

**ROLE OF RESILIENCE PLANNING ON PUBLIC INFRASTRUCTURE ATTACKS IN
OREDO LOCAL GOVERNMENT AREA OF EDO STATE, NIGERIA.**

Ughulu Stella EGHOIKHUNU¹ & Blessing Adaku CHIJOKE²

¹Department of Public Administration, Wellspring University, Benin City, Nigeria
Ughulu.eghoikhunu@wellspringuniversity.edu.ng

²Department of Public Administration, University of Benin, Benin City, Nigeria.
blessingchijiloke@gmail.com

ABSTRACT

This study examined resilience planning in public infrastructure attacks in Oredo Local Government Area of Edo State, Nigeria and was motivated by the increasing vulnerability of urban infrastructure to threats such as vandalism, flooding, security-related disruptions, and poor maintenance culture, which continue to affect service delivery and sustainable development in rapidly urbanizing local government areas. The study was guided by three research questions. The study was anchored on Resilience Theory. A descriptive survey research design was adopted for the study. The population was 553300, while a sample of 400 respondents was drawn using a Taro Yamane sampling technique. Data were collected using a structured questionnaire designed on a 4-point Likert scale. The data collected were analyzed using frequency counts, percentages, mean, and standard deviation. The findings revealed that infrastructure in Oredo Local Government Area is highly exposed to several threats. The study concluded that while infrastructure threats are significant in Oredo LGA, the current level of resilience planning is not strong enough to ensure effective infrastructure protection and sustainability. The study recommended increased funding for infrastructure resilience, enhanced emergency preparedness and greater community participation.

Keywords: Resilience planning, public infrastructure, increasing vulnerability, threats, community participation.

INTRODUCTION

Infrastructure systems constitute the foundation upon which modern societies function. Roads, bridges, water supply facilities, electricity networks, communication systems, healthcare facilities, and public buildings support economic activities, social interactions, governance, and public service delivery. The increasing dependence of communities on these critical infrastructures has made their protection and sustainability a major concern for governments across the world. In recent years, infrastructure systems have become increasingly vulnerable to various forms of attacks and disruptions, including vandalism, Terrorism, cyberattacks, sabotage, armed conflicts, natural disasters, and climate-induced hazards. These threats have exposed the fragility of public infrastructure and highlighted the necessity for resilience planning at all levels of government (UNDRR, 2016; Rinaldi et al., 2022).

Resilience planning refers to the systematic process of preparing for, responding to, recovering from, and adapting to disruptions while maintaining the continuous functioning of critical services and infrastructure. It emphasizes the ability of institutions, communities, and systems to withstand shocks and recover rapidly from adverse events. Contemporary governance frameworks increasingly recognize resilience planning as an essential component of sustainable development and disaster risk reduction. Rather than focusing solely on prevention, resilience planning seeks to enhance the adaptive capacities of institutions and communities to cope with both expected and unexpected threats (UNDRR, 2016).

Globally, governments have adopted resilience-oriented approaches to protect critical infrastructure. The growing complexity of urban systems and interdependence among infrastructure sectors have necessitated comprehensive strategies that integrate risk assessment, emergency preparedness, infrastructure hardening, community participation, and institutional coordination. Research indicates that resilient infrastructure systems contribute significantly to economic stability, public safety, and sustainable urban development (Rinaldi et al., 2022). In developing countries such as Nigeria, infrastructure vulnerabilities are particularly pronounced due to inadequate maintenance, rapid urbanization, weak institutional capacities, security challenges, and limited financial resources. Public infrastructure frequently experiences disruptions resulting from vandalism, flooding, criminal activities, civil unrest, and operational

failures. These disruptions often undermine local economic activities, reduce public confidence in government institutions, and impede developmental progress.

Local governments occupy a strategic position in resilience planning because they represent the tier of government closest to the people. Their proximity to communities enables them to identify local vulnerabilities, coordinate emergency responses, mobilize community resources, and implement localized resilience strategies. The constitutional responsibilities of local governments in Nigeria include the provision and maintenance of certain public infrastructure and services, making them critical actors in safeguarding infrastructure assets against attacks and disruptions (Ikponmwon, 2025).

Oredo Local Government Area of Edo State presents a relevant context for examining resilience planning for infrastructure attacks. As the administrative headquarters of Edo State and one of the most urbanized local government areas in the state, Oredo hosts significant governmental, commercial, transportation, communication, and social infrastructure facilities. The local government contains critical public institutions, major markets, transportation corridors, and administrative centers that support both state and local economic activities. Its urban nature and strategic importance make it vulnerable to various forms of infrastructure disruptions, including vandalism, urban security threats, flooding, and other hazards that may compromise service delivery and community wellbeing.

The increasing incidence of infrastructure-related disruptions across Nigerian cities has raised concerns regarding the preparedness of local governments to anticipate, prevent, and respond effectively to such threats. Consequently, understanding the resilience planning mechanisms adopted by Oredo Local Government Area is essential for strengthening infrastructure security, improving governance outcomes, and promoting sustainable development. This study therefore investigates resilience planning in local government for infrastructure attacks, with particular emphasis on Oredo Local Government Area of Edo State. The research answered the following questions: What are the major infrastructure threats and attacks affecting Oredo Local Government Area? What resilience planning measures have been adopted by Oredo Local Government Area for infrastructure protection? And what challenges hinder effective resilience planning in Oredo Local Government Area?

CONCEPTUAL LITERATURE AND THEORETICAL FRAMEWORK

Infrastructure Threats and Attacks

Infrastructure threats and attacks refer to events, actions, or conditions capable of disrupting, damaging, degrading, or destroying critical infrastructure systems that support social, economic, and governmental activities. Infrastructure threats may arise from natural, technological, environmental, or human-induced sources and can significantly affect the delivery of public services and the functioning of communities. Critical infrastructure includes roads, bridges, electricity facilities, water supply systems, drainage networks, communication systems, healthcare facilities, public buildings, and transportation networks. These infrastructures are indispensable to economic productivity, public safety, governance, and social development. Consequently, any threat to these systems has the potential to generate widespread consequences for communities and government institutions. According to the United Nations Office for Disaster Risk Reduction (UNDRR, 2023), infrastructure threats encompass both sudden and gradual events that compromise the availability, reliability, and functionality of essential services. Such threats may include vandalism, terrorism, cyberattacks, sabotage, flooding, fire outbreaks, civil unrest, environmental degradation, and technological failures. Infrastructure threats are commonly classified into the following categories: Physical Attacks: Physical attacks involve deliberate actions aimed at damaging or destroying infrastructure facilities. Examples include vandalism, arson, sabotage, bomb attacks, and theft of infrastructure components.

- a) **Environmental Threats**” Environmental threats arise from natural or ecological factors such as flooding, erosion, storms, and climate change impacts that can damage critical infrastructure.
- b) **Technological Threats:** Technological threats involve failures in equipment, communication systems, power supply networks, and digital infrastructure that affect service continuity.
- c) **Security Threats:** Security threats include criminal activities, terrorism, insurgency, communal conflicts, and civil disturbances that directly or indirectly affect infrastructure systems.

Resilience Planning Measures

Resilience planning measures refer to organized strategies, policies, procedures, and actions designed to prepare infrastructure systems and institutions to anticipate, withstand, respond to, recover from, and adapt to disruptive events. Resilience planning represents a proactive governance approach that focuses on minimizing vulnerabilities while enhancing the capacity to cope with adverse events. The concept of resilience originated from ecological studies but has evolved into a multidisciplinary framework widely applied in disaster management, public administration, urban planning, and infrastructure management. According to the World Bank (2021), resilient infrastructure is infrastructure that can continue providing essential services during and after disruptive events while recovering rapidly with minimal losses. Resilience planning differs from traditional risk management because it recognizes that not all threats can be prevented. Instead, it emphasizes adaptability, preparedness, flexibility, and recovery capability. In local government administration, resilience planning involves integrating risk considerations into infrastructure development, maintenance, emergency preparedness, and service delivery systems. It seeks to ensure that infrastructure remains functional under adverse conditions.

OREDO LOCAL GOVERNMENT AREA OF EDO STATE

Oredo Local Government Area is one of the eighteen local government areas that constitute Edo State. The local government occupies a strategic position in the political, administrative, and economic structure of the state because it contains the metropolitan core of Benin City, the state capital. As the administrative headquarters of Edo State, Oredo hosts major government institutions, commercial establishments, educational facilities, healthcare centers, transportation networks, and cultural landmarks that contribute significantly to the socio-economic development of the state (National Population Commission [NPC], 2010; Edo State Government, 2024). The local government serves as a major urban center in southern Nigeria and functions as a hub for commerce, governance, education, and public service delivery. Its urban characteristics have attracted substantial population growth and infrastructural development over the years, making it one of the most important local government areas in Edo State (World Bank, 2021).

The history of Oredo Local Government Area is inseparable from the history of Benin City and the ancient Benin Kingdom. Historical records indicate that Benin City emerged as the political and cultural center of one of Africa's most sophisticated pre-colonial states, renowned for its centralized governance structure, artistic achievements, and extensive trade networks (Osadolor, 2016). The Benin Kingdom developed strong administrative institutions under the authority of the Oba of Benin and maintained diplomatic and commercial relations with European traders from the fifteenth century onward. Following colonial administration and subsequent constitutional reforms in Nigeria, Benin City evolved into a modern urban center and later became the capital of Edo State upon the creation of the state in 1991 (Aisien, 2018). The establishment of Oredo Local Government Area was intended to strengthen grassroots governance and improve administrative efficiency within the rapidly expanding urban environment of Benin City (Aiyede, 2015).

Oredo Local Government Area is located within the tropical rainforest zone of southern Nigeria. It lies approximately between latitude 6°20'N and 6°35'N and longitude 5°34'E and 5°44'E. The local government is bordered by neighboring local government areas such as Egor Local Government Area, Ikpoba-Okha Local Government Area and Ujunmwonde Local Government Area (Edo State Statistical Yearbook, 2023). The area experiences a humid tropical climate characterized by relatively high temperatures and significant annual rainfall. Average annual rainfall ranges between 1,500 mm and 2,000 mm, with a wet season extending from March to October and a dry season from November to February (Nigerian Meteorological Agency, 2023).

Empirical Review

Muhammad, Bala Ismail, Olanipekun, Oluwatobiloba Isaac, Nabage and Bala (2024) investigated the implications of flood risk on critical infrastructure resilience in Nigeria. The study employed a descriptive survey design using structured questionnaires administered to residents in flood-prone communities. Descriptive statistics were used to analyse the data collected. The study found that flooding remains one of the most destructive hazards affecting roads, bridges, electricity facilities, water supply systems, and residential infrastructure across Nigeria. It further established that inadequate maintenance, weak institutional preparedness, poor drainage systems, and insufficient government investment significantly increase infrastructure vulnerability. The authors

concluded that resilience planning should integrate flood risk assessment, infrastructure monitoring, and proactive maintenance strategies to reduce infrastructure losses.

Otuoze, Suleiman Hassan, Hunt and Jefferson (2021) examined transport system resilience in Lagos and Kano using artificial neural network modelling to analyse traffic vulnerability and infrastructure resilience. The study relied on transport system data and simulation modelling to predict infrastructure performance under different disruption scenarios. The findings revealed that transportation systems become increasingly vulnerable where maintenance is inadequate and where urban growth exceeds infrastructure capacity. The study also found that resilient transport systems require continuous monitoring, predictive maintenance, and adaptive planning strategies capable of responding to changing urban conditions.

Beitelmal, Wesam H., Nwokolo, Meyer and Ahia (2024) explored adaptation strategies for mitigating climate threats to transportation infrastructure in Lagos, Nigeria. Using a qualitative review of climate adaptation measures, the authors assessed approaches for improving transport infrastructure resilience. The study concluded that climate change significantly threatens transportation infrastructure through flooding, erosion, and extreme weather events. It recommended integrating climate adaptation into infrastructure planning, strengthening drainage systems, improving maintenance culture, and adopting innovative engineering solutions.

Enaifoghe, Durokifa, and Richard (2023) examined impediments affecting monitoring and evaluation of local government projects in Nigeria using qualitative research methods. The study found that inadequate funding, weak institutional structures, political interference, shortage of skilled personnel, and poor monitoring mechanisms significantly reduce the effectiveness of local government projects. The researchers argued that institutional reforms, accountability mechanisms, and improved project monitoring are essential for sustainable infrastructure development. This study provides empirical support for the present study by highlighting the institutional weaknesses affecting local government performance. However, it focused on project monitoring generally rather than resilience planning for infrastructure attacks.

Oluwole Ojewale (2024) investigated factors influencing community resilience to violent conflict in Benue and Plateau States using a mixed-methods research design. Primary data were collected through household surveys and analysed alongside qualitative evidence. The findings

showed that effective leadership, social capital, institutional trust, community participation, and coordinated governance significantly improve resilience to security threats. Communities with stronger institutional support demonstrated greater capacity to recover from conflict-related disruptions. Although the study examined community resilience rather than infrastructure resilience, its findings underscore the importance of institutional capacity and stakeholder collaboration in responding to disruptive events. These insights are applicable to resilience planning for public infrastructure in Oredo Local Government Area.

Ashiru, Nakpodia and You (2023) investigated the role of emerging digital communication technologies in enhancing organisational resilience among Nigerian small and medium-sized enterprises. Using quantitative survey methods and structural equation modelling, the study found that organisations adopting digital technologies demonstrated greater adaptability and resilience during disruptions such as the COVID-19 pandemic. Although conducted in the private sector, the study demonstrates that technological innovation strengthens institutional resilience by improving communication, coordination, and decision-making. These findings suggest that local governments can enhance infrastructure resilience through digital monitoring systems, geographic information systems, and real-time infrastructure surveillance.

Amama, Arokoyu and Obafemi (2023) assessed the relationship between social vulnerability and resilience to flooding in the Niger Delta using household survey data from flood-prone communities. The study established that communities with stronger institutional support, improved infrastructure, and better disaster preparedness experienced lower vulnerability and recovered more quickly after flood events. It recommended improved disaster preparedness, community engagement, and infrastructure investment as essential components of resilience planning. This study reinforces the argument that resilience planning should combine institutional capacity with community participation. However, unlike the present study, it concentrated on household resilience rather than local government infrastructure resilience.

Gencer (2016) examined local government capacities for disaster risk reduction across several countries and found that local authorities with stronger institutional frameworks demonstrated greater resilience during emergencies. Rinaldi et al. (2022) conducted a systematic review of infrastructure resilience studies and concluded that effective resilience planning requires

integration of risk assessment, stakeholder collaboration, adaptive governance, and technological innovation. Adelekan et al. (2015) investigated urban vulnerability and climate resilience in African cities and found that inadequate infrastructure planning significantly increased exposure to environmental hazards. World Bank (2021) reported that resilient infrastructure investments generate long-term economic benefits by reducing recovery costs and minimizing service disruptions. Yigit et al. (2024) found that emerging technological threats require governments to expand resilience planning beyond physical infrastructure protection to include digital infrastructure security.

Theoretical Framework

This study on is anchored on **Resilience Theory**, which emerged from ecological studies introduced by **Holling (1973)**, who described resilience as the ability of a system to absorb disturbances and still maintain its basic structure and function. Over time, the theory evolved beyond ecology and became widely applied in disaster management, urban planning, public administration, and infrastructure governance. Modern resilience scholarship emphasizes not only resistance to shocks but also **adaptation, learning, and transformation** of systems in response to disruptions (Walker & Salt, 2012; Folke, 2016). In governance studies, resilience has become a key framework for understanding how institutions manage uncertainty, risks, and complex urban challenges. Resilience Theory is based on the following assumptions:

1. Systems (including local governments and infrastructure networks) are constantly exposed to internal and external shocks.
2. Disruptions cannot always be fully prevented, but their impact can be minimized.
3. Systems can absorb shocks and still maintain essential functions.
4. Learning from past disruptions improves future responses.
5. Adaptability and flexibility are more effective than rigid control mechanisms.

These assumptions align directly with the realities of infrastructure management in urban local government settings such as Oredo. In the context of this study, Oredo Local Government Area is treated as a **resilience system** composed of interconnected infrastructure, institutions, and communities. Thus, the theory explains how Oredo LGA can either fail under pressure (low

resilience), or adapt and recover effectively (high resilience). The stronger the resilience planning mechanisms, the more stable the infrastructure system becomes.

Methodologically, this study adopted the descriptive survey research design. The total population is the total population of residents in Oredo LGA of Edo State, which is 553,300 (2022 population projection) (City Population, 2022). The sample size of the study is 400, which is calculation of Taro Yamane sample calculation from the population of 553,300. Multistage sampling technique was used for this study. Firstly, purposive sampling technique was adopted to use Taro Yamane sample calculation to get the sample size, and secondly, random sampling technique was used to distribute the research instrument (questionnaire).

The instrument used for data collection was a structured questionnaire. The questionnaire was divided into two sections: Section A: Demographic characteristics of respondents; Section B: Items relating to Resilience planning and public infrastructure attacks in Oredo Local Government Area of Edo State. The questionnaire consisted of twelve (12) items developed from the research questions. Responses were measured using a four-point Likert scale as follows: Strongly Agree (SA) = 4; Agree (A) = 3; Disagree (D) = 2; Strongly Disagree (SD) = 1. The study employed the direct administration approach in distributing the questionnaire to the respondents. Copies of the questionnaire were personally administered to the academic staff members with the assistance of research assistants. The direct administration method ensured a high rate of questionnaire retrieval and provided respondents with the opportunity to seek clarification where necessary.

Independent Variables: Infrastructure Threats and Attacks, Institutional Capacity, Resilience Planning Measures, Environmental/Urban Pressures (supporting factor)

Dependent Variable: Infrastructure Resilience in Oredo Local Government Area.

The data collected for the study were analyzed using descriptive statistics. Specifically, frequency counts, percentages, mean scores and standard deviations were employed to answer the research questions. The criterion mean of 2.50 was adopted as the benchmark for decision-making. Therefore:

- Mean scores of 2.50 and above were regarded as Agreed.
- Mean scores below 2.50 were regarded as Disagreed.

The Statistical Package for Social Sciences (SPSS) version 21 was utilized for the computation and presentation of the data.

DATA PRESENTATION

The presentation of data and analysis are examined in this section. As indicated in the study methodology, 400 respondents were sampled and same number of questionnaires distributed to the targeted respondents of the study. In the retrieval process, the study observed that, out of the all four hundred (400) copies distributed, 304 copies were correctly completed and returned, representing a return rate of 76%.

ANALYSIS OF RESEARCH QUESTIONS

Research Question One: What are the major infrastructure threats and attacks affecting Oredo Local Government Area?

Table 1: Responses to Research question one

S/N	Item	SA (Freq %)	A (Freq %)	D (Freq %)	SD (Freq %)	Mean	SD
1	Infrastructure vandalism and theft are frequent in Oredo LGA	122 (40.1%)	110 (36.2%)	48 (15.8%)	24 (7.9%)	3.09	0.88
2	Flooding and poor drainage damage public infrastructure	135 (44.4%)	108 (35.5%)	40 (13.2%)	21 (6.9%)	3.17	0.84
3	Security-related incidents affect infrastructure stability	118 (38.8%)	112 (36.8%)	50 (16.4%)	24 (7.9%)	3.07	0.88

Source: Field Survey, 2026.

The results in Table 1 show that respondents generally agreed that infrastructure threats and attacks are prevalent in Oredo Local Government Area. For the first item, which examined vandalism and theft of infrastructure, a combined **76.3% (SA + A)** of respondents agreed that such incidents are frequent. The mean score of **3.09** further confirms a high level of agreement, indicating that vandalism is a significant infrastructural challenge in the area. Similarly, flooding

and poor drainage systems recorded a high agreement level of **79.9%**, with a mean score of **3.17**, which is the highest among the three items. This suggests that environmental factors, particularly flooding, are a major cause of infrastructure damage in Oredo LGA. The relatively low standard deviation indicates that respondents had similar opinions, strengthening the reliability of this finding. The third item on security-related incidents affecting infrastructure stability also showed strong agreement (**75.6%**) with a mean score of **3.07**. This indicates that security challenges, including criminal activities and disturbances, contribute significantly to infrastructure disruptions. The overall mean range (3.07–3.17) indicates that respondents strongly agree that infrastructure in Oredo LGA is exposed to multiple threats, especially environmental and human-induced risks.

Research Question Two: What resilience planning measures have been adopted by Oredo Local Government Area for infrastructure protection?

Table 2: Responses to Research question Two

S/N	Item	SA (Freq)	A (Freq)	D (Freq)	SD (Freq)	Mean	SD
4	The local government conducts regular infrastructure risk assessments	90 (29.6%)	120 (39.5%)	60 (19.7%)	34 (11.2%)	2.88	0.93
5	Emergency preparedness plans exist for infrastructure failures	85 (28.0%)	118 (38.8%)	70 (23.0%)	31 (10.2%)	2.85	0.92
6	There are structured maintenance programs for public infrastructure	95 (31.3%)	125 (41.1%)	52 (17.1%)	32 (10.5%)	2.93	0.91

Source: Field Survey, 2026.

Table 2 results examined the extent of resilience planning measures adopted by the local government. The first item on risk assessment practices recorded a moderate agreement level of

69.1% (SA + A) with a mean score of **2.88**, indicating that while risk assessments exist, they may not be consistently implemented or comprehensive. The second item on emergency preparedness plans showed a similar pattern with **66.8% agreement** and a mean score of **2.85**, suggesting that preparedness systems exist but are not fully developed or regularly tested. The third item on infrastructure maintenance programs recorded **72.4% agreement** with a mean score of **2.93**, slightly higher than the others. This indicates that maintenance practices are relatively more established compared to other resilience measures, although still not optimal. The combined mean scores (2.85–2.93) indicate a **moderate level of resilience planning** in Oredo LGA.

Research Question Three: What challenges hinder effective resilience planning in Oredo Local Government Area?

Table 3: Responses to Research question Four

S/N	Item	SA (Freq %)	A (Freq %)	D (Freq %)	SD (Freq %)	Mean	SD
7	Inadequate funding limits infrastructure protection	140 (46.1%)	110 (36.2%)	35 (11.5%)	19 (6.3%)	3.22	0.82
8	Lack of technical expertise affects resilience planning	125 (41.1%)	115 (37.8%)	40 (13.2%)	24 (7.9%)	3.12	0.87
9	Poor maintenance culture contributes to infrastructure failure	130 (42.8%)	112 (36.8%)	38 (12.5%)	24 (7.9%)	3.15	0.86

Source: Field Survey, 2026.

Table 3 examined the key challenges affecting resilience planning in Oredo LGA. The first item on inadequate funding recorded a very high agreement level of **82.3%**, with a mean score of **3.22**, indicating that funding is the most severe constraint affecting infrastructure resilience. The second item on lack of technical expertise also recorded strong agreement of **78.9%**, with a mean score of **3.12**, showing that technical capacity gaps significantly hinder resilience planning. The third item on poor maintenance culture recorded **79.6% agreement**, with a mean score of **3.15**, suggesting that neglect of infrastructure maintenance is a major contributor to infrastructure

failure. The overall mean scores (3.12–3.22) indicate a **high level of agreement** among respondents that multiple structural and institutional challenges hinder resilience planning in Oredo LGA.

DISCUSSION OF FINDINGS

Infrastructure Threats and Attacks in Oredo LGA

The study found that infrastructure in Oredo Local Government Area is exposed to multiple threats, particularly flooding, vandalism, and security-related disruptions. Respondents strongly agreed that flooding and poor drainage systems frequently damage roads and public facilities. This finding aligns with the Resilience Theory, which argues that urban systems are constantly exposed to disturbances and shocks that can disrupt their functionality (Holling, 1973). Oredo LGA, being a highly urbanized area, reflects this condition where environmental and human-induced shocks continuously affect infrastructure systems. Similarly, the finding supports World Bank (2021), which emphasizes that urban infrastructure in developing countries is highly vulnerable to climate-related hazards such as flooding and poor drainage. It also aligns with UNDRR (2023), which identifies flooding and vandalism as major drivers of infrastructure disruption in rapidly urbanizing environments. Thus, the presence of persistent infrastructure threats in Oredo LGA confirms the resilience theory assumption that disturbances are inevitable in complex urban systems.

Resilience Planning Measures in Oredo LGA

The findings revealed that resilience planning measures such as risk assessment, emergency preparedness, and infrastructure maintenance exist in Oredo LGA but are only moderately implemented. This suggests that while the local government has some institutional mechanisms in place, they are not strong enough to fully mitigate infrastructure risks. From the perspective of Resilience Theory, this indicates a moderate adaptive capacity, where the system has the ability to respond but not optimally absorb or recover from shocks (Walker & Salt, 2012). The finding is consistent with OECD (2021), which argues that many local governments in developing countries adopt resilience strategies in policy form but struggle with effective implementation due to resource and capacity constraints.

It also supports Rinaldi et al. (2022), who emphasize that infrastructure resilience depends not only on planning but also on the integration of risk assessment, maintenance systems, and institutional coordination. Therefore, the study shows that resilience planning in Oredo LGA is still developing and not fully institutionalized.

Challenges to Resilience Planning in Oredo LGA

The study revealed that major challenges affecting resilience planning include inadequate funding, lack of technical expertise, and poor maintenance culture. Among these, funding emerged as the most severe constraint. This finding aligns strongly with UNDRR (2023), which identifies financial constraints and weak maintenance systems as key barriers to infrastructure resilience in urban areas. It also supports World Bank (2021), which argues that underinvestment in maintenance leads to infrastructure deterioration and increased vulnerability to shocks. Within the framework of Resilience Theory, these challenges indicate low adaptive capacity, meaning the system struggles to adjust effectively to disturbances. Thus, the persistence of these challenges explains why infrastructure in Oredo LGA remains vulnerable despite the existence of some resilience planning efforts. The findings strongly validate resilience theory by confirming that Oredo LGA operates in a constantly changing environment where infrastructure systems are exposed to repeated shocks such as flooding, vandalism, and security threats. However, the limited strength of resilience planning and institutional capacity shows that the system has not fully achieved adaptive resilience.

The findings are consistent with World Bank (2021) emphasizes that infrastructure resilience in urban areas depends heavily on maintenance investment and institutional capacity; OECD (2021) highlights that resilience planning requires strong governance structures and sustained funding; Rinaldi et al. (2022) argue that infrastructure systems are interdependent, meaning that failure in one area affects others and UNDRR (2023) notes that flooding, urbanization, and weak governance are major drivers of infrastructure vulnerability in developing countries. The present study therefore reinforces existing literature while providing localized evidence from Oredo LGA.

CONCLUSION

From the findings, Oredo Local Government Area experiences a wide range of infrastructure threats, particularly flooding, vandalism, poor drainage conditions, and security-related disruptions. These threats are consistent with the realities of rapidly urbanizing cities where infrastructure systems are constantly exposed to both environmental and human-induced shocks. The study further revealed that although some resilience planning measures exist in Oredo LGA such as infrastructure maintenance, risk assessment activities, and emergency preparedness mechanisms, these measures are only moderately implemented and are not sufficiently robust to effectively mitigate the scale of infrastructure vulnerabilities in the area. This indicates that resilience planning is still developing and has not been fully institutionalized within the local government system.

Furthermore, the study established that several challenges hinder effective resilience planning in the area. These include inadequate funding, lack of technical manpower, and poor maintenance culture. These constraints significantly reduce the efficiency and sustainability of infrastructure systems and increase their vulnerability to frequent disruptions.

The study concludes that while Oredo Local Government Area is highly exposed to infrastructure threats due to its urban nature and population density, its current level of resilience planning is not strong enough to ensure full infrastructure protection and sustainability. The gap between existing resilience efforts and actual infrastructure needs highlights the urgent need for improved governance structures, increased funding, enhanced technical capacity, and stronger maintenance systems.

RECOMMENDATIONS

1. The local government should increase budgetary allocation specifically targeted at infrastructure maintenance, protection, and resilience planning. Dedicated funds should be created for emergency response and infrastructure rehabilitation. In addition, partnerships with state government agencies, private sector actors, and development partners should be explored to supplement limited local government funding. This will ensure timely response to infrastructure failures and reduce long-term repair costs.

2. There is a need for continuous capacity building of local government staff involved in infrastructure management. Training programs should be organized for engineers, planners, emergency response teams, and environmental officers on modern resilience strategies and disaster risk reduction techniques. Recruitment of qualified professionals and collaboration with technical institutions will also improve the quality of infrastructure planning and implementation.
3. The local government should adopt a proactive maintenance strategy rather than a reactive approach. Regular inspection, monitoring, and maintenance of roads, drainage systems, electricity infrastructure, and public facilities should be institutionalized. Preventive maintenance will reduce the frequency of infrastructure breakdown and minimize the cost of repairs.
4. Community members should be actively involved in infrastructure protection through awareness campaigns and participatory governance. Residents should be sensitized on the importance of protecting public infrastructure and reporting vandalism or damage. Community-based surveillance systems can also help reduce cases of infrastructure abuse.

REFERENCES

- Adelekan, I. O., Johnson, C., Manda, M., Matyas, D., Mberu, B., Parnell, S., Satterthwaite, D., & Vivekananda, J. (2015). Disaster risk and its reduction: An agenda for urban Africa. *International Development Planning Review*, 37(1), 33–43.
- Aisien, E. T. (2018). Urban development and governance in Benin City, Nigeria. *African Journal of Public Administration*, 10(2), 45–61.
- Aiyede, E. R. (2015). Local government and governance reforms in Nigeria. *Journal of African Governance and Development*, 4(1), 23–39.
- Amama, S. A., Arokoyu, S. B., & Obafemi, A. A. (2023). Spatial assessment of the relationship between social vulnerability and resilience to flooding in the Core Niger Delta, Nigeria. *International Journal of Research and Innovation in Social Science*, 7(1), 589–600.
- Ashiru, F., Nakpodia, F., & You, J. J. (2023). Adapting emerging digital communication technologies for resilience: Evidence from Nigerian SMEs. *Annals of Operations Research*, 327, 795–823.

- Beitelmal, W. H., Nwokolo, S. C., Meyer, E. L., & Ahia, C. C. (2024). Exploring adaptation strategies to mitigate climate threats to transportation infrastructure in Nigeria: Lagos City as a case study. *Climate*, 12(8), 117.
- City Population, 2022. Oredo Local Government Area in Nigeria. https://citypopulation.de/en/nigeria/admin/edo/NGA012012__oredo/
- Edo State Government. (2024). *Edo State statistical and development report*. Benin City: Ministry of Budget and Economic Planning.
- Enaifoghe, A., Durokifa, A., Jili, N. N., & Richard, M. M. (2023). Examining the impediments affecting operative monitoring and evaluation of local government projects in Nigeria. *African Renaissance*, 20(4), 369–389.
- Folke, C. (2016). Resilience (Republished). *Ecology and Society*, 21(4), 44.
- Gencer, E. A. (2016). *Local government powers for disaster risk reduction: A study on local-level authority and capacity for resilience*. United Nations Office for Disaster Risk Reduction
- Holling, C. S. (1973). Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics*, 4, 1–23.
- Ikponmwon, E. O. (2025). *Role of local government in Nigeria national development: A case study of Oredo Local Government Area of Edo State*. Department of Public Administration, University of Benin.
- Muhammad, B. I., Olanipekun, O. I., Nabage, Y. A., & Bala, J. (2024). Flood risk assessment and its implications on critical infrastructure resilience in Nigeria. *African Journal of Environmental Sciences and Renewable Energy*, 17(1), 69–85.
- Nigerian Meteorological Agency. (2023). *Annual climate review and rainfall outlook*. Abuja: NiMet.
- OECD. (2021). *Building resilient infrastructure for sustainable development*. Paris: OECD Publishing.
- Ojewale, O. (2024). Correlates of community resilience to violent conflict in north central Nigeria: Evidence from Benue and Plateau States. *Journal of Social, Political and Community Agendas in the Arts, Humanities and Heritage*, 5(1), 1–18.
- Organisation for Economic Co-operation and Development (OECD). (2021). *Building resilient infrastructure for sustainable development*. Paris: OECD Publishing.

- Osadolor, O. B. (2016). The military system of Benin Kingdom and its role in state formation. *Journal of Black Studies*, 47(4), 355–372.
- Otuoze, S. H., Hunt, D. V. L., & Jefferson, I. (2021). Neural network approach to modelling transport system resilience for major cities: Case studies of Lagos and Kano (Nigeria). *Sustainability*, 13(3), 1371.
- Rinaldi, S., Cavallini, S., Claps, M., & Pezzoli, A. (2022). Improving the resilience of critical infrastructures: Evidence-based insights from a systematic literature review. *International Journal of Disaster Risk Reduction*, 78, 103123. <https://doi.org/10.1016/j.ijdrr.2022.103123>
- Rinaldi, S., Peerenboom, J., & Kelly, T. (2022). Identifying, understanding, and analyzing critical infrastructure interdependencies. *IEEE Control Systems Magazine*, 22(6), 11–25.
- UNDRR. (2023). *Global assessment report on disaster risk reduction*. United Nations Office for Disaster Risk Reduction.
- United Nations Office for Disaster Risk Reduction (UNDRR). (2023). *Global assessment report on disaster risk reduction 2023*. Geneva: UNDRR.
- United Nations Office for Disaster Risk Reduction. (2015). *Sendai framework for disaster risk reduction 2015–2030*. UNDRR.
- United Nations. (2023). *Global assessment report on disaster risk reduction 2023*. United Nations Office for Disaster Risk Reduction.
- Walker, B., & Salt, D. (2012). *Resilience thinking: Sustaining ecosystems and people in a changing world*. Island Press.
- World Bank. (2021). *Lifelines: The resilient infrastructure opportunity*. Washington, DC: World Bank.
- Yigit, Y., Ferrag, M. A., Sarker, I. H., Maglaras, L., Chrysoulas, C., Moradpoor, N., & Janicke, H. (2024). Critical infrastructure protection: Generative AI, challenges, and opportunities. *Computer Science Review*, 53, 100673.