

Assessment of the Environmental and Socioeconomic Effects of Flood Disasters and Intervention Measures in Abuja, Nigeria

Shettima E., Sangari D.U, Adana M.Y*

Department of Geography, Nasarawa State University, Keffi, PMB 1022.

*Corresponding Author

DOI: <https://doi.org/10.47772/IJRISS.2026.100500769>

Received: 11 May 2026; Accepted: 16 May 2026; Published: 13 June 2026

ABSTRACT

This study examined the environmental and socioeconomic effects of flood disasters and assessed intervention measures in the Federal Capital Territory (FCT), Abuja, Nigeria. The research was motivated by the increasing frequency of flooding in the region and its associated impacts on communities and infrastructure. A cross-sectional research design was adopted, utilizing data collected from residents and relevant institutions within flood-prone areas such as Nyanya and Kubwa. Findings revealed that flooding has caused significant environmental degradation, including soil erosion, land degradation, water pollution, destruction of vegetation, and loss of biodiversity. The study also identified severe socioeconomic impacts, such as loss of lives, displacement of residents, destruction of homes and infrastructure, disruption of economic activities, increased poverty, and outbreaks of waterborne diseases, alongside psychological effects on affected populations. The study further highlighted the roles of governmental and non-governmental organizations, particularly the National Emergency Management Agency (NEMA), Federal Emergency Management Agency (FEMA), and the Nigerian Red Cross Society, in flood disaster management. Key interventions included early warning systems, emergency response, relief distribution, and community-based disaster risk reduction initiatives. Among mitigation measures, flood awareness campaigns and early warning systems were perceived as the most effective, although challenges in infrastructure and implementation persist. The study concludes that while efforts have been made to manage flood risks in Abuja, there is a need for improved infrastructure, enhanced policy implementation, and strengthened community participation to build long-term resilience against flood disasters.

Keywords: Flood disasters, Environmental impacts, Socioeconomic effects, Disaster management, Flood mitigation, Early warning systems.

INTRODUCTION

Flood disasters remain among the most destructive natural hazards globally, with increasing frequency and intensity linked to climate change, rapid urbanization, environmental degradation, and poor land-use practices (Intergovernmental Panel on Climate Change [IPCC], 2012). Across many regions of the world, floods have resulted in severe human, environmental, and economic losses, disrupting livelihoods, infrastructure, transportation systems, and ecological stability. Reports indicate that inland floods affect millions of people annually and account for substantial fatalities and property damage worldwide (Gore, 2010). Major flood events in countries such as Pakistan, India, Bangladesh, China, and the United States have demonstrated the growing vulnerability of both developed and developing societies to flood-related disasters (Webster et al., 2011; Gochis et al., 2015).

In recent decades, the global increase in flood occurrences has attracted significant attention due to the scale of environmental degradation and socioeconomic disruption associated with these events. Floodwaters often destroy homes, roads, bridges, drainage systems, farmlands, and public facilities, while also contributing to soil erosion, contamination of water bodies, and loss of biodiversity (Istifanus et al., 2023). The impacts extend beyond physical destruction, as flooding also increases poverty levels, displacement, disease outbreaks, food insecurity, and social vulnerability among affected populations (Wisner et al., 2004). Vulnerable groups,

particularly low-income households living in poorly planned urban settlements, are usually the most severely affected (Ahmad & Afzal, 2021).

Nigeria has experienced recurring flood disasters over the years, with the 2012 nationwide flood disaster regarded as one of the worst in the country's history. The event affected more than 30 states, displaced millions of residents, and caused extensive destruction to infrastructure and livelihoods (NEMA, 2013). Since then, flood incidents have continued to occur in many urban centers due to poor drainage systems, rapid population growth, indiscriminate waste disposal, and inadequate urban planning. The increasing frequency of flooding has raised concerns regarding the adequacy of disaster preparedness, response mechanisms, and institutional coordination in the country (Ojo, 2013).

Within the Federal Capital Territory (FCT), Abuja, flood disasters have become increasingly common, particularly in rapidly expanding settlements such as Nyanya, Kubwa, and Lokogoma. The combination of urban expansion, environmental mismanagement, and insufficient drainage infrastructure has heightened flood vulnerability across the city. Flood events in Abuja have resulted in loss of lives, destruction of residential buildings and public infrastructure, disruption of economic activities, displacement of residents, and deterioration of environmental quality (Adelekan & Adelekan, 2017). These impacts have placed considerable pressure on both governmental and non-governmental organizations responsible for disaster risk reduction and emergency management.

Governmental agencies such as the National Emergency Management Agency and the Federal Emergency Management Agency have implemented various flood mitigation and emergency response measures, including early warning systems, public awareness campaigns, evacuation support, and relief distribution (NEMA, 2013). Similarly, non-governmental organizations such as the Nigerian Red Cross Society and Oxfam Nigeria have contributed significantly to disaster preparedness, humanitarian assistance, and community-based flood risk reduction initiatives. Despite these efforts, concerns remain regarding the effectiveness, coordination, and sustainability of intervention measures in reducing flood impacts within the FCT (Alexander, 2013).

Existing studies on flood disasters in Nigeria have largely focused on flood vulnerability, climate change, environmental degradation, and disaster response mechanisms. While several scholars have examined the role of governmental and non-governmental organizations in disaster management, limited studies have comprehensively assessed the environmental and socioeconomic effects of flood disasters alongside the effectiveness of institutional interventions in Abuja. In addition, there appears to be insufficient empirical attention given to community participation, coordination among stakeholders, and the practical challenges affecting flood disaster management within the FCT (Kapucu, 2008; Tierney, 2012).

This gap in knowledge creates the need for a more integrated assessment of flood disaster impacts and intervention measures in Abuja, Nigeria. Understanding both the environmental and socioeconomic consequences of flooding, as well as the roles played by governmental and non-governmental organizations, may provide useful insights for improving disaster preparedness, mitigation, and resilience strategies in flood-prone communities.

Therefore, this study assesses the environmental and socioeconomic effects of flood disasters and intervention measures in Abuja, Nigeria. Specifically, the study seeks to:

1. Examine the environmental effects of flood disasters in Abuja.
2. Assess the socioeconomic effects of flood disasters in the study area.
3. Examine interventions on flood disasters by governmental and non-governmental organizations in Abuja, Nigeria.

METHODOLOGY

Research Design

This study adopted a mixed-methods research design involving both quantitative and qualitative approaches to assess the environmental and socioeconomic effects of flood disasters and intervention measures in Abuja,

Nigeria. The mixed-methods approach provided an opportunity to combine numerical data with qualitative insights for a broader understanding of flood impacts and management interventions within the Federal Capital Territory (FCT).

Sources and Types of Data

Both primary and secondary sources of data were utilized in the study. Primary data were obtained through questionnaire administration, semi-structured interviews, and field observations. The data collected focused on flood impacts, institutional interventions, community participation, and mitigation strategies in flood-prone areas within Abuja. Secondary data were obtained from government reports, NGO publications, academic journals, online databases, and previous studies related to flood disaster management. Additional information was sourced from reports of the National Emergency Management Agency, Federal Emergency Management Agency, Nigerian Red Cross Society, and Oxfam Nigeria.

Population of the Study

The study population comprised residents of flood-prone communities in Abuja, officials of government agencies, representatives of non-governmental organizations, community leaders, and flood victims involved in or affected by flood disaster management activities within the FCT.

Sampling Technique and Sample Size

A combination of purposive and random sampling techniques was employed for the study. Purposive sampling was used to select relevant governmental and non-governmental organizations involved in flood disaster and emergency management, while random sampling was used in selecting respondents for questionnaire administration. A total of 300 questionnaires were administered, out of which 286 were successfully completed and retrieved for analysis. In addition, 10 key informants were purposively selected for in-depth interviews based on their involvement in flood disaster management activities in Abuja.

Instruments for Data Collection

The instruments used for data collection included structured questionnaires, interview guides, and observation checklists. The questionnaire consisted of both closed-ended and open-ended questions designed to obtain information on environmental impacts, socioeconomic effects, mitigation measures, and institutional interventions relating to flood disasters. Semi-structured interview guides were used to obtain detailed information from key informants, while observation checklists were used during field visits to assess flood-prone locations and intervention activities.

Data Collection Procedure

Field surveys were conducted in selected flood-prone communities within Abuja. Questionnaires were administered directly to respondents, while interviews were conducted with representatives of relevant organizations and community stakeholders. Field observations were also carried out to examine drainage conditions, environmental degradation, and existing flood control measures.

A pilot study was conducted to test the reliability and suitability of the research instruments prior to the main data collection exercise.

Data Analysis Techniques

Quantitative data obtained from the questionnaires were analysed using descriptive statistical tools such as frequencies, percentages, means, and standard deviations with the aid of Statistical Package for Social Sciences (SPSS). Qualitative data obtained from interviews and observations were analysed using thematic and content analysis techniques to identify major themes and patterns relating to flood impacts and intervention measures.

Ethical Considerations

Ethical standards were maintained throughout the study. Informed consent was obtained from all respondents before participation, while confidentiality and anonymity of participants were ensured during data collection and analysis. Participants were also informed that the information provided would be used strictly for academic purposes.

RESULTS

Environmental and Socioeconomic Effects of Flood Disasters and Intervention Measures in Abuja, Nigeria

Environmental Effects of Flood Disaster

Findings from the study revealed that flooding in the Federal Capital Territory (FCT), Abuja, has caused serious environmental degradation. Respondents and institutional reports indicated that flood events contribute significantly to soil erosion, degradation of land quality, and the loss of fertile topsoil, thereby reducing agricultural productivity in peri-urban communities. Floodwaters also contaminate rivers, streams, and drainage channels with sewage, waste materials, and pollutants, increasing the risk of waterborne diseases and environmental pollution.

The study further showed that flooding damages drainage infrastructure and blocks waterways, thereby worsening urban flooding conditions in areas such as Nyanya, Kubwa, and other flood-prone settlements within Abuja. Flooding was also associated with destruction of vegetation, disruption of ecosystems, habitat loss, and reduction in biodiversity. Prolonged inundation in some locations resulted in waterlogging and declining land usability, particularly in low-lying communities. Overall, the environmental impacts identified in the study include; Soil erosion and land degradation, water pollution and contamination of water bodies, destruction of vegetation and ecosystems, damage to drainage infrastructure, increased environmental health risks, loss of biodiversity and habitat disruption

Socioeconomic Effects of Flood Disaster

The study revealed that flood disasters have severe socioeconomic consequences on residents of Abuja. Findings indicated that flooding has led to loss of lives, injuries, displacement of households, and destruction of residential buildings and public infrastructure such as roads, bridges, schools, and drainage systems.

Economic activities were also significantly disrupted as markets, businesses, and transportation systems were affected during flood incidents. Respondents noted that many households experienced income loss and increased poverty due to property destruction and interruption of livelihoods. Vulnerable populations, especially low-income residents living in flood-prone areas, were disproportionately affected because of poor housing conditions and limited coping capacity.

The study also identified major health-related consequences associated with flooding. Outbreaks of waterborne diseases such as cholera, typhoid, and malaria were reported due to contaminated water sources and poor sanitation conditions after flood events. Psychological impacts such as trauma, stress, and anxiety among affected residents were equally observed. The major socioeconomic effects identified include; loss of lives and injuries, displacement of residents, destruction of homes and infrastructure, disruption of businesses and economic activities, increased poverty and livelihood losses, public health challenges and disease outbreaks and social disruption and educational interruption

Governmental and Non-Governmental Interventions on Flood Disaster

Nigerian Red Cross Society Interventions

The findings showed that the Nigerian Red Cross Society plays a major role in flood disaster response and management in Abuja. The organization operates as a humanitarian support agency and collaborates closely with government agencies during emergencies.

Specific interventions carried out by the organization in the FCT include:**Preparedness and Early Warning**

- Participation in coordination meetings with NEMA, FEMA, and AMAC
- Dissemination of early warning messages to vulnerable communities
- Prepositioning of relief materials such as blankets, tarpaulins, water purification tablets, and kitchen sets

Emergency Response

- Deployment of trained staff and volunteers for rescue operations
- Provision of first aid and evacuation support
- Establishment of temporary shelters for displaced persons

Relief and Humanitarian Assistance

- Distribution of food and non-food items to flood victims
- Provision of hygiene kits, mosquito nets, and clean water containers
- Shelter support for affected households

Health and Psychosocial Support

- Emergency healthcare and health promotion activities
- Psychosocial support services for traumatized victims
- Public health awareness campaigns on cholera, malaria, and typhoid prevention

Community Engagement and Disaster Risk Reduction

- Community sensitization on flood preparedness and risk reduction
- Household disaster preparedness training
- Support for community-based early warning systems

The study further revealed that the major strengths of the Nigerian Red Cross Society include its nationwide volunteer network, international donor support, rapid mobilization capacity, and strong community acceptance, particularly in vulnerable and informal settlements.

Non-Governmental Organization (NGO) Interventions

The findings showed that several NGOs contribute to flood disaster management in Abuja, particularly during relief and recovery phases. Key NGOs identified include the Nigerian Red Cross Society, Oxfam Nigeria, and GIVE Directly.

The interventions provided by NGOs include:

- Community-based disaster risk reduction programmes

- Emergency preparedness training and first aid education
- Advocacy for climate adaptation and flood management policies
- Capacity-building workshops for local communities and officials
- Research and data collection on flood vulnerability and impacts
- Stakeholder collaboration and awareness campaigns

The study observed that NGO interventions complement government efforts and contribute significantly to community resilience and preparedness.

Flood Mitigation Measures

Findings from Table 4.5 revealed that several flood mitigation measures are implemented within Abuja. Flood prevention awareness ranked highest with a mean score of 5.00, followed by early warning systems (Mean = 4.59), flood-resistant construction (Mean = 3.56), drainage systems (Mean = 2.22), and floodwalls (Mean = 1.33). The results suggest that awareness creation and early warning mechanisms are perceived as the most effective measures in reducing flood impacts in the study area.

Major mitigation measures identified include:

- Construction and rehabilitation of drainage systems
- Early warning systems
- Flood prevention awareness campaigns
- Flood-resistant building practices
- Community preparedness programmes

Satisfaction with Flood Intervention Measures

The study assessed respondents' satisfaction with flood intervention measures implemented in Abuja. Findings revealed varying levels of satisfaction among residents. A significant proportion of respondents were only fairly satisfied with intervention measures, while others expressed dissatisfaction due to inadequate implementation, poor maintenance of drainage infrastructure, and insufficient emergency support. The findings suggest that although interventions exist, there are still gaps in effectiveness, sustainability, and responsiveness.

Government Agencies Involved in Flood Disaster Control

The study identified major government agencies involved in flood disaster management in Abuja. Findings showed that the National Emergency Management Agency was the most recognized agency involved in flood disaster control, followed by the Federal Emergency Management Agency and the Federal Ministry of Environment.

These agencies were found to be responsible for:

- Emergency response coordination
- Relief distribution
- Public awareness campaigns

- Environmental management
- Flood preparedness and recovery efforts

The study also noted collaborative partnerships between government agencies and NGOs during disaster response operations.

Community Participation and Engagement in Flood Management

The findings demonstrated that community participation plays an important role in flood disaster management in Abuja. Major forms of community engagement identified include:

- Public awareness campaigns
- Community-based initiatives
- Stakeholder meetings and consultations
- Community sensitization programmes

Public awareness campaigns and community initiatives ranked highest among engagement strategies used by organizations to reduce flood risk.

The study further revealed that mechanisms used in planning and implementation processes included:

- Public meetings and consultations
- Focus group discussions and surveys
- Community-based committees and task forces
- Community sensitization activities

These participatory approaches were found to improve local awareness, strengthen preparedness, and enhance community resilience to flooding.

DISCUSSION

The findings of this study provide comprehensive insights into the environmental and socioeconomic impacts of flood disasters in Abuja, as well as the effectiveness of intervention strategies implemented by governmental and non-governmental actors. The results align with existing literature that highlights flooding as a major environmental and developmental challenge in rapidly urbanizing regions of sub-Saharan Africa.

Environmental Effects of Flood Disasters

The study revealed that flooding in Abuja significantly contributes to environmental degradation, including soil erosion, land degradation, and loss of fertile topsoil. This finding is consistent with previous studies that identify flooding as a major driver of land productivity decline and ecological instability (Adelekan, 2016; Nkwunonwo et al., 2020). The contamination of water bodies with sewage and waste materials further underscores the public health dimension of environmental degradation caused by floods. Polluted water sources increase the risk of waterborne diseases and adversely affect aquatic ecosystems.

Additionally, the observed destruction of vegetation, loss of biodiversity, and disruption of ecosystems reflect the broader ecological consequences of prolonged flooding. Flood-induced damage to drainage infrastructure and blockage of waterways, particularly in densely populated areas such as Nyanya and Kubwa, exacerbates the

frequency and severity of urban flooding. These findings corroborate earlier research indicating that poor drainage systems and rapid urban expansion without adequate planning intensify flood risks (Satterthwaite et al., 2018). Overall, the environmental impacts identified demonstrate the interconnectedness of natural and built environments in shaping flood vulnerability.

Socioeconomic Impacts of Flood Disasters

The study found that flooding has severe socioeconomic consequences, including loss of lives, displacement, and destruction of infrastructure. These results are consistent with global evidence suggesting that floods are among the most devastating natural hazards in terms of human and economic losses (UNDRR, 2019). The disruption of economic activities and livelihoods highlights the vulnerability of urban populations, particularly those in informal settlements and low-income communities.

Furthermore, the findings indicate that flooding exacerbates poverty and inequality, as vulnerable populations often lack the resources to recover quickly. Health implications, including outbreaks of cholera, typhoid, and malaria, were also prominent, reinforcing the link between environmental hazards and public health outcomes (WHO, 2021). The psychological impacts such as trauma and stress further extend the burden of floods beyond physical and economic damages, emphasizing the need for holistic disaster response strategies that incorporate mental health support.

Effectiveness of Governmental and Non-Governmental Interventions

The study highlighted the critical role of the Nigerian Red Cross Society and other NGOs in flood disaster management. The organization's involvement in preparedness, emergency response, relief distribution, and psychosocial support demonstrates a comprehensive approach to disaster management. These findings align with the literature that emphasizes the importance of humanitarian organizations in complementing government efforts, particularly in emergency response and community-level interventions (IFRC, 2020). Similarly, NGOs such as Oxfam Nigeria and GIVE Directly were found to contribute significantly to disaster risk reduction, advocacy, and capacity building. The collaborative nature of these interventions suggests that multi-stakeholder partnerships are essential for effective flood management. This supports the argument that integrated approaches involving government agencies, NGOs, and communities enhance resilience and sustainability (Twigg, 2015).

Flood Mitigation Measures and Community Perception

The findings revealed that flood prevention awareness and early warning systems were perceived as the most effective mitigation measures. This indicates that non-structural approaches, such as public education and timely information dissemination, play a crucial role in reducing flood impacts. While structural measures such as drainage systems and floodwalls are important, their lower ranking suggests challenges related to implementation, maintenance, and cost. The varying levels of satisfaction with intervention measures indicate gaps in policy implementation and service delivery. Issues such as poor maintenance of drainage infrastructure and inadequate emergency support highlight systemic weaknesses in urban management. These findings are consistent with previous studies that identify governance and institutional capacity as key determinants of disaster risk reduction effectiveness (UN-Habitat, 2020).

Role of Government Agencies and Community Participation

The identification of key agencies such as the National Emergency Management Agency (NEMA), Federal Emergency Management Agency (FEMA), and the Federal Ministry of Environment underscores the institutional framework for flood disaster management in Nigeria. Their roles in coordination, awareness campaigns, and environmental management are critical for effective response and recovery. Importantly, the study emphasized the role of community participation in flood management. Public awareness campaigns, community-based initiatives, and stakeholder consultations were identified as key engagement strategies. These participatory approaches enhance local ownership, improve preparedness, and strengthen resilience. This finding aligns with the growing recognition that community engagement is essential for sustainable disaster risk reduction (Maskrey, 2011). Overall, the study demonstrates that flood disasters in Abuja have far-reaching

environmental and socioeconomic consequences. While significant efforts have been made by government agencies and NGOs to mitigate these impacts, challenges remain in terms of infrastructure, policy implementation, and community resilience. The findings suggest that a balanced approach that integrates structural measures, non-structural strategies, and community participation is necessary for effective flood management.

Limitations of the study

This study is limited by its reliance on self-reported data prone to recall bias, restricted geographic scope within selected flood-prone areas of Abuja limiting generalizability, use of a cross-sectional design that does not capture temporal changes, challenges in accessing complete institutional data, focus on major organizations excluding smaller community actors, and constraints in time and resources affecting sample size and coverage, thereby suggesting the need for broader, longitudinal, and more inclusive future research approaches.

CONCLUSION

This study examined the environmental and socioeconomic effects of flood disasters and the intervention measures implemented in Abuja, Nigeria. The findings revealed that flooding remains a major environmental hazard in the Federal Capital Territory, with significant consequences for both the natural environment and human livelihoods. Environmentally, flooding contributes to soil erosion, land degradation, water pollution, destruction of vegetation, and loss of biodiversity, thereby reducing the overall ecological stability and land usability in affected areas. From a socioeconomic perspective, the study demonstrated that flood disasters result in severe human and economic losses, including deaths, injuries, displacement of residents, and destruction of homes and infrastructure. The disruption of economic activities and livelihoods further exacerbates poverty, particularly among vulnerable populations living in flood-prone communities. In addition, the study highlighted serious public health challenges associated with flooding, including outbreaks of waterborne diseases and psychological impacts such as trauma and stress.

The study also revealed that both governmental and non-governmental organizations play critical roles in flood disaster management in Abuja. Agencies such as the National Emergency Management Agency (NEMA), Federal Emergency Management Agency (FEMA), and the Federal Ministry of Environment are central to coordination, response, and policy implementation. Similarly, organizations like the Nigerian Red Cross Society and other NGOs contribute significantly through emergency response, relief distribution, health support, and community-based disaster risk reduction initiatives.

Furthermore, the findings indicated that non-structural measures such as flood awareness campaigns and early warning systems are perceived as the most effective strategies for mitigating flood impacts. However, structural measures such as drainage systems and flood control infrastructure require improvement, particularly in terms of maintenance and implementation. The study also found that although intervention measures exist, satisfaction levels among residents remain moderate due to gaps in efficiency, sustainability, and responsiveness. Importantly, community participation was identified as a key component of effective flood management. Engagement through awareness campaigns, consultations, and community-based initiatives enhances preparedness and resilience, thereby reducing vulnerability to flood disasters.

In conclusion, while significant efforts have been made to address flood risks in Abuja, the persistence of environmental degradation, socioeconomic losses, and institutional challenges indicates the need for more integrated and sustainable approaches. Strengthening infrastructure, improving policy implementation, enhancing inter-agency collaboration, and promoting community-driven strategies are essential for effective flood disaster management. Future efforts should focus on combining structural and non-structural measures to build long-term resilience and reduce the overall impact of flooding in Abuja and similar urban settings.

Conflict declaration

The authors declare that there is no conflict

REFERENCES

1. Adelekan, I. O. (2016). Flood risk management in the coastal city of Lagos, Nigeria. *Journal of Flood Risk Management*, 9(3), 255–264.
2. Adelekan, I., & Adelekan, A. (2017). Flood disasters and community vulnerability in Abuja, Nigeria. *Journal of Environmental Studies and Management*, 10(2), 145–158.
3. Adeleke, O., Akinyemi, F., & Odufuwa, B. (2018). Disaster management and institutional response in Nigeria. *International Journal of Disaster Risk Reduction*, 31, 123–131.
4. Ahmad, D., & Afzal, M. (2021). Flood hazards, human displacement and socioeconomic vulnerability: A global review. *Environmental Science and Pollution Research*, 28(24), 30512–30524.
5. Akpan, E., Ekanem, E., & Udo, J. (2018). Challenges of disaster management coordination in Nigeria. *African Journal of Emergency Management*, 8(3), 115–123.
6. Alat, P. (2019). Emergency management systems and flood response challenges in Nigeria. *Journal of Disaster Risk Studies*, 11(1), 1–9.
7. Alexander, D. (2013). Resilience and disaster risk reduction: An etymological journey. *Natural Hazards and Earth System Sciences*, 13(11), 2707–2716.
8. Allin, D., Wu, S., & Chen, Y. (2010). Historical flood disasters along the Yellow River in China. *Natural Hazards Review*, 11(3), 112–120.
9. Ambelu, A., Birhanu, Z., & Tesfaye, A. (2017). Flood disasters and associated health risks in developing countries. *Environmental Health Insights*, 11, 1–8.
10. Ayal, D., Leal Filho, W., & Amsalu, A. (2018). Flood vulnerability and human security in developing countries. *Climate and Development*, 10(6), 540–552.
11. Burke, J., Khan, M., & Ali, S. (2014). Flood disasters in Kashmir and implications for regional disaster management. *International Journal of Disaster Risk Science*, 5(4), 221–230.
12. ClimaCell. (2019). Flood forecasting and climate resilience report. ClimaCell Publications.
13. Dilshad Ahmad, Kanwal, M., & Afzal, M. (2022). Community-based disaster preparedness and flood resilience. *International Journal of Disaster Risk Reduction*, 67, 102654.
14. Dong, S., & Frangopol, D. (2016). Economic losses and infrastructure vulnerability due to flood disasters. *Structure and Infrastructure Engineering*, 12(2), 157–170.
15. Doocy, S., Daniels, A., Murray, S., & Kirsch, T. (2013). The human impact of floods: A historical review of events 1980–2009 and systematic literature review. *PLoS Currents Disasters*, 1, 1–27.
16. Gochis, D., Schumacher, R., Friedrich, K., Doesken, N., Kelsch, M., Sun, J., ... & Rutledge, S. (2015). The great Colorado flood of 2013. *Bulletin of the American Meteorological Society*, 96(9), 1461–1487.
17. Gore, A. (2010). *Our choice: A plan to solve the climate crisis*. Rodale Books.
18. Intergovernmental Panel on Climate Change (IPCC). (2012). *Managing the risks of extreme events and disasters to advance climate change adaptation*. Cambridge University Press.
19. International Federation of Red Cross and Red Crescent Societies (IFRC). (2020). *World disasters report 2020*. IFRC.
20. Istifanus, J., Luka, D., & Yakubu, P. (2023). Flood disasters and environmental sustainability in Nigeria. *Journal of Environmental Management and Safety*, 14(1), 44–58.
21. Kapucu, N. (2008). Collaborative emergency management and national emergency management network. *Disaster Prevention and Management*, 17(4), 526–539.
22. Kreft, S., Eckstein, D., & Melchior, I. (2021). *Global climate risk index 2021*. Germanwatch.
23. Kundzewicz, Z., Kanae, S., Seneviratne, S., Handmer, J., Nicholls, N., Peduzzi, P., ... & Sherstyukov, B. (2014). Flood risk and climate change: Global and regional perspectives. *Hydrological Sciences Journal*, 59(1), 1–28.
24. Maskrey, A. (2011). Revisiting community-based disaster risk management. *Environmental Hazards*, 10(1), 42–52.
25. McEntire, D. (2007). *Disciplines, disasters, and emergency management: The convergence and divergence of concepts, issues and trends from the research literature*. Charles C Thomas Publisher.
26. NEMA. (2013). *National flood disaster situation report*. [National Emergency Management Agency](#)
27. Nkwunonwo, U. C., Whitworth, M., & Baily, B. (2020). A review of the current status of flood risk management in Nigeria. *Journal of Environmental Management*, 257, 109–120.

28. Ojo, O. (2013). Flood disaster preparedness and response in Nigeria. *Journal of Sustainable Development in Africa*, 15(4), 1–12.
29. Satterthwaite, D., Archer, D., Colenbrander, S., Dodman, D., Hardoy, J., Mitlin, D., & Patel, S. (2018). *Responding to climate change in cities and in their informal settlements and economies*. International Institute for Environment and Development.
30. Smith, K. (2013). *Environmental hazards: Assessing risk and reducing disaster* (6th ed.). Routledge.
31. Tierney, K. (2012). Disaster governance: Social, political, and economic dimensions. *Annual Review of Environment and Resources*, 37, 341–363.
32. UN-Habitat. (2020). *Cities and pandemics: Towards a more just, green and healthy future*. United Nations Human Settlements Programme.
33. UNISDR. (2015). *Sendai framework for disaster risk reduction 2015–2030*. United Nations Office for Disaster Risk Reduction. [UNDRR Sendai Framework](#)
34. United Nations Office for Disaster Risk Reduction (UNDRR). (2019). *Global assessment report on disaster risk reduction*. UNDRR.
35. Webster, P., Toma, V., & Kim, H. (2011). Were the 2010 Pakistan floods predictable? *Geophysical Research Letters*, 38(4), 1–5.
36. Wisner, B., Blaikie, P., Cannon, T., & Davis, I. (2004). *At risk: Natural hazards, people's vulnerability and disasters* (2nd ed.). Routledge.
37. World Health Organization (WHO). (2021). *Flooding and communicable diseases fact sheet*. WHO.