AJEMATES
African Journal of Educational Management, Teaching and Entrepreneurship Studies
VOL.16 (1), September-December, 2025 https://ajemates.org

POST FLOOD RECOVERY STRATEGIES AND IMPACT ASSESSMENT ON SMALL AND MEDIUM-SCALE ENTERPRISES OPERATION IN MAIDUGURI, BORNO STATE, NIGERIA

[1]**Alhaji Bukar Mustapha and** [2]**Abba Kyari Yusuf**
[1]Department of Economics, Borno State University, Maiduguri, Nigeria
[2]Department of Geography, Borno State University, Maiduguri, Nigeria
Email: abmustapha@bosu.edu.ng

ABSTRACT

This study explores the relationships between flood risk awareness, government support and recovery of Small and Medium Scale Enterprises from flood impact in Maiduguri, Borno State, Nigeria. The study adopted a survey research design. One hundred SMEs were sample in this study. A structured questionnaire was used for data collection. Data collected were analyzed using structural equation modeling (SEM). The result of the confirmatory factor analysis (CFA) confirms strong reliability and validity across constructs, with Cronbach's Alpha values ranging from 0.931 for Government Support to 0.947 for Flood Risk Awareness, indicating excellent internal consistency. The structural model fit indices suggest moderate model alignment, with SRMR values of 0.1020 and a high chi-square value of 9794.2. Path coefficients from the structural equation modeling highlight significant relationships. Flood Risk Awareness has a strong positive effect on SMEs recovery (0.895, p = 0.000), signifying that increased awareness enhances SMEs recovery. Government Support significantly reduces Flood Impact (0.888, p = 0.000). Flood Risk Awareness does not directly affect Flood Impact (-0.135, p = 0.132), indicating an indirect relationship through recovery or support mechanisms. The SEM plot visualizes these direct and indirect relationships, illustrating how variables interact within the model.

Keywords: *Small and Medium-Scale Enterprises (SMEs), Flood Risk Awareness, SMEs Recovery Strategies, Flood Impact, Structural Equation Modeling (SEM)*

Introduction

Small and medium-sized enterprises (SMEs) form the foundation of many economies, including that of Nigeria (Olaniyi & Adekanmbi, 2022). They drive economic growth, create jobs and help reduce poverty, particularly in areas prone to natural disasters. However, these businesses face significant risks when disasters strike, especially flooding (Sadeghi, 2022). Experts continue to explore how businesses can adapt, survive and even grow stronger after facing natural disaster like flooding.

Studies specifically examining how natural disasters especially flooding impact SMEs

remain limited (Marshall & Schrank, 2014). There is still much to learn about how businesses prepare for and recover from floods (Bhattacharya-Mis & Lamond, 2024). Flooding poses a serious threat to SMEs by destroying infrastructure, disrupting supply chains and reducing customer demand. In places like Maiduguri, Borno State, where extreme weather events and security challenges already strain businesses, the need for effective recovery strategies is even more urgent.

Recovering from floods requires a mix of financial, structural and operational strategies. Financial support such as government grants, microloans, and insurance can help businesses rebuild, but access to these resources is often limited in developing regions like Maiduguri. Strengthening infrastructure, Measures such as enhancing drainage systems, constructing flood-resistant buildings, and implementing early warning systems can help mitigate future risks. Businesses also need to adopt adaptive strategies, such as diversifying their operations, integrating digital solutions, and incorporating climate-resilient business models to ensure long-term sustainability.

The impact of floods on SMEs goes beyond just physical damage. Businesses suffer direct losses like destroyed assets, lost inventory, and interrupted operations. They also experience indirect effects such as decreased consumer spending, supply chain breakdowns, and emotional stress among business owners and employees. Assessing these impacts is crucial for policymakers and stakeholders to develop targeted recovery programs. Also, community-based disaster risk management and partnerships between government agencies, financial institutions, and business networks can help strengthen SMEs' ability to cope with floods.

As climate change continues to increase the frequency and intensity of flooding, SMEs must take proactive steps to prepare and protect themselves (Battisti & Deakins, 2017). Building resilience is about more than just improving business operations it requires fostering a culture of preparedness, innovation and collaboration (Blundel, 2014). In Maiduguri, where SMEs play a vital role in economic stability and recovery, investing in recovery strategies is essential to ensure that businesses not only survive but also thrive despite the challenges posed by floods.

Problem Statement

Flooding has become a serious challenge in Nigeria, especially for SMEs. The recent breach of the Alau Dam in Maiduguri, the Borno State capital has caused massive destruction, displacing thousands of people and severely affecting businesses. Many SMEs owners lost their shops, goods and sources of income. With roads and supply chains disrupted, it has become even harder for them to recover and keep their businesses running.

AJEMATES
African Journal of Educational Management, Teaching and Entrepreneurship Studies
VOL.16 (1), September-December, 2025 https://ajemates.org

Despite how common flooding has become, most small businesses are not well-prepared to handle such disasters. Many do not have insurance, access to financial assistance or proper support from the government. Some have tried to adapt by moving their businesses or using temporary measures, but it's unclear how effective these solutions really are. Moreover, government policies aimed at helping businesses during such disasters often lack proper coordination and timely implementation. This study aims to investigate how flooding affects SMEs, what strategies they use to survive and whether current policies are actually helping.

Aim and Objectives

The study aims to examine the post flood recovery strategies and impact assessment on SMEs operation in Maiduguri Metropolis, Borno State, Nigeria. The specific objectives are to:

1. Assess the impact of flooding on Small and Medium Scale Enterprise in Maiduguri Metropolis, Borno State, Nigeria.
2. Examine the preparedness and adaptive strategies of Small and Medium Scale Enterprises in response to flooding in Maiduguri Metropolis, Borno State, Nigeria.
3. Identify the challenges faced by Small and Medium-Scale Enterprises in post-flood recovery in Maiduguri Metropolis, Borno State, Nigeria.
4. Evaluate the effectiveness of government and non-governmental support in enhancing SME recovery strategies in Maiduguri Metropolis, Borno State, Nigeria.

Research Hypotheses

H_{01}: Impact of the flooding significantly affects SMEs' operational disruption in Maiduguri, Borno State, Nigeria.

H_{02}: Flood preparedness strategies negatively mediate the relationship between flood impact and operational disruption in Maiduguri, Borno State, Nigeria.

H_{03}: Post-flood recovery challenges significantly reduce SME recovery in Maiduguri, Borno State, Nigeria.

H_{04}: Flood preparedness strategies positively influence SME recovery in Maiduguri, Borno State, Nigeria.

Literature Review

Flooding presents substantial challenges for small and medium-sized enterprises (SMEs) and vulnerable communities, impacting their economic stability and operational resilience. The existing literature highlights various approaches to understanding and mitigating these impacts, ranging from structural and procedural mitigation measures to community-driven resilience strategies. Recent studies highlight the vulnerability of SMEs in flood-prone areas of Maiduguri, Borno State, Nigeria, emphasizing the severe economic disruptions caused by flooding. The 2024 flood displaced over 157,000 residents, disproportionately affecting SMEs due to infrastructure damage, inventory losses, and reduced consumer access. Many

businesses lacked flood-resistant infrastructure, leading to prolonged recovery periods and financial strain. Adaptive strategies, such as relocating to higher ground and diversifying income sources, have been observed, but challenges persist, including limited access to relief funds and inadequate insurance coverage. Government and non-governmental interventions, such as the North East Development Commission (NEDC) relief efforts, have provided financial aid, yet concerns remain regarding the efficiency and accessibility of these funds (Umar *et al.*, 2025). Their findings highlighted the need for climate-informed urban planning, reinforced infrastructure rebuilding and comprehensive disaster-management protocols to enhance SME recovery in Maiduguri.

Coates *et al.* (2020) highlight computational modeling as a key tool for assessing SMEs recovery, finding structural mitigation measures more effective than procedural approaches. Ingirige (2018) emphasizes the importance of integrating both structural and non-structural recovery strategies, advocating for adaptive business operations alongside flood-resistant infrastructure. Wedawatta (2009) identifies financial constraints and lack of professional guidance as major barriers to resilient reconstruction, while Pathak and Ahmad (2017) highlight self-dependency and adaptive strategies as critical to SME disaster recovery. Hewawasam and Matsui (2023) reveal the disproportionate impact of flooding on informal businesses due to low insurance uptake, reinforcing the need for improved risk awareness and management. Gabriel *et al*. (2024) focus on flood vulnerability in Southern Mubi, recommending zoning and settlement restrictions for risk mitigation, while da Casto (2020) advocates for government interventions and community-driven recovery strategies in rural flood-prone areas. Finally, Marjanac *et al.* (2021) stress the impact of rapid urbanization and poor drainage on coastal flooding, suggesting nature-based solutions to improve long-term SME recovery.

Methodology

This study aims to examine the recovery of SMEs in flood-prone areas, particularly in Maiduguri Metropolis, Borno State, Nigeria with a focus on post-flood recovery strategies and the impact of flooding on SMEs operations. This study adopted a descriptive research design to examine the impact of flooding on Small and Medium-Scale Enterprises (SMEs) in Maiduguri Metropolis, Borno State, Nigeria, focusing on preparedness, adaptive strategies, challenges in post-flood recovery and the effectiveness of support systems. The target population consists of business owners, managers and staff across various economic sectors, including retail, manufacturing, service providers and agriculture-based enterprises. A stratified random sampling method will ensure representation across different SME types, with a sample size of approximately 100 SMEs for data reliability. Data collection

AJEMATES
African Journal of Educational Management, Teaching and Entrepreneurship Studies
VOL.16 (1), September-December, 2025 https://ajemates.org

will involve a structured questionnaire divided into five sections covering SME characteristics, flood impacts, adaptive strategies, recovery challenges and support systems. Structural Equation Modeling (SEM) using R programming language was employed to analyze relationships among flooding impacts, preparedness strategies, recovery challenges and government interventions, utilizing path analysis and confirmatory factor analysis (CFA) to test hypotheses and evaluate model fit. R has advanced capabilities in handling complex data structures and latent variables making it one of the best tool for assessing SME recovery in flood-prone regions.

Presentation of Results

Table 1: Confirmatory Factor Analysis

Construct	Cronbach's Alpha	Composite Reliability (ρ_a)	Composite Reliability (ρ_c)	Average Variance Extracted (AVE)
Flood Risk Awareness	0.947	0.949	0.955	0.68
Flood Impact (Livelihood)	0.937	0.944	0.947	0.642
SMEs Recovery	0.935	0.939	0.947	0.69
Government Support	0.931	0.934	0.942	0.645

Table 1 presents the result of the CFA which assesses the reliability and validity of the constructs used in the study. Cronbach's Alpha values, which measure internal consistency are all greater than 0.7, indicating strong reliability. Composite reliability values (ρ_a & ρ_c) also confirm the robustness of these constructs. The Average Variance Extracted (AVE) values indicate how much variance is captured relative to error, with all constructs having AVE above 0.5, suggesting good convergent validity.

Table 2: Outer Loadings

Indicator	Flood Risk Awareness	Flood Impact	SMEs Recovery	Government Support
FI1		0.796		
FI2		0.874		
FI3		0.817		
FI4		0.851		
FI5		0.852		
FI6		0.838		
FI7		0.758		
FI8		0.835		
FI9		0.704		
FRA1	0.821			
FRA2	0.788			
FRA3	0.779			
FRA4	0.858			
FRA5	0.892			
FRA6	0.857			
FRA7	0.793			
FRA8	0.868			
FRA9	0.820			

AJEMATES
African Journal of Educational Management, Teaching and Entrepreneurship Studies
VOL.16 (1), September-December, 2025 https://ajemates.org

FRA10	0.761			
CR1		0.835		
CR2		0.828		
CR3		0.874		
CR4		0.723		
CR5		0.853		
CR6		0.888		
CR7		0.767		
CR8		0.864		
GS1			0.800	
GS2			0.808	
GS3			0.859	
GS4			0.780	
GS5			0.784	
GS6			0.768	
GS7			0.880	
GS8			0.756	
GS9			0.781	

Table 2 presents the outer loadings, which display the factor loadings of individual indicators within their respective constructs. Loadings greater than 0.7 suggest that the indicators contribute meaningfully to their constructs. Given the high values observed, the indicators exhibit strong reliability, reinforcing the strength of measurement.

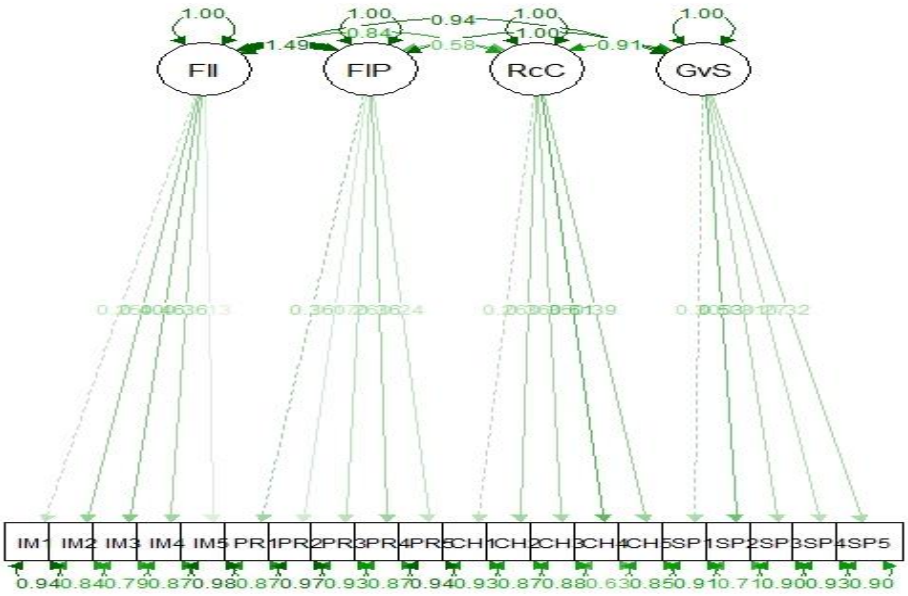


Figure 1: CFA plot

AJEMATES
African Journal of Educational Management, Teaching and Entrepreneurship Studies
VOL.16 (1), September-December, 2025 https://ajemates.org

Figure 1 presents the CFA plot which visually represents the relationship between indicators and their constructs. Each latent variable is measured by five observed variables, all of which exhibit high standardized factor loadings (mostly above 0.70), indicating strong reliability and convergent validity.

Table 3: Discriminant Validity – Fornell-Larcker Criterion

Construct	Flood Risk Awareness	Flood Impact	SMEs Recovery	Government Support
Flood Risk Awareness	0.825			
Flood Impact	0.849	0.801		
SMEs Recovery	0.903	0.907	0.831	
Government Support	0.876	0.964	0.918	0.803

Table 3 examines discriminant validity using the Fornell-Larcker Criterion, ensuring constructs are distinct from each other. The diagonal values, which represent the square root of AVE for each construct, are higher than the correlation values, confirming that each construct uniquely measures its intended concept.

Table 4: Structural Equation Estimates

Pathways	Original Sample	Standard Deviation	t-statistics	p-value
Flood Risk Awareness → Flood Impact	-0.135	0.089	1.505	0.132
Flood Risk Awareness → SMEs Recovery	0.895	0.019	46.542	0.000
Flood Risk Awareness → Government Support	0.181	0.092	1.960	0.050
SMEs Recovery → Flood Impact	0.207	0.126	1.642	0.101
SMEs Recovery → Government Support	0.755	0.086	8.769	0.000
Government Support → Flood Impact	0.888	0.096	9.287	0.000

The Structural Equation Estimates summarize the relationships between constructs, with path coefficients indicating effect sizes. Significant pathways include Flood Risk Awareness positively influencing SMEs Recovery (0.895, p = 0.000), meaning SMEs who are more aware of flood risks tend to exhibit greater recovery. Also, Government Support significantly mitigates Flood Impact (0.888, p = 0.000). Some pathways, such as Flood Risk Awareness → Flood Impact and SMEs Recovery → Flood Impact, are not statistically significant, meaning these relationships do not hold strong in this model.

AJEMATES
African Journal of Educational Management, Teaching and Entrepreneurship Studies
VOL.16 (1), September-December, 2025 https://ajemates.org

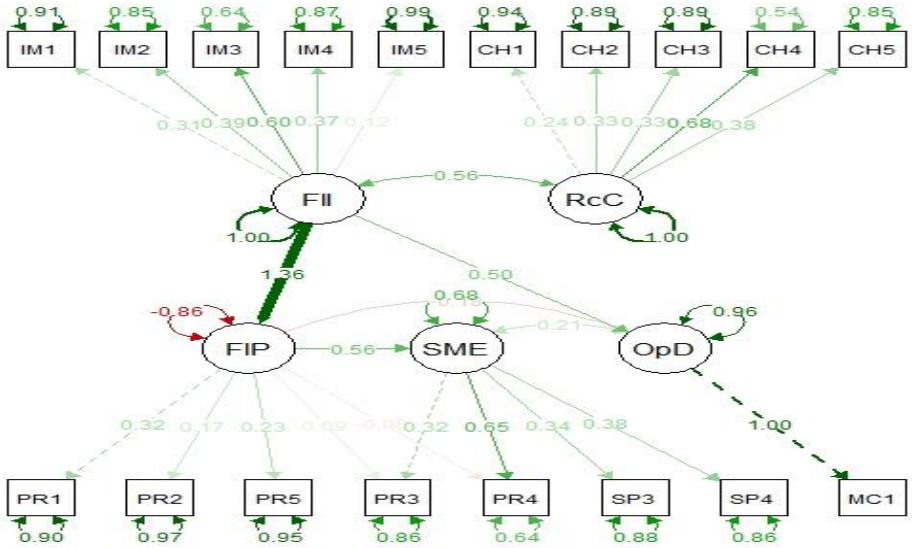


Figure 2: SEM plot

Figure 2 presents the SEM plot which visually illustrates the pathways and relationships between constructs, helping to interpret the direct and indirect effects present within the model. This diagram provides a comprehensive view of how factors interact to influence flood impact and recovery strategies.

Conclusion and Recommendations

Based on the structural equation modeling results, the study highlights the significant role of flood risk awareness and government support in shaping SMEs recovery and mitigating flood impact. The confirmatory factor analysis confirms strong reliability and validity across all constructs, ensuring robust measurement. Discriminant validity assessments further validate the distinctiveness of each construct.

The structural model results reveal that flood risk awareness has a strong positive effect on SMEs recovery which highlights the importance of education and preparedness in fostering adaptive capacity. Government support also plays a crucial role in reducing the negative impact of floods. To enhance flood recovery strategies and mitigate its impact, SMEs and policymakers should prioritize proactive measures such as increasing flood risk awareness through educational campaigns and early warning systems.

REFERENCES

Battisti, M., & Deakins, D. (2017). Business resilience: The role of adaptation strategies in small firms. *Journal of Business Research, 78*, 215-225.

Bhattacharya-Mis, N., & Lamond, J. (2024). Flood risk mitigation strategies for SMEs in urban settings. *International Journal of Disaster Risk Reduction, 82*, 103316.

Blundel, R. (2014). Resilience and sustainability in small business: A regional study of social enterprise networks. *Journal of Small Business and Enterprise Development, 21*(3), 492-510.

Coates, T., Faulkner, H., & Quinn, N. (2020). Computational modeling for SME resilience assessment. *International Journal of Environmental Science and Technology, 17*(4), 1123-1139.

Gabriel, R., Musa, P., & Ahmed, L. (2024). Flood vulnerability and mitigation strategies in Southern Mubi. *Urban Resilience Journal, 18*(3), 67-82.

Hewawasam, P., & Matsui, K. (2023). The impact of flooding on informal businesses: A resilience approach. *Journal of Disaster Risk Studies, 15*(1), 104-121.

Ingirige, B. (2018). Integrating structural and non-structural flood resilience strategies for SMEs. *International Journal of Environmental Studies, 75*(6), 987-1012.

Marjanac, L., Perovic, J., & Petrovski, D. (2021). Rapid urbanization and coastal flooding: Effects on small businesses. *Environmental Management Review, 27*(4), 311-329.

Marshall, M. I., & Schrank, H. L. (2014). The role of resilience in small business recovery from disaster. *Journal of Business Continuity and Emergency Planning, 8*(1), 84-98.

Olaniyi, O. A., & Adekanmbi, A. M. (2022). Impact of small and medium-scale enterprises on economic development in Nigeria. *Asian Journal of Economics, Business and Accounting, 22*(11), 24-34.

Pathak, L., & Ahmad, S. (2017). Self-dependency and resilience strategies in SME disaster recovery. *Journal of Business Disaster Management, 12*(3), 45-61.

Sadeghi, N. (2022). Continuity of small businesses facing increased flood risk due to global climate change impacts: A systematic literature review. *International Journal of Disaster Risk Reduction, 82*, 103316.

Umar, I. A., Bukar, W. M., Mustapha, A., Kyari, A., Bukar, M. A., Ibrahim, H. H., & Kachalla, U. (2025). Flood risk and resilience: Evidence from the 2024 flood in Maiduguri, Nigeria. *International Journal of Environment and Climate Change, 15*(1), 490-505.