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EVALUATION OF THE EFFECTS OF ANNUAL FLOODING ON RESIDENTS OF KOTON KARFE, KOGI STATE

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Abstract

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Flooding is a global environmental phenomenon. In Nigeria, its impact is greatly felt during its occurrence. Therefore, the study looked at the effects of annual flooding on residents of Koton Karfe, Kogi State. The objectives of the study include the socio-economic effects of flooding, the health implications, and the resilience strategies employed by residents of Koton-Karfe, Kogi State. A total of three hundred and seventy-five (375) questionnaires were administered to the respondents out of which 367 (97.9%) were completed and returned. The methodology that was adopted for this study was descriptive research method and simple random techniques. Finding of the study shows that (50%) respondents reported that their income was moderately reduced after flooding. Also, majority of the respondents (83%) agreed that flooding heightened exposure to waterborne diseases such as cholera and diarrhea and increased mosquito breeding, which worsened malaria incidence. Furthermore, majority of respondents (69%) reported taking precautionary actions before floods, such as raising household property or storing essential supplies. The study recommends strengthening flood management infrastructure, community based adaptation strategies, enhanced health services and emergency preparedness, strengthening policy and institutional framework among others in order to mitigate against impact of flooding to the residents of Koton-Karfe, Kogi State, Nigeria.

Keywords: *Environmental Phenomena, Flooding, Residents, Resilience, Socio-Economic.*

Introduction

Urban centers are prone to environmental challenges such as flooding. Urban flooding could be pluvial, fluvial and coastal. Pluvial flooding is caused by heavy rainfall, fluvial by nearby river overflowing its bank and coastal caused by storm surges. Flooding is one of the global phenomena that is destructive and pervasive, affecting millions of people yearly. According to World Meteorological Organization [WMO], (2021), flooding accounts for nearly 40% of all natural disasters and has great implication for human lives, property, and economic stability.

In Nigeria, flooding has become a yearly occurrence leaving behind different socio-economic impacts. Federal Ministry of Environment, (2021) asserted that the country's geographical features, vast river systems like the Niger and Benue, with a seasonal monsoon climate, make it highly susceptible to both riverine and flash floods. Several factors such as rapid urbanization, poor drainage systems, and deforestation increases the risk, while intense rainfall events increases flood disasters each year (United Nations Office for the Coordination of Humanitarian Affairs [OCHA], 2022).

In recent years, Koton Karfe, a small size urban center (SSUC) in Kogi State is one of the most severely impacted communities. Situated along the River Niger, the area has experienced rising flood frequency and severity. These floods, caused by seasonal rainfall and river overflow, have

devastating consequences, such as displacement of residents, destruction of crops, property loss, and increased exposure to waterborne diseases (Kogi State Ministry of Environment, 2021). The socio-economic impact is great, as many residents lose their main sources of income, especially those relying on agriculture, which remains highly vulnerable to flood damage (Adeyemo et al., 2021).

The consistent annual flooding in Koton Karfe, Kogi State, has become a serious threat to residents, leading to widespread socio-economic disruption and serious risks to health, property, and livelihoods. These floods not only displace families and destroy homes but also destroy agricultural lands, the major source of income for residents (Adeyemo *et al.*, 2021). More so, the health consequences of flooding, including outbreaks of waterborne diseases such as cholera and malaria, remain poorly documented in the area. This knowledge gap hinders the ability to address the public health risks associated with floodwaters effectively. The convergence of socio-economic losses, public health threats, and fragile infrastructure underscores the urgent need for a comprehensive assessment of flood impacts in Koton Karfe, alongside an evaluation of residents' resilience and adaptive capacities (Federal Ministry of Environment, 2021). This study therefore seeks to fill this gap by evaluating the effects of annual flooding on the socio-economic conditions, health, and resilience strategies of residents in Koton Karfe, Kogi State.

Several empirical studies on flooding have been done over the years. Week, & Wizer (2020). Studied the effects of flood on food security, livelihood and socio-economic characteristics in flood-prone areas of the core Niger Delta, Nigeria. Major findings of the study indicate 75.3% agreed that basic food became scarce after floods, 69.9% reported that flood washed away farmlands, hindering crop growth and 60.9% agreed that flooding caused loss of income and difficulty caring for children. Adeleke, Fadairo, Mayowa, & Oyewole, (2024), investigated coping strategies used by flood victims in rural households of Benue State. Major finding shows high overall use of coping strategies (75%) and a significant relationship between superstitious beliefs and coping behavior. Berezi and Nwankwoala (2022), assessed 1,265 community responses in Bayelsa State using stratified random sampling. The study identified key strategies for flood resilience to be sandbag dyke construction, channel/drainage clearing, blocked drain maintenance, land reclamation, raising building floors and relocating valuables. Onoja et al. (2023), studied a catastrophic flood in Nigeria: Impact on health facilities and population health. The study used mixed methods. Findings of the study shows residents perceived a sharp rise in waterborne illnesses and reported reduced access to functioning clinics; households reported increased out-of-pocket spending and delays in treatment because of facility damage and transport problems. Okpala, Ejide, and Okonkwo (2025) studied schools in Anambra State and revealed that floods damaged classrooms and learning materials, reduced student attendance, and negatively impacted academic performance. Adelekan, Ajibade & Taiwo (2022), surveyed urban households in Lagos and showed that frequent flooding influenced migration intentions, with some residents planning to relocate permanently due to recurrent losses. Despite the various empirical studies mentioned above, none have worked on the evaluation of the effects of annual flooding on residents of Koton Karfe, Kogi State, Nigeria. This forms the premise of this study.

Study Area

Koton Karfe, is located approximately on latitude 8.0040° N and longitude 6.7922° E. Located along the western bank of the River Niger, Koton Karfe is in the north-central region of Nigeria, (Kogi State Ministry of Environment, 2021).

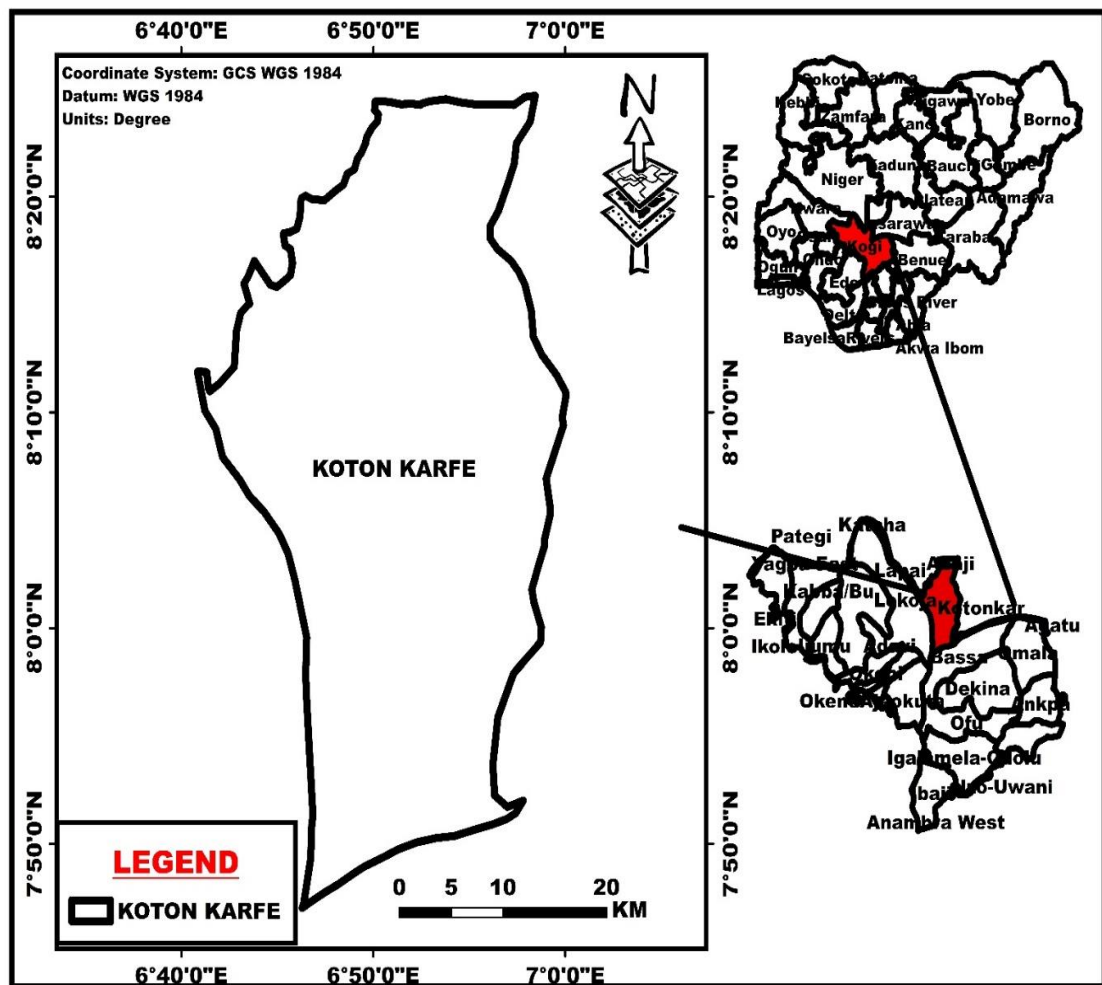


Fig 1: Koton Karfe
Source: PAAU Geography GIS Lab

The topography of Koton Karfe is predominantly flat, with gentle undulations that contribute to the easy spread of floodwaters across the area. Koton Karfe's tropical savanna climate, featuring distinct wet and dry seasons, exacerbates these issues. The wet season, lasting from April to October, brings substantial rainfall that leads to rapid rises in the water levels of nearby rivers. This seasonal pattern results in considerable impact on local agriculture, infrastructure, and public health, making Koton Karfe a crucial area for focused flood risk and resilience analysis (World Health Organization [WHO], 2020). The wet season in Koton-Karfe typically spans from April to October, peaking between July and September, with an annual rainfall range of 1,000 mm to 1,500 mm (NIMET, 2022). This period is marked by heavy and sometimes prolonged rainfall, which contributes to the recurring flood events in the area. Koton Karfe, situated within the Guinea Savanna ecological zone of Nigeria, exhibits a diverse soil and vegetation profile shaped by its geographic location and climatic conditions. These natural attributes significantly influence agricultural practices, land use patterns, and the community's overall resilience to environmental challenges, including flooding. Koton Karfe, lies within a geologically significant region marked by its complex geology and diverse relief features. These natural attributes have implications for the area's susceptibility to flooding, soil fertility, and land use patterns. The geology of Koton Karfe is dominated by the Basement Complex rocks of Precambrian age, interspersed with sedimentary formations along the floodplains of the Niger and Benue Rivers. The relief of Koton Karfe is characterized by a combination of upland and lowland terrains, creating a varied topography.

Methodology

The research design that was adopted for this study is the descriptive research method. The populations for this study are the residents of Koton- Karfe. The population as at 1991 was 7,369. Given 2.61% annual growth rate for 2024, the population was projected to 17,436. Based on the total population of the study area which is 17,436 as projected to 2024 and using Krejcie and Morgan table, a total of 375 questionnaires were distributed to respondents. In this research the simple random sampling technique was employed to distribute the questionnaire to residents around Palace axis, GSS axis, Odariko and Odaki. These areas were purposively selected because there are usually prone to the impacts of flooding in Koton-Karfe town. The instrument of data collection for the study was the questionnaire. It was designed in order to get specific information from residents in the study area. The study adopted the use of descriptive statistics such as frequency table to analyze the data. Likewise, the likert scale was adopted in discussing the result of findings.

Results and Findings

The data for the study was obtained and analyze based on the stated objectives.

Table 1: Percentage Distribution of Respondents by Demographic Characteristics.

Variable	Category	Frequency (N = 367)	Percentage (%)
Gender	Male	261	71.1
	Female	106	28.9
Age	< 18	23	6.3
	18–30	54	14.7
	31–40	107	29.2
	41–50	104	28.4
	Above 50	79	21.5
Occupation	Farming	97	26.4
	Trading	102	27.8
	Civil service	108	29.4
	Informal service	60	16.4
Educational Qualification	No formal education	43	11.7
	Primary	51	13.9
	Secondary	102	27.8
	Tertiary	97	26.4
	Vocational/Other	74	20.2

Source: Field Work (2025)

The demographic characteristics of respondents indicates that males constituted the majority at (71. %), while females accounted for (29. %). This gender imbalance reflects the predominance of men in economic activities and decision-making in rural and peri-urban communities of Nigeria, although women also contribute significantly to household income (Adekola & Lamond, 2021). In terms of age distribution, (29. %) of the respondents were between 31 and 40 years, (28. %) were between 41 and 50 years, and (22. %) were above 50 years. Those aged 18–30 represented (15. %), while only 6.3% were under 18. This suggest that majority of the respondents were within the middle and economically active age groups. This supports evidence that flood-affected communities are predominantly composed of middle-aged individuals who are actively engaged in livelihood activities (Okoli et al., 2025). Furthermore, the table shows the occupation of respondents. Civil servants made up the largest proportion at (29. %), followed by traders (28. %) and farmers (26. %). Informal service providers represented the smallest group at

16%. This finding disagrees with Nkwunonwo *et al.* (2020), who observed that agriculture and trading are the most vulnerable occupations to flood disruption in Nigeria. Demographic characteristics on education indicates that, (28. %) of respondents had secondary education, (26. %) had tertiary education, and (20. %) had vocational or other forms of training. In contrast, (14%) attained only primary education, while (12. %) had no formal education. This indicates a relatively literate population, which may influence their awareness and responses to flooding. This agrees with Olorunfemi and Akinbobola (2022) who argued that education enhances adaptive capacity in disaster-prone regions.

Table 2: Effect of Flooding on Socio-Economic Activities (N = 367)

Variable	Categories	Frequency (%)	Mean	SD
Household income after flooding	Not affected	54 (14.7)	2.66	0.91
	Slightly reduced	71 (19.3)		
	Moderately reduced	186 (50.7)		
	Highly reduced	56 (15.3)		
	Completely lost	0 (0.0)		
Impact of flooding on livelihood	No effect	74 (20.2)	2.41	0.89
	Minor disruption	97 (26.4)		
	Temporary loss of work/income	169 (46.0)		
	Long-term job/income loss	27 (7.4)		
Increased household expenditure	Strongly disagree	23 (6.4)	3.48	1.00
	Disagree	42 (11.4)		
	Neutral	56 (15.3)		
	Agree	216 (58.9)		
	Strongly agree	23 (6.4)		
Affects children's education	Not at all	13 (3.5)	2.86	0.71
	Slightly	81 (22.1)		
	Moderately	217 (59.1)		
	Severely	56 (15.3)		
Disrupts access to markets and businesses	Never	15 (4.1)	3.24	0.81
	Rarely	19 (5.2)		
	Sometimes	218 (59.4)		
	Often	92 (25.1)		
	Always	23 (6.3)		

Source: Field Work (2025)

The findings in Table 2 reveal that flooding significantly disrupted socio-economic activities in the study area. With regard to household income, more than half of the respondents (51. %) reported that their income was moderately reduced after flooding, while (19. %) indicated a slight reduction, and only (15. %) reported that their income was not affected. The mean score of 2.66 (SD = 0.91) suggests that, on average, most households experienced a moderate reduction in income. This aligns with evidence that flooding directly undermines income security, particularly among small-scale traders and farmers (Adelekan, 2021). Similarly, flooding had a noticeable impact on livelihoods, with nearly half (46. %) of respondents reporting a temporary loss of work or income, while (26. %) indicated minor disruptions. The mean score of 2.41 (SD = 0.89) further reflects a general trend toward temporary or minor livelihood disruptions. Also, household expenditures indicate significant proportion (59. %) of respondents agreed that flooding increased their expenses through costs such as repairs and relocation, while (15. %) remained neutral. The mean score of 3.48 (SD = 1.00) indicates that respondents largely

perceived flooding as increasing household expenditure. The majority of respondents also confirmed that flooding adversely affected children's education, with (59. %) indicating moderate impact and (15. %) reporting severe disruption. The mean score of 2.86 (SD = 0.71) suggests a moderate but significant effect on educational continuity. Also, access to markets and businesses was particularly affected. Likewise, the table shows that (59. %) reported that flooding sometimes disrupted their access, while (25. %) said it often did. The mean score of 3.24 (SD = 0.81) indicates that market access was moderately disrupted on a regular basis. Finally, the results suggest that flooding had widespread and multi-dimensional socio-economic impacts, particularly on income, household expenditures, children's education, and access to markets, with most of the effects being rated as moderate.

Table 3: Perceived Health Implications of Annual Flooding (N = 367)

Variable	Categories	Frequency (%)	Mean (M)	SD
Increases risk of waterborne diseases (cholera, diarrhea)	Neutral	59 (16.1%)	4.34	0.68
	Agree	184 (50.1%)		
	Strongly agree	124 (33.8%)		
Increases mosquito breeding and malaria cases	Disagree	12 (3.3%)	4.19	0.70
	Neutral	48 (13.1%)		
	Agree	192 (52.3%)		
Causes stress, anxiety, or sleeplessness	Strongly agree	115 (31.3%)	3.50	0.90
	Rarely	42 (11.4%)		
	Sometimes	194 (52.8%)		
	Often	75 (20.4%)		
Access to health facilities is disrupted	Always	56 (15.3%)	3.62	0.86
	Not at all	25 (6.8%)		
	Slightly	76 (20.7%)		
	Moderately	185 (50.4%)		
Increases household health expenditure	Severely	81 (22.1%)	3.33	0.72
	Slightly	75 (20.4%)		
	Moderately	198 (53.9%)		
	Severely	94 (25.6%)		

Source: Field Work (2025)

Table 3 highlights that flooding is perceived to have significant health implications. A majority of respondents agreed (50. %) or strongly agreed (34. %) that flooding increases the risk of waterborne diseases such as cholera and diarrhea. The average perception (M = 4.34, SD = 0.68) indicates a strong consensus that this is a major health concern. Similarly, most respondents believed that flooding increases mosquito breeding and malaria cases, with 84% either agreeing or strongly agreeing (M = 4.19, SD = 0.70). This aligns with empirical evidence showing that floodwaters create conducive breeding grounds for malaria vectors, thereby elevating malaria risks. On mental health impacts, over (53. %) respondents are experiencing stress or anxiety "sometimes," while 15.3% reported this "always" occurred. The mean of 3.50 (SD = 0.90) demonstrates a moderate but significant mental strain among flood-affected individuals. Access to health facilities was also severely impacted as 50.4 % indicated moderate disruption, and (22. %) noted severe limitations (M = 3.62, SD = 0.86). Flood events often damage infrastructure and overwhelm healthcare delivery systems, making access difficult. Finally, household health

expenditures rose noticeably, with (54. %) reporting moderate increases and (26. %) experiencing severe increases ($M = 3.33$, $SD = 0.72$). This reflects the increased out-of-pocket spending for illness and recovery costs following flooding. In Nigeria, catastrophic health expenditures remain common during disasters. This corroborates with the findings of Akinyemi and Babalola (2021), who highlighted the link between stagnant floodwaters and disease outbreaks in Nigeria. Psychosocial health effects were also noted, with (73. %) of respondents reporting stress, anxiety, or sleeplessness sometimes to always. This aligns with Okeke *et al.* (2024), who emphasized the mental health burden of recurrent flooding, often neglected in disaster response frameworks. Access to health facilities was reported as moderately or severely disrupted by (72. %) of respondents, which reflects infrastructure vulnerability to flooding, as highlighted by Nkwunonwo *et al.* (2020).

Table 4: Resilience Strategies Adopted by Residents (N = 367)

Variable	Categories	Frequency (%)	Mean (M)	SD
Precautionary actions before floods (raising property, storing food/water)	Yes	256 (69.8%)	1.30	0.46
	No	111 (30.2%)		
Most common coping strategy in household	Temporary relocation	152 (41.4%)	2.29	1.36
	Use of sandbags/drainage clearing	58 (15.8%)		
	Reliance on relatives/neighbors	98 (26.7%)		
	Seeking government/NGO assistance	0 (0%)		
	Doing nothing	59 (16.1%)		
Effectiveness of strategies in minimizing losses	Not effective	62 (16.9%)	2.74	1.08
	Slightly effective	104 (28.4%)		
	Moderately effective	135 (36.8%)		
	Very effective	51 (13.9%)		
	Extremely effective	15 (4.1%)		
Community support during flooding reduces hardship	Disagree	52 (14.2%)	3.48	0.97
	Neutral	71 (19.3%)		
	Agree	169 (46.0%)		
	Strongly agree	75 (20.4%)		
Willingness to adopt more resilient strategies if resources are available	Neutral	75 (20.4%)	3.49	0.57
	Agree	254 (69.2%)		
	Strongly agree	38 (10.4%)		

Source: Field Work, (2025)

Table 4 indicate that a majority of respondents (70. %) reported taking precautionary actions before floods, such as raising household property or storing essential supplies. This indicates a relatively high level of preparedness among residents ($M = 1.30$, $SD = 0.46$). Such precautionary behavior is consistent with previous studies emphasizing household-level adaptation as the first line of resilience in flood-prone communities (Nkwunonwo *et al.*, 2020). Coping mechanisms shows that temporary relocation (41. %) and reliance on relatives or neighbors (27. %) were the most common strategies. Only (16. %) reported using sandbags or drainage clearing, and

notably, none sought government or NGO assistance. About (16. %) admitted to “doing nothing.” The mean coping preference ($M = 2.29$, $SD = 1.36$) suggests that relocation and social networks are primary coping strategies, while institutional support remains minimal, echoing earlier findings of weak governmental intervention in disaster resilience in Nigeria (Oluwasanya & Okoye, 2021). In terms of effectiveness, most respondents rated their coping mechanisms as either moderately effective (37. %) or slightly effective (28. %), with only 18% reporting high effectiveness (very/extremely effective). The overall mean ($M = 2.74$, $SD = 1.08$) reflects moderate confidence in the strategies employed. This highlights the limited capacity of household-level measures to significantly reduce flood-related losses (Eze *et al.*, 2022).

Community support was widely acknowledged, with 66.4% either agreeing or strongly agreeing that it reduces hardship. The mean score ($M = 3.48$, $SD = 0.97$) underscores the importance of social capital in resilience-building, consistent with studies stressing collective action as a critical factor in post-disaster recovery (Adelekan, 2021). Finally, respondents expressed a strong willingness to adopt more resilient strategies if resources were available, with (69. %) agreeing and (10. %) strongly agreeing ($M = 3.49$, $SD = 0.57$). This suggests that resource constraints, rather than lack of awareness, are the main barrier to resilience. This finding reinforces calls for targeted investments in community-based adaptation programs to enhance long-term disaster preparedness (Okoli *et al.*, 2025)

Conclusion and Recommendation

This study examined the demographic characteristics of respondents, the socio-economic effects of flooding, its perceived health implications, and the resilience strategies adopted by residents in flood-prone communities. The findings revealed that flooding significantly undermines household income, disrupts livelihoods, increases household expenditure, and negatively impacts children’s education and access to markets. Health consequences were equally profound, with respondents highlighting heightened exposure to waterborne and vector-borne diseases, increased.

Based on the findings, the following recommendations are proposed to mitigate the socio-economic and health impacts of flooding and to strengthen resilience in affected communities:

1. Strengthen Flood Management Infrastructure
2. Promote Community-Based Adaptation Strategies.
3. Enhance Health Services and Emergency Preparedness.
4. Support Livelihood Recovery and Economic Resilience.
5. Mainstream Flood Education and Awareness.
6. Strengthen Policy and Institutional Frameworks.

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