become vital in spreading information quickly and broadly. Studies have shown that citizen-generated content can reach wide audiences and provoke significant public discourse (Hermida, 2010). For instance, platforms like Twitter and Facebook allow for real-time sharing of climate-related events, from local weather anomalies to large-scale environmental protests, thereby increasing public engagement and awareness (Smith et al., 2017).

Citizen journalism also plays a crucial role in influencing policy and fostering community resilience. Grassroots engagement through digital media can pressure policymakers to address environmental issues and implement sustainable practices (Rheingold, 2008). Case studies from various parts of the world illustrate how citizen-led campaigns have led to policy changes and increased government accountability in environmental matters (Cox et al., 2015). Furthermore, by sharing local adaptation strategies, communities can learn from each other's

experiences and develop more effective responses to climate challenges (Dodman & Mitlin, 2013).

Regardless of the numerous benefits, citizen journalism in climate reporting faces several challenges. Credibility and accuracy of the information are major concerns, as citizen journalists may lack the training and resources of professional journalists (Hermida, 2010). Ensuring the reliability of citizen-generated content is critical for it to be useful in scientific and policy contexts (Goodchild & Li, 2012). Also, there is the issue of digital divide, where unequal access to technology due to limited infrastructure can limit participation from marginalized communities, thereby skewing the representation of climate impacts (Hargittai & Hinnant, 2008).

Documenting Climate Change

Citizen journalists play a crucial role in documenting the impacts of climate change, particularly in regions where mainstream media presence is limited. The advent of digital technology and social media platforms has democratized journalism, allowing individuals to report on events and issues often neglected by mainstream media. Through platforms like Twitter, Facebook, YouTube, and specialized climate blogs, individuals share real-time updates on weather anomalies, environmental degradation, and biodiversity loss (Schäfer, 2012). For example, communities affected by hurricanes or droughts can provide firsthand accounts and visual evidence, which can be invaluable for researchers and policymakers (Nugroho et al., 2012).

Citizen journalists have contributed significantly in a number of ways such as localized reporting by providing accounts of climate change impacts at the local level, offering insights into events such as floods, wildfires and droughts. (Hermida, 2012.) Also steering awareness and engagement through social media, blogs and multimedia content, citizen journalists raise awareness and foster engagement on climate change issues. Their grassroots approach reaches diverse audiences, enhancing public understanding and concern (Meijer, 2020). Mainstream media frequently focus on high profile or sensational aspects of climate change whereas citizen journalists fill these gaps by covering underreported and providing continuous updates, contributing to a more comprehensive narrative (Campbell, 2015).

The Impact of Citizen Journalism on Climate Change Awareness

Citizen journalism has been significant in creating climate change awareness by amplifying the voices of those directly affected by climate change, such as indigenous communities and residents of rural communities who lack representation in mainstream media. Citizen journalists from these communities can share their experiences and adaptation strategies, providing valuable insights into the local impacts of climate change and the resilience of these communities (Carpenter et al., 2015). This participatory form of journalism, characterized by ordinary citizens actively engaging in the collection, reporting and dissemination of news has significantly influenced public awareness and discourse on climate change. This inclusion leads to greater empathy and a broader call to action among global audiences (Lewis, 2010). Through platforms like blogs, social media and independent news websites, they bring attention to pressing climate issues making the phenomenon more tangible and urgent to the general public (Allan, 2013). The grassroots reporting has been instrumental in highlighting the real time effects of climate change (Holton, 2015). It is notable that it has also enhanced public engagement because citizen-generated content on social media leads to higher engagement rates compared to traditional media, driving public discourse and potentially influencing policy changes (Meijer, 2020).

Furthermore, citizen journalism has been a catalyst for environmental degradation and the efforts to combat climate change, citizen journalists inspire collective action. Social media campaigns, viral videos, and grassroots reporting have mobilized public opinion and pressured policymakers to address climate issues (Ristow, 2020). The immediacy and personal nature of these reports often evoke strong emotional responses, driving individuals to participate in climate advocacy and sustainability initiatives (Hermida, 2014).

The Challenges faced by Citizen Journalists

In spite of its significant contributions, citizen journalism faces some challenges such as credibility and accuracy issues which are occasioned by lack of formal training among citizen journalists. Misinformation or unverified reports can undermine efforts to educate the public about climate change

(Hermida, 2012). Unlike professional journalists, citizen journalists often lack access to resources such as funding, professional networks, and advanced equipment, limiting the scope and quality of their reporting (Allan, 2013). Citizen journalists, particularly those reporting from conflict zones or politically unstable regions, face legal repercussions and personal safety risks (Campbell, 2015).

Reporting Adaptation Efforts

With the advent of digital technology and social media platforms, ordinary citizens now have unprecedented access to tools that allow them to report on local and global issues, including climate change (Allan, 2013; Bruns, 2008). Citizen journalists have been instrumental in documenting the effects of climate change, particularly in regions where traditional media coverage is limited. They provide real-time updates, grassroots perspectives, and firsthand accounts that enrich the public's understanding of environmental changes and their impacts (Gillmor, 2006). For instance, during extreme weather events such as hurricanes, floods, and wildfires, citizen journalists often provide immediate and detailed coverage, supplementing the reports from professional journalists (Hermida, 2012).

Moreover, to highlighting the adverse effects of climate change, citizen journalists document and report on local adaptation efforts. These reports often cover grassroots initiatives, traditional knowledge systems, and innovative practices that may be overlooked by larger media outlets. Adaptation efforts to climate change encompass a wide range of activities aimed at reducing vulnerability and enhancing resilience. Citizen journalists play a critical role in highlighting these efforts by documenting local initiatives, sharing success stories, and providing a platform for marginalized voices. This grassroots reporting can influence public opinion and policy-making by showcasing effective adaptation strategies and mobilizing community action (Lewis, 2012; Shanley & López, 2009).

Theoretical Review

This study was premised on the Participatory Communication Theory (Paulo Freire, 1970) which emphasizes the active involvement and empowerment of individuals and community members in communication processes leads to more democratic and

effective outcomes. This theory promotes dialogue, mutual understanding and collective decision making, fostering an environment where all participants have a voice and can contribute to the discourse. This theory was relevant in describing how individuals use different digital forums such as Facebook accounts, Twitter accounts, WhatsApp, Tiktok accounts and Blogs among others to share information relating to climate change. It aligns with the role of citizen journalism in climate change documentation, where community members actively document and report on environmental changes and local adaptation strategies (Servaes, 1999). It was complemented by The Public Sphere Theory, which provides a framework for understanding how citizen journalism creates a platform for public discourse. According to Habermas (1989), the public sphere is an arena where individuals can come together to discuss and influence societal issues. Citizen journalism fosters this engagement by allowing individuals to share their climate-related observations and experiences, thereby contributing to broader climate change discussions and policy-making processes.

Research Methodology

Research design

The study employed the descriptive research design which aims at describing various aspects of a phenomenon including characteristics and /or behavior of a sample population (Ethridge, 2004). It was therefore used to describe how the citizen journalists' document and report on climate change and adaptation efforts, the types of platforms they use, and the nature of their content. This design was preferred since it allows a large volume of data to be collected cheaply and makes the data analysis process easier and faster (Gilbert, 2008).

Population and Sampling design

The study population comprised of the citizen journalists, while the target population included community groups, experts in journalism, and experts in climate science, online platforms, and citizen journalism audience members. A sample of citizen journalism content from various digital platforms, social media and independent news sites were analyzed to assess the themes, accuracy, and depth of climate change reporting. A sample of 8 individual Citizen Journalists, 2 experts in climate science, 2

community leaders, 2 experts in journalism and 13 audience members participated in the study.

These were purposively selected since they interact with digital forums and media on a daily basis. The purposive sampling technique was also used to select the most popular social media forums such as blogs, WhatsApp, YouTube channels, Twitter, Tiktok, Facebook and online audience members.

Sample Population

This study administered questionnaires to 13 citizen journalism audiences, engaged 8 individual citizen journalists in focus group discussions, interviewed 2 experts in climate science, 2 experts in journalism 2 and 2 community leaders who made a total of 27 participants.

Research Instruments

The main instrument for data collection was the questionnaire, which contained both close-ended and open-ended questions. It generated quantitative data. Face-to-face interviews were conducted with experts in climate science, experts in journalism and community leaders to ensure high response rates (Neuman, 2006). Focus group discussion guides were used to obtain information from the users of twitter accounts, Tiktok, Facebook accounts and WhatsApp who represented citizen journalists' audiences. These generated qualitative data.

Data Analysis

Quantitative Data Analysis

Data obtained using the quantitative research method was coded and entered in the Statistical Package for Social Scientists (SPSS) for analysis. After entry into SPSS, data was then cleaned to identify errors made while keying the data. This was done by ensuring that data is entered twice independently by two people according to Robinson (2002). SPSS aided in organizing, summarizing, tabulating and analyzing the data using descriptive statistics including means, standard deviations and frequency distributions, to enable the researcher come with conclusions.

Qualitative Data Analysis

The qualitative data adopted thematic analysis approach where major concepts or themes drawn from the FGDs and interviews were identified. This

was done procedurally through identification of information relevant to the objectives, developing a coding system based on collected data, classification of major issues covered and major themes identified. Development of a summary report identifying major themes and the association between them was then done (Creswell, 2009)

Findings

The study sought to find out role of citizen journalism in documenting and reporting climate change and adaptation efforts. All respondents (100%) were in agreement that citizen journalism is quite significant in documenting and reporting climate change and adaptation efforts. Citizen journalism has significantly contributed to raising awareness about climate change, particularly in areas underserved by mainstream media. Advancements in technology has brought about a host of new media devices and digital platforms including DV cameras, social media platforms such as Facebook, Twitter, YouTube, Tiktok, Instagram, Snapchat, Blogs and Google plus that are currently used for content creation and dissemination of information. The reports disseminated by citizen journalists educate the public about climate change impacts and importance of adaptation, increasing general awareness and understanding.

Through social media platforms, individuals share real-time updates, photos, and videos, providing valuable data for disaster response and recovery efforts (Ranada, 2015). It is evident that these grassroots reports raise awareness and foster community resilience by sharing practical solutions (Munyua, 2000).

Citizen Journalism has also enhanced community engagement because local communities are more engaged and proactive in climate adaptation efforts when they are informed by citizen journalists. Citizen journalists can report events as they happen, providing timely updates on natural disasters, climate related incidents and adaptation measures. Further citizen journalism facilitates a two way communication channel where communities can interact with the content, ask questions and share their own experiences which fosters a sense of community and collective responsibility towards climate action. Localized reports highlight the specific impacts of climate change on local communities such as changes in agricultural productivity, water scarcity or extreme weather events. They capture first hand accounts of

how individuals and communities are affected by climate change. These reports resonate more with local and global audiences because the data is broken into understandable language through use of various formats like videos, blogs, social media posts and photos.

Citizen journalism provides a platform for diverse voices and perspectives, often highlighting marginalized communities' experiences with climate change. It allows accessibility and inclusivity of voices of the marginalized and underrepresented communities who are most affected by climate change but least heard in the mainstream media. Citizen journalists create room for indigenous people, rural communities and low income populations to share their unique perspectives and knowledge on climate change and adaptation strategies.

Citizen journalism has significantly contributed to influencing climate change policies and adaptation efforts through various mechanisms such as raising awareness and visibility by bringing attention to local climate issues that may not be covered by mainstream media, making policy makers aware of specific challenges faced by different communities. Detailed reports on issues like deforestation, erosion, water scarcity help to highlight the urgency of these problems.

Real-time updates from citizen journalists provide immediate evidence of climate impacts, such as floods, storms and heat waves. Continuous documentation of changing environmental conditions offers a valuable archive of evidence that can contribute largely to support policy proposals and highlight the need for action. For example tracking pollution levels, temperature changes or biodiversity loss through citizen generated data can a detailed picture for policymakers.

Discussion

Citizen journalism has the ability to raise awareness about climate change by leveraging the immediacy and accessibility of digital platforms ordinary citizens can disseminate information rapidly and widely. This democratization of information sharing enables real-time updates on environmental changes, often complementing the mainstream media by filling coverage gaps and providing a more nuanced understanding of climate change impacts and adaptation strategies. It helps in bridging the information

gap in regions undeserved by traditional media because citizen journalists provide real-time and up to date insights. However, challenges such as issues of credibility, accuracy, lack of formal training, and lack of resources to access to technology and the potential for misinformation need to be addressed.

Conclusion

Citizen journalism is crucial in documenting and reporting climate change and adaptation efforts. Providing real-time data, highlighting local adaptation strategies and amplifying marginalized voices, citizen journalists contribute significantly to the climate discourse. By leveraging digital platforms, ordinary individuals can contribute valuable data and narratives that complement traditional media and scientific discourse. However, challenges such as credibility, access to technology, and sustained engagement must be addressed to maximize the impact of citizen-driven climate narratives. Addressing the challenges that citizen journalists' face and enhancing their capacity will further strengthen their role in shaping a sustainable future. Through enhancing training, technological support, and collaboration, the contributions of citizen journalists can be more improved, fostering greater community resilience and informed policy-making. The integration of citizen journalism with traditional media and institutional support can enhance its effectiveness and reliability. Future research should focus on developing frameworks to support citizen journalist in verifying information and collaboration with traditional media to enhance the overall quality of climate change reporting

Recommendations

The future of citizen journalism in climate reporting looks very promising with several trends indicating continued growth and impact. To sustain citizen journalism in climate documentation and reporting this paper recommends introduction of community engagement initiatives to foster community engagement through local climate action groups that encourage citizens to share their experiences and adaptation strategies to create a more collaborative approach to climate reporting, partnerships with traditional media since collaborations between citizen journalists and traditional media outlets citizen reporters will be provide access to resources, professional networks and broader audiences, advocacy

for improved access to technology and internet infrastructure in under-resourced communities to empower more citizens to document climate change, encourage citizen journalists to leverage a variety of digital platforms, including blogs, podcasts, and social media, to reach different demographics also expand their audience. The study further endorses training and capacity building by developing workshops and training programs for citizen journalists on effective reporting techniques, fact-checking, and ethical journalism. This will enhance the quality and reliability of the content they produce and strengthen the role of citizen journalism in climate change reporting, and foster community resilience.

References

- Allan, S. (2013). *Citizen Journalism: Global Perspectives*. Peter Lang Publishing, Inc.
- Allan, S. (2013). *Citizen Witnessing: Revisioning Journalism in Times of Crisis*. Polity.
- Carpenter, S., Nah, S., & Chung, D. (2015). Social media, journalism, and the public sphere. *Journalism & Mass Communication Quarterly*, 92(1), 49-70.
- Carpenter, S., Nah, S., & Chung, D. (2015). Social media, journalism, and the public sphere. *Journalism & Mass Communication Quarterly*, 92(1), 49-70.
- Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). Sage Publications
- Dodman, D., & Mitlin, D. (2013). Challenges for community-based adaptation: discovering the potential for transformation. *Journal of International Development*, 25(5), 640-659.
- Ethridge, D. E. (2004). *Research methodology in applied economics: Organizing, planning, and conducting economic research*. John Wiley & Sons.
- Gillmor, D. (2006). *We the Media: Grassroots Journalism by the People, for the People*. O'Reilly Media.
- Gilbert, N. (2008). *Researching Social Life*. London, UK: Sage Publications.
- Goodchild, M. F., & Li, L. (2012). Assuring the quality of volunteered geographic information. *Spatial Statistics*, 1, 110-120.
- Freire, P. (1970). *Pedagogy of the oppressed*. Herder and Herder.
- Habermas, J. (1989). *The Structural Transformation of the Public Sphere: An Inquiry into a Category of Bourgeois Society*. MIT Press.

- Hargittai, E., & Hinnant, A. (2008). Digital inequality: Differences in young adults' use of the Internet. *Communication Research*, 35(5), 602-621.
- Harcup, Tony. *The Ethical Journalist: Making Responsible Decisions in the Digital Age*. SAGE Publications, 2021.
- Holton, A. (2015). Citizen journalism: The future of news? *The Journal of Social Media in Society*, 4(1), 1-16.
- MCK (2016). *The Impact of Digital Technologies and Internet on Media and Journalism in Kenya*. Author
- Munyua, H. (2000). Information and communication technologies for rural development and food security: Lessons from field experiences in developing countries. Sustainable Development Department (SD), Food and Agriculture Organization of the United Nations (FAO).
- Neuman W. L. (2006). *Social Research Methods: Qualitative and Quantitative Approaches*. India. New Delhi: Pearson Education, Inc. & Dorling Kindersley Publishing, Inc.
- Nugroho, Y., Sulastri, R., & Putri, D. A. (2012). Citizen Journalism in Indonesia: Embracing Networks and Challenging Established Media. In S. Allan & E. Thorsen (Eds.), *Citizen Journalism: Global Perspectives Volume 2* (pp. 75-86). Peter Lang.
- Pavlik, J. V. (2011). *Journalism and New Media*. New York: Columbia University Press.
- Ranada, P. (2015). How social media changed disaster response in the Philippines. *Rappler*. Retrieved from Rappler
- Ristow, B. (2020). New media and transformative learning. In *The Handbook of Transformative Learning*. Wiley-Blackwell.
- Rheingold, H. (2008). *Smart Mobs: The Next Social Revolution*. Basic Books.
- Robson, C. (2002). *Real world research: A resource for social scientists and practitioner-researchers* (2nded.) Oxford: Blackwell Publishing
- Robinson, P. (2002). *Quantitative data analysis using SPSS: An introduction for health and social science*. Open University Press.
- Servaes, J. (1999). *Communication for Development: One World, Multiple Cultures*. Hampton Press.
- Smith, B. G., Smith, S. B., & Knighton, D. (2017). Social media dialogues in a crisis: A mixed-method analysis of Twitter during the 2013/2014 South West England floods. *Computers in Human Behavior*, 78, 154-161.
- Schäfer, M. S. (2012). Online communication on climate change and climate politics: a literature review. *Wiley Interdisciplinary Reviews: Climate Change*, 3(6), 527-543.