

NATIONAL DISASTER MANAGEMENT ORGANISATION'S RISK COMMUNICATION IN GHANA: A CASE STUDY OF FLOOD AREAS IN ACCRA

CHARLES HANSON ADU

Group Executive for Airport Management,
Ghana Airports Company Limited.

LAWRENCIA AGYEPONG

Lecturer, Department of Communication Studies,
Ghana Institute of Journalism, Ghana.
ORCID: 0000-0002-0512-3427

ABSTRACT

Risk communication is an integral part of any Risk Management process. This study reports on its importance, the medium, the approach used as well as the factors that influence risk communication in Accra, Ghana. Data obtained from residents through the administration of questionnaires in the flood-prone areas, as well as interviews with the National Disaster Management Organisation (NADMO), the institution mandated to manage the risk of flooding and other emergencies, brought out various issues on the risk communication process in Accra. This study finds that despite the perceived importance of risk communication in the risk management process, risk communication in Accra is hampered by ineffective regulations and a lack of trust by affected residents among other impediments. This research recommends that NADMO must increasingly use the radio as the main medium for conveying risk messages and that the organization must change its "top-down" risk communication approach into a more interactive one.

Keywords: Risk Communication, Risk Management, Floods, Accra, National Disaster Management Organization (NADMO).

1.0 INTRODUCTION

In Accra, floods that mainly result from rainfall are gradually becoming an annual affair. Some of the floods have been very devastating in terms of damage to properties and loss of human lives depending on the magnitude and antecedent conditions of the rainfall (Asumadu-Sarkodie et al., 2015; Amoako & Boamah, 2014). In June 2002, two (2) lives were lost and 1,735 people were displaced by floods, caused by heavy rains in the capital, Accra. The city of Accra recorded 123.3 millimeters of rain during a 10-hour downpour between the night of Sunday 9th June and the morning of Monday 10th June 2002, causing flooding in low-lying sections of the city. In June of 2010, the National Disaster Management Organization (NADMO) recorded massive damages to personal property and infrastructure as well as the displacement of over 33,000 people and the death of 36 (NADMO, 2010).

The worst recorded flood in Accra occurred in June 2015 which saw the loss of lives of 150 inhabitants (Ahadzie et al., 2016). This mishap, Ahadzie et al. (2016) argue, has exacerbated the need to expedite action on the development of a robust integrated flood management

model in Ghana. However, issues such as weak economies and the overwhelming challenges posed by the demands for limited public funds have bedeviled the efforts of Sub-Saharan countries like Ghana in tackling the issue of flooding. They advance that there is the need for prompt, effective, and robust risk management efforts to mitigate its effects (Ahadzie et al., 2016).

NADMO is mandated by a regulatory framework (National Disaster Management Organisation Act, 1996, Act 517) for the management of floods and their effects and other emergencies in Ghana. This organization has as its vision, the need to reduce the level of vulnerability by advocating and practicing disaster risk reduction. Over the years, NADMO has been trying to reduce the occurrence and the effects of flooding in the city of Accra. Generally, substantial funds are expended annually worldwide on risk communication programs to promote natural hazard preparedness. The adoption of these measures facilitates a capacity for coping with the temporary disruption associated with hazardous activity and with minimizing damage and insurance costs.

In Ghana, just like other African countries, there has been an increasing interest in studying the considerable risks associated with flooding (Asumadu-Sarkodie et al., 2015; Amoako & Boamah, 2014; Ahadzie & Proverbs, 2011; Ansah et al., 2020). There however appears to be a paradigm shift in the literature, where the emphasis is noticed to be gravitating toward effective risk management approaches for vulnerable communities that emphasize human dimensions (Ologunorisa, 2009). The recent of all efforts are seen in the strides of Armah et al. (2010), Ahadzie and Proverbs (2011), Armah et al., 2010; Musah and Akai (2014) who predominantly focused on rural and farming communities which are known for their homogeneity.

There however appears to be a deficit in examining the risk management efforts in urban, complex, and heterogeneous environments and settlements. Thus, despite these efforts, the levels of preparedness within such communities have fallen short of expectations, and as Lindell and Whitney (2000) note, this leaves households vulnerable to subsequent hazard effects. Although most of the available literature purports to give practical advice for risk managers, to date, few definitive empirical studies of risk communication and particularly of its consequences and effectiveness are available. It is highly plausible to intimate that, the risks of flooding have not been packaged adequately and communicated to the people living in the flood-prone areas of the city of Accra. It is in light of these deficiencies that this research was conducted to investigate the problem by examining risk communication in Ghana, with a particular focus on floods in the capital city of Accra. This study is therefore tailored around the following objectives:

- i. Determine the factors that influence risk communication in Ghana.
- ii. Establish the medium and approach of NADMO's communication of flood risk.

2.0 LITERATURE REVIEW

2.1 Risk Communication

Risk communication refers to the exchange of information about the health risk caused by environmental, industrial, or agricultural processes, policies or products among individuals,

groups, and institutions (Glik, 2007). It is of essential significance to the management of risks and allows people to partake in or be efficiently represented in decisions about managing risks. It also plays a fundamental part in putting decisions into practice – whether helping people to comprehend regulations, informing them, advising them about risks they can manage themselves, or dissuading them from antisocial activities.

Palancar and Heath (2002) argue that the objective of risk communication is an attempt to take into consideration the diverse perception of risk to minimize conflict. They further indicate that the essential feature of risk communication is not to create some all-encompassing solution but to enhance dialogue and cooperation by establishing realistic common goals for people with differing expectations. It is argued by scholars like Alaszewski (2005) that risk communication should consider, the differences between expert and lay knowledge, as well as perceptions of risk. Effective risk communication depends on the actual and perceived characteristics of the communicators, the message communicated and the recipients (The University of Leicester, 2001).

The Health Protection Network (2008) advances that the utilitarian objective of risk communication is to “provide the public with meaningful, relevant, accurate and timely information in relation to all risks in order to influence choice”(as cited by Infanti et al., 2013, p. 2). In that regard, the aim of risk communication should therefore be, to enable the effective participation and/or representation of all interested and affected parties in making decisions about how to manage risks and to support the most effective implementation of risk management decisions.

From the above discussion, risk communication ought to be multidirectional rather than directional, a discussion instead of a sermon. Good regulation should allow the participation of people as well as consider their views and preferences in decisions about risks which must also be executed efficiently. This research, therefore, examines the perception of recipients of risk communication messages while comparing this to the perception of NADMO on their activities to establish the effectiveness or otherwise of NADMO’s Risk communication and risk communication techniques as well as identify problems that hamper the success of risk communication in Accra, Ghana.

2.2 Theorizing Factors that Affect Risk Communication

The assumption that providing the public with information on hazards and how to mitigate their consequences will encourage preparation is unfounded (Smith, 1993). Despite considerable efforts and expenditure on public hazard education, levels of preparedness remain low (Ballantyne et al., 2000; Duval and Mulilis, 1999; Lindell and Whitney, 2000). In other words, while considerable work has been directed toward understanding how to construct effective risk messages, it has not equated to the adoption of preventive measures by the public (Nathe et al., 1999).

A 2017 study on the social perception of disaster risk reduction regarding flood disasters in communities along the Volta River in Ghana by Bempah and Øyhus examined issues that influence local people’s understanding of NADMO. The study attributed peoples’ irrational attitude towards a disaster situation like flooding sometimes having an underlying rational cause embedded in culture and the failure of entrusted authorities. Furthermore, a significant

discontinuity between people's risk beliefs and their levels of preparation suggests that acceptive decisions are predisposed to additional motivational and interpretational processes. These findings underscore the need for a more methodical comprehension of the factors that underpin reasoning, judgment, and decisions regarding disaster preparedness.

2.2.1 The Trust Determination Model

The Trust Determination model is one of the models identified by researchers as an explanation of how risk information is processed, how risk perceptions are formed, and how risk decisions are made (Covello, 1998; Covello & Sandman, 2001). Taylor-Gooby (2004) notes that trust is central to risk communication, arguing that individuals give particular credibility to sources that they know, which may include family and friends but also medical advisers with whom they have developed some form of a relationship. A universal thread in all risk communication strategies is the need to establish trust. Without trust, effective risk communication is not possible (Renn & Levine, 1991; Slovic, 1999; Peters et al., 1997). This is evident in Samaddar et al.'s 2018 research on vulnerable rural communities in the Northern parts of Ghana. Based on field studies, they empirically concluded that trust is a key mediator between the audience's response to disaster and the sources of information.

Because of the importance of trust in resolving risk controversies, a significant part of the risk communication literature focuses on the application of a trust determination model to articulate scenarios (Covello et al., 2001). To establish or sustain trust, third-party endorsements from trustworthy sources should ideally be undertaken, as well as the use of four trust determination factors: caring and empathy; dedication and commitment; competence and expertise; and honesty and openness (Slovic, 1999). Evaluation studies reveal that individual or small group settings, such as information exchange and public workshops, are the most effective venue for communicating these trust factors (Covello, 1998).

Perceptions of trust are decreased by activities or communications that indicate: disagreements among experts; lack of coordination among risk management organizations; inconsideration by risk management authorities to the need for effective listening, dialogue, and public participation; a reluctance to acknowledge risks; and an unwillingness to divulge or share information promptly (Chess et al., 1995).

2.2.2 The Risk Perception Model

Another model identified by literature is the Risk Perception Model. Many factors affect how risks are perceived and these factors can alter risk perceptions in varying degrees of magnitude (Slovic, 1987; Covello, 1998). Research is done by the US National Research Council (1989), and academics like Sandman (1989), Iorfa et al. (2020), and Rakow et al. (2015) have revealed some risk perception factors that have direct relevance to risk communication. These factors play a large role in determining levels of concern, worry, anger, anxiety, fear, hostility, and outrage, which, in turn, can significantly change attitudes and behavior (Sandman, 1989).

Sandman (1989) asserted that due to the strong feelings that such risk perceptions can generate, literature refers to them as 'Outrage factors'. When present, outrage factors take on

a resilient moral and emotional overtone, predisposing an individual to react emotionally who can in turn, significantly intensify levels of perceived risk. Risk perception research suggests that specific activities such as collecting and appraising empirical information from stakeholders about their judgments of each of the risk perception factors (e.g., control, fairness, trust, benefits, and dread) should ideally be undertaken as part of a risk communication effort (Fischhoff, 1989).

2.2.3 The Individual

Other factors that affect risk communication include the individual. Alaszewski (2008) advances that individuals are not passive in the process of risk communication. They are active participants that seek information on risks from different sources, especially when faced with making crucial behavior-changing decisions.

Risk Communication effectiveness can also be influenced by the recipient's beliefs regarding their existing knowledge. In his research Ballantyne (2000) found that, while 41% of respondents stated a belief in their ability to recite the information on what to do in the event of hazardous activity, only 6% could correctly recite it. Thus, if people over-estimate their existing knowledge, the likelihood of their attending to public information will be reduced.

In urban contexts, the task of creating effective communication strategies that are consistent with the recipients' beliefs, calculated to meet their requirements, and motivate appropriate action is rendered more intricate by the diversity and distribution of vulnerable groups throughout a city (Paton, 2000). As a result, the most cost-efficient approach to the fabrication and diffusion of risk messages is rendered less successful, because it assumes a level of community homogeneity with regard to factors like demographics, beliefs, resources, etc. that is impractical. Evolving effective messages in this context would require taking into consideration, individual and community vulnerability factors, defining relationships between them and hazard effects, and then adapting information for each group (Ballantyne, 2000; Paton, 2000).

Studies have also demonstrated some major barriers to successful risk communication, including preparation, skill, inadequate risk communication planning, as well as a lack of coordination among stakeholders (Rakow et al., 2015; Rahman et al., 2021; Chess et al., 1995). Taken together, the above literature indicates that conventional approaches to risk communication in Ghana may have limited success in facilitating action. In the context of the above discourse, it is not unexpected that the link between risk information provision and preparedness remains weak.

3.0 METHODOLOGY

The researchers adopted the mixed methods approach to ensure that the subject matter was thoroughly covered and both perspectives were incorporated in the study (Doyle et al., 2009; Venkatesh et al., 2013). A total of 200 subjects made up of 198 residents of the flood-prone areas of Accra and 2 top staff of NADMO were sampled using the non-probability sampling technique where judgment sampling was used to ensure that the samples were good prospects for accuracy of information. The subjects for the research were the representatives of

NADMO, the residents of Alajo, Avenor, Tesano, Abelenkpe/Dworwolu, Dansonman/Sahara, Chokor, and Achimota.

Quantitatively, a questionnaire was distributed to two hundred and forty (240) residents in the flood-prone areas of the city of Accra, in the areas mentioned above of which hundred and ninety-eight (198) responded. The survey instrument was a 5-point Likert-style questionnaire design based on research themes in the literature review that underpinned an effective Risk Communication Process and was customized to suit the research context. The survey for residents of the flood-prone areas was necessary for eliciting primary first-hand information from the recipients of risk communication messages and residents of flood-prone areas.

Qualitatively, interviews were conducted with two NADMO officials – the National Operations Director and the Greater Accra Regional Coordinator- using a semi-standardized style of questioning. Semi-standardized interview questions were asked to enable the collection of both open and close-ended data, to explore participant thoughts, feelings, and beliefs about the topic of research.

These were augmented with a document analysis of internal documents of NADMO, external reviews, and previous studies related to the topic.

4.0 RESULTS

By using the triangulation protocol, this research was able to move beyond presenting the findings related independently to each method, to what Farmer et al. (2006) call meta-themes that cut across the findings from both approaches used. Below is a meta-thematic presentation and discussion of findings from both qualitative interviews and quantitative questionnaires administered about the research questions.

4.1 Factors Influencing Risk Communication in Accra

This research sought to answer the question of what factors influenced risk communication in Ghana. A review of risk communication literature indicated factors like trust, education, responsibility for safety, residents' beliefs and needs and resources to support risk messages, etc., as influential in the process of risk communication (Health Protection Agency, 2008; Glik, 2007; Bishop, 2000; Zimmerman et al., 2010).

4.1.1 The Trust Factor

The findings of this research revealed low levels of trust in NADMO's ability to effectively communicate and handle flood disaster prevention among the residents. Of the 198 residents who answered questionnaires, when asked if they had a high sense of trust in the state agencies' ability to communicate and handle flood disaster prevention, 19 respondents indicated that they did not at all have any sense of trust in the state agencies' ability to communicate and handle disaster prevention. The majority, i.e., 104 felt that they had to a very little extent trust in government agencies to handle communication relating to flood prevention or its management. 65 felt they had to some extent a high sense of trust in the state agencies' ability to communicate and handle flood prevention. 8 respondents felt that to a

great extent they trusted the state agencies' ability to communicate the risk of floods while the remaining 2 respondents indicated they trusted the state agencies to a very great extent.

The above observation is certainly a major handicap in the Risk Communication process as regards the risk of floods in the city of Accra. The Trust Determination Model found in reviewed literature explicitly asserts the need to establish trust. Without trust, effective risk communication is not possible (Covello et al., 2001). It is only when trust has been established that other goals, such as education and consensus-building can be achieved (Health Protection Agency, 2008). According to the literature, trust can only be built over time and is the result of ongoing actions, listening, and communicative skills.

4.1.2 Education of Residents of the Risk of Flooding

Interviews with both the National Director of Operations and the Greater Accra Regional Coordinator of NADMO confirmed that NADMO had a hazard education program that involved their staff going to the affected areas to educate residents. The interviews further revealed that NADMO has Technical Committees and Public Relations outfits dedicated to educating people on the risk of flooding.

Despite the educational drive embarked upon by NADMO, when asked whether state agencies educated residents on the risks of flooding, 28 of 198 respondents indicated that they did not at all educate them on the risk of flooding. 83 stated that the state agencies educated residents to a very little extent 78 of the people questioned felt that the state agencies to some extent educated them on the risks of floods. Only 9 felt that to a great extent they were educated, however, no one felt that the state agencies educated to a very great extent.

The research result demonstrates that despite the flood risk education program of NADMO, residents perceive their efforts to be in vain and not educative enough. Literature stipulates that for effective risk communication, communities should be provided with hazard scenarios that describe the possible challenges, opportunities, and threats faced by a community from hazardous activity, and the promotion of strategies to manage or control them (Sandman, 1994). These are evidently lacking in NADMO's educational drive.

4.1.3 Responsibility for Safety and Self-Preparedness

When asked who was responsible for their safety against flooding as people in flood-prone areas, out of the 198 questionnaire responses, 154 felt that the government agencies were responsible for their safety against flooding in their area. They attributed this reasoning to the fact that among others, it was the government's responsibility to plan the city, provide adequate drainage systems, etc. Only 13 felt the responsibility was theirs while 31 felt both they and the government were responsible. Reacting to the question as to whether they were more prepared against the risks of flooding than others in their community, the majority felt they were more prepared to deal with the risks of floods than others in their community whereas 90 said no.

This research exposed a very low perceived responsibility of the residents living in the highest flood-prone areas of Accra. The literature points out that even if favorable hazard preparedness intentions are formed after risk messages are sent, they may not also be acted on

because of low perceived responsibility (Bishop et al., 2000). This research also confirms the literature which says that by attributing improved preparedness to self, relative to the entire community, individuals may accept the need for greater preparedness but perceive this as applying to others but not to themselves, thus the likelihood of their attending to information or acting on warnings will be minimized (Johnson, 1999).

4.1.4 Resources to Support Risk Messages

In response to the question of whether state agencies have supported their risk messages with a backup of state resources, 11 indicated that the state agencies have not at all supported their risk messages with resources. 78 felt that state agencies have supported their risk messages with resources to a very little extent. 68 stated that to some extent, the state agencies have supported their risk messages with resources. The remaining 41 indicated that state resources were provided to an appreciable extent.

One of the problems with the Risk Communication process in Ghana as identified in the research is the lack of resources for the implementation of the risk messages. During the interviews, it was clear that due to low budgets, NADMO could not support all residents in the flood-prone areas with the necessary resources. Even if favorable hazard preparedness intentions are formed after risk messages are sent, they may not be acted on because the intention-preparedness link could be disrupted if people lack resources for implementation (low response efficacy) (Ballantyne, 2000; Bishop et al., 2000). However, a majority of responses indicated that state agencies in Accra support risk messages with resources even if those resources were sometimes sparse.

4.1.5 Regulations

In his interview with the researcher, the Greater Accra Regional Coordinator of NADMO indicated that the construction of buildings in the natural waterways and the blockage of drainage infrastructure with refuse contribute, in no small measure, to the severity of the floods in the city of Accra every year during the raining season. He went on to explain that there were regulations to control these anti-social activities. However, the implementation/enforcement of these regulations has not been carried out over the years and continues to be inadequate. As a result, people flout the regulations with open impunity. This lack of enforcement of regulations has adversely affected the Risk Communication process in the city of Accra.

The findings from the research revealed that recurrent floods are made worse by human activity. This state of affairs has affected adversely the Risk Communication process in Ghana because the risk messages are not backed by effective regulations. As regards effective regulation of the activities of individuals to protect those exposed to the risk, literature further states that there is a more intricate set of communication requirements including, devising regulations generally accepted as open-minded and even-handed, ensuring that all involved comprehend the regulations and how to conform to them, enforce compliance on those who disregard regulations and make sure that those at risk have access to information about the risks, the controls put in place by those who generate them, and what they can do to reduce the risk (ILGRA, 1998).

4.1.6 The Medium and Approach of NADMO's Communication of Flood Risk

The medium and approach of NADMO's communication of flood risk affect the effectiveness of the message. Abunyewah et al. (2016) studied the influence of risk communication on people in informal settlements' intention to prepare for flood hazards. He and his colleagues noted that channels for communicating risk are extremely important sources of information and include radio, face-to-face dialogue, telephone, television, the internet, siren, radio, and newspaper. The approach to communication determines the medium that is employed by risk communication bodies.

The interviews conducted indicated that the main medium used to convey risk messages in Ghana were the radio, television, newspapers, and to some extent personal interaction between the staff of NADMO and affected residents. From the data collected from residents, it was obvious that more people in the areas of the survey listen to the radio, followed by television, and lastly print media. One of the main deductions from synthesized data is that the literacy rate for most of the researched areas is low. In other words, they are more likely to react to risky messages on the radio rather than from any printed medium.

Interviews on the communication approach indicated that information is collected from experts and then disseminated to the residents in the flood-prone areas in Accra; the interviews also revealed that some efforts were being made in involving the affected people in the risk communication approach. An in-depth analysis of the above however revealed that the risk communication approach used by NADMO is a "top-down" approach.

Otway and Wynne (1989), and Stern (1991) have indicated that by adopting this risk communication approach, the communicator devalues the perspectives and knowledge of the risk bearers as well as masks the political aspects of many of the risk conflicts in society. ILGRA recommends that instead of seeking risk communication as a "provision of information" it should be seen as a two-way process that engages people in discussion and debate.

According to the earlier mentioned Risk Perception Model, risk perception factors have direct relevance to risk communication as these factors can significantly change attitudes and behavior. The approach to risk communication in Accra to a large extent does not fulfill the requirements of understanding the risk perceptions of targeted stakeholders. The strategy for effective risk communication ought to reflect the sincerity of the process to all viewpoints and to what degree values are sieved from scientific claims. Data collected revealed that a collective 71.8% of residents of flood-prone areas believed that their views were either not considered or solicited to a very little extent. 25.3% indicated that their views were considered to some extent while only collectively 2.5% felt their views were solicited to a great extent and a very great extent.

5.0 CONCLUSION

The literature review and fieldwork have been synthesized to help identify the key issues to be managed by NADMO to improve the Risk Communication process in Ghana. The conclusions made from the study are discussed in the paragraphs that follow.

The above findings indicate that a lot of work needs to be done on the formulation and delivery of risk messages if the risk communication process in Ghana is to be more effective. The strong relationships between perceived risk and behaviour and the incorporation of subjective elements in perceived likelihood estimates can have positive implications such as the communication influencing behaviours to a greater extent, an observation that was found lacking in the data.

Observations of beliefs and needs of the residents of the flood-prone areas are that of apathy, and lack of commitment to their plight by the state agencies responsible for the management of the risk of floods in Accra such as NADMO. As effective outward communication stems from good listening, a sufficient understanding of people's current knowledge, beliefs, needs, and opinions is an absolute prerequisite (Covello, 1998). This situation has to a very high measure contributed to the mistrust the affected residents have for the NADMO. It was revealed from the research that residents in the highest flood-prone areas of the city of Accra have a very low level of trust in the ability of NADMO to adequately communicate risk messages. The "top-down" approach used by NADMO certainly does not help to engender trust and show commitment. The researchers recommend that NADMO employ a more inclusive communication methodology and establish trust between themselves and residents by using the trust determination factors; care and empathy, dedication and commitment, competencies and expertise, and last but not least honesty and openness.

From the research it was very clear that the NADMO perceives Risk Communication as a very important part of Risk Management practice, and as such has dedicated sections and units handling risk communication. This institution was also observed to support risk messages with necessary resources even if those resources were sometimes meager. However, effective regulation which was a means of backing the risk communication process in Accra by NADMO was found lacking. The central government of Ghana must, as a matter of grave importance, implement measures to enforce risk regulations. It is also recommended that the regulatory bodies must identify and engage with all those concerned and affected by each risk issue and endeavor to understand their attitudes to risks and risk control measures.

Finally, the main media used by the state institution to communicate risk in Ghana were mainly Radio, Television, and Print media, and to lesser extent workshops. The research revealed that the use of radio as a medium to convey risk messages was the most effective because of the universal availability and wider reach in Ghana. This is also however indicative of a lack of or general disuse of new media for risk communication, a no progressive method of communication. NADMO will only effectively reach its audience if they employ the use of the mediums its audiences most respond to. As such, inclusive research must be first conducted to draw a realistic picture of audiences' media uses inclusive of new media.

6.0 FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

REFERENCES

- Abunyawah, M., Gajendran T and Maund K. (2016). Influence of Risk Communication on intention to prepare for Flood Hazards in Informal Settlements. 6th International Conference on Building Resilience. Massey University: Paper No 49.
- Ahadzie, D. K., & Proverbs, D. (2011). Emerging Issues in the Management of Floods in Ghana. *International Journal of Safety and Security Engineering*, 1(2), 1-11.
- Ahadzie, D. K., Dinye, I., Dinye, R. D & Proverbs, D. G. (2016). Flood Risk Perception, Coping and Management in Two Vulnerable Communities in Kumasi, Ghana. *Int. J. of Safety and Security Eng.*, 6(3): 538–549.
- Alaszewski, A. (2005). Risk communication: Identifying the Importance of SocialContext. *Health Risk & Society*, Vol. 7(2): 101-105.
- Amoako, C. & Boamah, E. F. (2014). The Three-dimensional Causes of Flooding in Accra, Ghana. *International Journal of Urban Sustainable Development*, 7(1), 109-129.
- Ansah, S. O., Ahiataku, M. A., Yorke, C. K., Otu-Larbi, F., Bashiru, Y., Lamptey, P. N. L., and Tanu, M. (2020). Meteorological Analysis of Floods in Ghana. *Advances in Meteorology*, vol. 2020, Article ID 4230627.
- Asumadu-Sarkodie, S., Owusu, P. A., and Rufangura, P. (2015). Impact Analysis of Flood in Accra, Ghana. *Advances in Applied Science Research*, 6(9),53-78.
- Ballantyne, M. Paton, D. Johnston, D. Kozuch, M. and Daly, M. (2000). Information on Volcanic and Earthquake Hazards: The Impact on Awareness and Preparation. Institute of Geological and Nuclear Sciences Limited Science Report No 2000/2.
- Bishop, B. Paton, D. Syme, G. and Nancarrow, B. (2000). Coping with Environmental Degradation: Salination as a Community Stressor. *Network*, 12: 1-15.
- Chess, C. Salomone, K.L. Hance, B.J. and Saville, A. (1995) A Results of a National Symposium on Risk Communication: Next Steps for Government Agencies. *Risk Analysis*, 15(2): 115-125.
- Covello, V.T. & Sandman, P. M. (2001) Risk Communication: Evolution and Revolution. In: Wolbarst, A, ed. *Solutions to an Environment in Peril*, Baltimore, MD: John Hopkins University Press: (in Press): 164-178.
- Covello, V.T. (1998) Risk Perception, Risk communication, and EMF exposure: Tools and Techniques for Communicating Risk Information. In: Mattes R, Bernhardt J H, Repacholi MH, eds. *Risk Perception, Risk Communication, and its application to EMF Exposure: Proceedings of the World Health Organization/ICNRP International Conference. (ICNIRP5/98)* International Commission on Non-Ionizing Radiation Protection: 179-214.
- Covello, V.T. McCallum, D.B. and Pavlova, M.T. (1989) Principles and Guidelines for Improving Risk Communication. In Covello, V.T. McCallum, D.B. Pavlova, M.T

- eds. Effective Risk Communications: The Role and Responsibility of Government and Non-government Organizations, Plenum Press: 3-16.
- Covello, V.T. Peter, R.G. Wojtecki, J, E. Hyde, R.C. (2001) Risk Communication. The West Nile Virus Epidemic, and Bioterrorism: Responding to the Communication Challenges Posed by the Intentional or Unintentional Release of a Pathogen in an Urban Setting. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, 78(2), 382-391.
- Doyle, L., Brady, A. M., & Byrne, G. (2009). An Overview of Mixed Methods Research. *Journal of research in nursing*, 14(2), 175-185.
- Duval, T.S. and Mulilis, J. P. (1999). A Person Relative – to Event (Pr E) Approach to Negative Threat Appeals and Earthquake Preparedness: A Field Study. *Journal of Applied Social Psychology*, 29: 485-516.
- Farmer, T, Robinson, K, Elliott, S.J. & Eyles, J. (2006). Developing and Implementing a triangulation protocol for qualitative health research. *Qual Health Res* vol. 16:377-94.
- Fischhoff, B. (1989) Helping the Public Health Risk Decisions. In: Covello, V.T. McCallum, D.B. Pavlova, M.T. eds. Effective Risk Communication. The Role and Responsibility of Government and Non-government Organizations. Plenum Press; 111-116.
- Glik, D. (2007). Risk Communication for Public Health Emergencies. *Annual review of public health*, 28(1): 33-54. Health Protection Network (2008). Communicating with the Public about Health Risks. Glasgow: Health Protection Scotland.
- Infanti, J., Sixsmith, J., Barry, M. M., Núñez-Córdoba, J., Oroviogioicochea-Ortega, C. & Guillén-Grima, F. (2013). A Literature Review on Effective Risk Communication for the Prevention and Control of Communicable Diseases in Europe. ECDC. Inter-Departmental Liaison Group on Risk Assessment. (1998). Risk Communication: A Guide to Regulatory Practice. ILGRA.
- Iorfa, S.K., Ottu, I.F.A., Oguntayo, R., Ayandele, O., Kolawole, S.O., Gandi, J.C., Dangiwa, A.L. & Olapegba, P.O. (2020). COVID-19 Knowledge, Risk Perception, and Precautionary Behavior Among Nigerians: A Moderated Mediation Approach. *Frontiers in Psychology*, 11, 3292.
- Johnson, D. W. (1999). Reaching Out: Interpersonal Effectiveness and Self-Actualization. Prentice-Hall.
- Lindell, M.K. & Whitney, D.J. (2000). Correlatives of Household Seismic Hazard Adjustment Adoption. *Risk Analysis*, 20(1), 13-25.

- Musah, B. A. N., & Akai, C. Y. (2014). Effects of flood disasters on livelihood coping mechanism in Tolon/Kumbungu district of northern region of Ghana. *International Journal of Agricultural Policy and Research*, 2(1), 33-40.
- NADMO (National Disaster Management Organisation), (2010). *National Standard Operating Procedures for Emergency Response*. NADMO, Accra.
- Nathe, S., Gori, P., Greene, M., Lemersal, E. and Mileti, D. (1999). Public Education for Earthquake Hazards. *Natural Hazards Informer*. No. 2.
- Ologunorisa, T.E., (2009). Content Analysis of HydroMeteorologicalNetwork in the Lower BenueRiver basin, Nigeria. *Journal of Applied Sciences and Environmental Management*. 13(2): 33-35.
- Otway, H.J. and Wynne, B. (1989). Risk Communication: Paradigm and Paradox. *Risk Analysis*. 9, 141-145.
- Palanchar, M. J. and Heath, R. L. (2002). Another Part of the Risk Communication Model: Analysis of Communication Processes and Message Content. *Journal of Public Relations Research*, 14(2): 127–158.
- Paton, D. (2000). Emergency Planning: Integrating Community Development, Community Resilience and Hazard Mitigation. *Journal of the American Society of Professional Emergency Manager*, 7, 109-118.
- Peter, R.G., Covello, V.T., McCallum, D.B. (1997). The Determents of Trust and Credibility in Environmental Risk Communication: An Empirical Study. *Risk Analysis*, 17 (1): 43-54.
- Rahman, F.N., Bhuiyan, M.A.A., Hossen, K., Khan, H.T.A., Rahman, A.F. & Dalal, K. (2021). Challenges in Preventive Practices and Risk Communication towards COVID-19: A Cross-Sectional Study in Bangladesh. *Int. J. Environ. Res. Public Health*, 18, 9259.
- Rakow, T., Heard, C. L., & Newell, B. R. (2015). Meeting Three Challenges in Risk Communication: Phenomena, Numbers, and Emotions. *Policy Insights from the Behavioral and Brain Sciences*, 2(1), 147–156.
- Renn, O. and Levine, D. (1991). Credibility and Trust in Risk Communication. In: Kasperson and Stallen, Eds *Communicating Risk to the Public*. Kluwer Academic Publishers.
- Samaddar, S., Yokomatsu, M., Dayour, F., Oteng-Ababio, M., Dzivenu, T. & Ishikawa, H. (2018). Exploring the Role of Trust in Risk Communication Among Climate-Induced Vulnerable Rural Communities in Wa West District, Ghana. In *Strategies for Building Resilience against Climate and Ecosystem Changes in Sub-Saharan Africa*, 247-264.
- Slovic, P. (1999). Trust, Emotion, Sex, Politics, and Science: Surveying the Risk Assessment Battlefield. *Risk Analysis*, 19 (4): 689-701.

- Smith, K. (1993). Environmental Hazards; Assessing Risk and Reducing Disaster. Routledge.
- Stern, P.C. (1991). Learning Through Conflict: A Realistic Strategy for Risk Communication. *Policy Sciences*, 24: 99-119.
- Taylor-Gooby, P. (2004). New Social Risks in Postindustrial Society: Some Evidence on Responses to Active Labour Market Policies from Eurobarometer. *International Social Security Review*, 57 (3): 45-64.
- The University of Leicester, (2001). The Context of Organisational Health and Safety Risks, Unit 6, p33, Leicester.
- US National Research Council, (1989). Improving Risk Communication. National Academy Press.
- Venkatesh, V., Brown, S. A., & Bala, H. (2013). Bridging the Qualitative-Quantitative Divide: Guidelines for Conducting Mixed Methods Research in Information Systems. *MIS quarterly*, 37(1).
- Zimmerman, R., Carlos, E., Restrepo, A., Wendy, E. R., Alison, K., Ian, P. & George L. F. (2010). Risk communication for catastrophic events: results from focus groups. *Journal of Risk Research*, 13(7): 913-935.