



Causes of Coastal Flooding as Perceived by Crop Farmers and Artisanal Fisher Folks in South-South, Nigeria

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Abstract: The world is constantly faced with various forms of disasters which adversely affect lives on earth. Coastal flooding is one of such disasters. This paper analyzed the causes and effects of coastal flooding in South-South Nigeria. The objectives of this study is to identify other livelihood activities undertaken by crop farmers and Artisanal Fisher Folks the farmers affected by coastal flood in the area and to assess the perceived causes of coastal flooding by the crop farmers and artisanal Fisher Folks with the hypothesis that there is no significant difference in the perceived causes of coastal flooding among the crop farmers and artisanal Fisher Folks in the three selected States of the study in South-South Nigeria. A total of 450 crop farmers and artisanal Fisher Folks were sampled for the study. Data were collected using a set of structured questionnaire. Data analysis was done using percentage, mean score and Anova. The result revealed that rural households indeed engaged in multiple activities and relied on diversified income portfolios like agro-processing (91.2%), artisan (88.4%), basket weaving (61.30%) and sand excavating (54.81%). Generally, majority of the respondents (96.69%) across the States obtained information about flood from friends and neighbours. The perceived effects of coastal flood included loss of river embarkment ($\bar{x}=3.30$), loss of livelihood ($\bar{x}=3.29$) and reduction in income ($\bar{x}=3.06$). The study concludes that the effects of the coastal flooding are significant. It was recommended that enlightenment campaign should be emphasized in the South-South zone of Nigeria at the onset of the rain to alert the people and prepare them for eventful flood incidence, the perceived effects of coastal flooding and the socio-economic determinants should be given important consideration in advocacy and intervention by the government and Non- Governmental Organizations (NGO'S).

Keyword: Coping strategies, climate change, Coastal flood, livelihood, crop farmers, artisanal fisher folks.

Introduction

The incidence of coastal flooding poses significant threats to the economic and social development of Nigeria. Coastal flooding, as defined by Asthana (2014), results from the accumulation of large volumes of water that overflow riverbanks, causing extensive damage to human lives and property. The aftermath of such disasters often includes the spread of diseases, loss of thousands of lives, and destruction of property worth billions of naira (World Bank, 2020).

Flooding represents a major risk to riverine populations and floodplains, causing substantial environmental impacts, including harm to aquatic fauna and flora and increased erosion at riverbanks. Flooding in Nigeria has become increasingly severe and frequent, disproportionately affecting the urban poor, who often cannot recover without external aid (Blaikie, 2014). Floods are among the most recurring and disastrous natural hazards globally, with various types such as river flooding, groundwater flooding, surface water flooding, sewer flooding, reservoir flooding, and coastal flooding (Nicholas, 2017). Urban flooding, common in Nigeria's Niger Delta, results from heavy rainfall and inadequate drainage systems, leading to significant loss of life and destruction of infrastructure (Nicholas, 2007).

In Nigeria, urban flooding predominantly affects the Niger Delta states, Rivers, Akwa-Ibom, Cross River, Bayelsa, Delta, and Edo. This flooding is often due to inadequate maintenance of stormwater drains, poor urban planning, and encroachment on drainage systems (NIUA, 2016). Both natural and human factors contribute to flooding. Human activities such as deforestation, poor drainage patterns, and unplanned urbanization exacerbate the problem (Nwigwe & Emberga, 2014). Additionally, climate change has increased precipitation, leading to more frequent and severe flooding events (Aja and Olaore, 2014). The South-South zone's soil, vegetation, and landform predispose it to flooding and environmental degradation, which in turn exacerbates poverty through the destruction of livelihoods. For example, UN-OCHA (2018) reported significant displacement and property loss in Delta State due to flooding. In Edo State, the soil texture, flat terrain, overpopulation, and proximity to the Atlantic Ocean contribute to recurrent flooding (Allens & Spatio, 2016). Similarly, Cross River State's Calabar metropolis experiences severe annual flooding and landslides, attributed to high temperatures and humidity (Osang *et al.*, 2014). Other states in the South-South, such as Rivers, Bayelsa, and Akwa-Ibom, have also reported severe flooding with significant loss of life and property (Obot *et al.*, 2010).

Coastal flooding in South-South Nigeria has become an increasingly severe issue, posing substantial threats to the region's economic stability and social development. Despite numerous warnings from the Nigerian Meteorological Agency (NIMET) regarding the potential for above-normal rainfall and consequent flooding, there remains a significant lack of preparedness and effective response mechanisms. The catastrophic flooding events of 2011, 2012, and most recently 2022, which resulted from the release of water from the Lagdo Dam in Cameroon, have underscored the urgency of addressing this issue. The low-lying nature of the Niger Delta region makes it particularly susceptible to flooding, which not only devastates infrastructure and property but also exacerbates health crises through the spread of diseases. Urban poor communities are disproportionately affected, facing long-term economic and social disruption that they are often unable to recover from without external assistance. Moreover, human activities such as deforestation, unplanned urbanization, and poor drainage systems further aggravate the situation. These factors, combined with climate change-induced increases in precipitation, have led to more frequent and severe flooding events. The recurring nature of these floods highlights a systemic failure in urban planning and environmental management.

Existing interventions and policies have proven inadequate in mitigating the impacts of these floods, as evidenced by the substantial loss of life and property. The need for a comprehensive,

data-driven approach to flood management and mitigation in South-South Nigeria is evident. Addressing this problem requires not only immediate relief efforts but also long-term strategies to enhance resilience and preparedness among the affected communities. This research seeks to investigate the perceived causes and effects of coastal flooding in the region, aiming to provide actionable insights for policymakers and stakeholders to develop more effective flood management and mitigation strategies.

Objectives

Specifically, the objectives of the study include to:

- i. identify other livelihood activities undertaken by crop farmers and Artisanal Fisher Folks the farmers affected by coastal flood in the area;
- ii. assess the perceived causes of coastal flooding by the crop farmers and artisanal Fisher Folks; and to
- iii. analyze significant difference in the perceived causes of coastal flooding among the crop farmers and artisanal Fisher Folks in the three selected States of the study in South-South Nigeria.

Methodology

The study was conducted in Nigeria's South-South Zone, an area characterized by its extensive river systems, creeks, estuaries, and stagnant swamps, spanning approximately 2,370 square kilometers and 8,600 square kilometers respectively (Nigerian Meteorological Agency, 2020). This zone includes the states of Edo, Delta, Bayelsa, Rivers, Akwa-Ibom, and Cross River, supporting diverse ecosystems rich in terrestrial and aquatic flora and fauna, crucial for human livelihoods (Uyigue & Agho, 2007). With a total population of 25,692,842 and annual rainfall exceeding 4,000mm (NBS, 2023), the region's wetlands are vital for providing food, water, and livelihood security for the local poor. However, activities such as tree felling and bush burning by rural households exacerbate the region's vulnerability to flooding.

A multi-stage sampling procedure was employed to select the sample for the study. The initial stage involved the purposive selection of three state, namely: Bayelsa, Rivers, and Delta purposively because of their severe flooding incidents. The second stage focused on the purposive selection of the two most flood-affected Local Government Areas (LGAs) in each state: Yenagoa and Brass in Bayelsa; Ughelli South and Udu in Delta; and Ogba Egbema Ndoni and Ahoada East in Rivers. In the third stage, the most affected flood-prone communities within these LGAs were purposively selected. These included Effuru-Otor, Olomu, and Ekrokpe in Ughelli South, Delta; Ubogo, Egini, and Ogbe Udu in Udu, Delta; Omoku, Ebocha, and Ndoni in Ogba Egbema Ndoni, Rivers; Ahoada, Mbiama, and Okobe in Ahoada East, Rivers; and Swali, Igbogene, and Tombia in Yenagoa, Bayelsa. In Brass, the communities of Fatua, Brass, and Akasa were sampled. This process resulted in a total of 18 communities being selected. In the final stage, the list of all coastal flood affected household heads involved in crop farming and artisanal fishing

was obtained from the community leaders and extension officers and used to select the respondents. A reconnaissance survey was carried out to generate the sampling frame, and the list contained a total of 4500 families from which 10% (450) of the total population was proportionately selected as shown in Table 1. The study population comprised of heads of crop farming households and fishing households in the study area. Data for the study were collected from primary source using structured questionnaire.

Table 1 Proportionate Sampling for this Study

States	LGAS	Communities	Affected Total Population	Sample Size
Bayelsa	Yenagoa	Swali	360	36
		Igbogene	240	24
		Tombia	300	30
	Brass	Fantua	250	25
		Brass	350	35
		Akasa	300	30
				180
Rivers	Ogba Egbema Ndoni	Omoku	190	19
		Ebocha	183	18
		Ndoni	160	16
	Ahoada East	Ahoada	202	20
		Mbiama	200	20
		Okobe	120	12
				106
Delta	Ughelli South	Effurun- Otor	300	30
		Olomu	260	26
		Ekropke	350	35
	Udu	ubogo	210	21
		Egini	270	27
		Ogbe Udu	250	25
				164
TOTAL			4500	450

RESULTS AND DISCUSSION

Livelihood Activities of Crop Farmers and Artisanal Fisher Folks affected by Coastal Flooding in the Study Area

Table 2 results reveal that respondents in the study area engage in a variety of supplementary livelihood activities. In Bayelsa State, a significant majority are involved in canoe making (88.8%), foraging for wild food (82.7%), agro-processing (71.6%), and trading (63.3%). Similarly, in Delta State, respondents participate in agro-processing (59.1%), trading (75.9%), harvesting wild food (89.6%), and canoe building (93.9%). In Rivers State, the engagement in agro-processing (79.2%), trading (69.8%), harvesting wild food (95.3%), and canoe building (91.5%) is also notable. Other livelihood activities engaged by the respondents as witnessed during the recognizance survey included collecting and selling of marine and forest resources. Such as wild vegetables, periwinkles, mollusks, bivalves, mushrooms, and various plants such as *Gnetum africanum* (Okazi), *Gongronema latifolium* (Utazi), *Piper nigrum* (Uziza), and *Irvingia gabonensis* (Ogbono).

The farmers’ engagement in additional livelihood activities is likely a response to the increased vulnerability of agricultural productivity due to flooding. Participants in the study affirm that economic diversification is a critical survival strategy. This observation aligns with the research by Akukwe *et al.* (2018), which highlights that households resort to temporary employment to sustain themselves after poor harvests caused by flooding. The engagement in multiple livelihood activities underscores the precarious nature of relying solely on agriculture in flood-prone areas. The data suggest a strategic adaptation by the respondents to mitigate the economic impacts of environmental challenges. However, the reliance on diverse income sources also reflects the inadequacy of existing agricultural support systems and the urgent need for more robust, flood-resilient agricultural practices and infrastructure. The findings call for policy interventions that not only address immediate economic needs but also promote sustainable agricultural practices and improve resilience against environmental shocks.

Table 2: Distribution of respondents by Livelihood activities engaged by crop farmers and artisanal Fisher Folks affected by Coastal Flooding

Livelihood Activities	Bayelsa		Delta		Rivers	
	F	%	F	%	F	%
i. Canoe Making	160	88.8	154	93.9	97	91.5
ii. Picking Wild Food	145	82.7	147	89.6	101	95.3
iii. Civil Services	43	23.8	34	20.7	54	50.9
iv. Trading	114	63.3	124	75.6	74	69.8
v. Artisanry	78	43.3	44	26.8	30	28.3
vi. Agro-						
vii. Processing	129	71.6	97	59.1	84	79.2
viii. Brick Laying	54	30.0	32	19.5	41	38.6
ix. Block						
x. Moulding	41	22.7	26	15.8	20	24.5
xi. Basket Weaving	43	23.8	14	8.5	41	38.6
xii. Sand Mining	34	18.8	34	20.7	48	45.2

Source: Field Survey data (2024)

Perceived Causes of Coastal Flooding

Result in Table 3 presents a distribution of the perceived causes of coastal flooding by in respondents in the area. Using a discriminating index of Mean ≥ 3.0 as “cause”, and Mean < 3.0 as “no cause” the result identifies several significant factors, including climate change ($\bar{x} = 3.52$), prolonged heavy rainfall ($\bar{x} = 3.37$), river overflow ($\bar{x} = 3.07$), and infrastructural issues such as structures on drainage channels ($\bar{x} = 3.20$) and blocked canals ($\bar{x} = 3.27$). Additionally, careless refuse disposal ($\bar{x} = 3.18$), coastal storms ($\bar{x} = 3.38$), dam failure and canal collapse ($\bar{x} = 3.03$), failed drainage systems ($\bar{x} = 3.12$), and failed waste management systems ($\bar{x} = 3.18$) are highlighted. Interestingly, unregulated urbanization ($\bar{x} = 2.55$) is also noted, though to a lesser extent. It could be seen from the results that climate change emerges as the most significant factor, reflecting its pervasive impact on the environment in the region. The exacerbation of prolonged rainfall, river overflow, and compromised drainage systems due to climate change aligns with NIMET's (2020) findings that increased rainfall rates contribute to substantial runoff and flooding. The IPCC (2001) corroborates this by highlighting climate change's discernible effects on various water-related factors that cause flooding. However, the respondents' apparent dismissal of corruption and malfunctioning systems ($\bar{x} = 2.49$) and inadequate laws and policy failure ($\bar{x} = 2.18$) as significant causes of coastal flooding demands critical scrutiny.

From the results it could explained that Bayelsa experiences more intense or prolonged rainfall compared to Delta and Rivers, significantly contributing to flooding. The slightly lower scores of river overflow as a causative in Delta and Rivers could indicate either less frequent river overflows or more effective management practices in these states. In terms of inadequate drainage system, it could be said that urban planning and infrastructure development may be inadequate or poorly managed, especially in Delta State leading to obstructions in natural water flow and contributing to flooding. This is further buttressed by the fact that blocked canals are particularly problematic in Delta, exacerbating the challenges of maintaining clear water pathways. In Bayelsa, indiscriminate dumping of refuse is highly problematic leading to blocked waterways and exacerbating flooding issues. The fact that coastal storms are perceived as a significant cause of flooding in the South-South region indicates the region's high exposure to storm-related flooding.

The neglect of these factors may indicate a lack of awareness or a reluctance to confront institutional failings that contribute to inadequate flood management and response. The results underscore a complex interplay of natural and human-induced factors driving coastal flooding. While climate change undeniably plays a critical role, the importance of addressing infrastructural deficiencies and promoting effective waste management cannot be overstated. The respondents' focus on immediate, observable causes rather than systemic issues may reflect a localized perspective that prioritizes tangible, direct interventions over broader policy and governance reforms.

Meanwhile, the standard deviation of the responses which falls between 0.7 to 1.9 provides insights into the level of agreement or disagreement among respondents regarding the causes of coastal flooding. Item statements with Standard deviation values less than 0.6 indicate strong consensus amongst the respondents, enhancing the reliability of the mean as a representative measure, while item statements with standard deviation value higher than 0.6 suggest greater variability in opinions, signaling the need for cautious interpretation and possibly further investigation. These insights are crucial for designing effective, widely supported interventions to mitigate coastal flooding in South-South Nigeria.

Table 3: Distribution of respondents by Perceived causes of coastal flood by the crop farmers and artisanal Fisher Folks

Causes	Bayelsa		Delta		Rivers	
	Mean	Std Dev.	Mean	Std. Dev	Mean	Std Dev.
Prolonged heavy rain	3.87	0.97	3.00	1.14	3.24	1.42
River overflow	3.43	1.17	2.87	1.16	2.91	1.57
Structures on drainage channel	2.65	1.56	3.26	0.96	2.74	1.44
Poor physical plan	2.81	1.16	3.15	1.19	2.55	1.46
Poor drainage channel	3.22	0.73	3.31	1.01	3.06	1.38
Blocked canals	3.06	1.22	3.51	1.00	3.25	0.94
Indiscriminate refuse dump	3.66	0.95	3.04	1.09	2.85	0.36
Coastal storm	3.33	0.90	3.57	0.98	3.24	0.85
Dam failures and canal collapse	2.80	1.74	3.12	0.84	3.16	0.92
Climate change	3.65	0.83	3.42	0.93	3.50	1.00
Poor/failed drainage systems	3.25	0.98	3.12	0.91	3.01	0.98
Failed waste Mgt systems	3.07	0.85	3.25	1.13	3.21	0.78
Unregulated urbanization	2.63	1.31	2.78	1.03	2.24	1.50
Weak legislation and policy failure	2.07	1.65	2.08	0.96	2.22	1.62
Corruption and failed systems	3.43	0.94	1.98	0.89	2.07	1.72

Source: Field Survey data (2024)

Difference in the perceived causes of flooding among crop farmers and artisanal fisher folks

To ascertain the whether the respondents in the three selected States differed significantly in their perception about the causes of coastal flooding, analysis of variance was carried out at 5% probability level. The result as presented in Table 4 shows that a significant difference existed in perceived causes of coastal flooding among crop farmers and artisanal Fisher Folks across the three selected States of South-South, Nigeria ($F_{(2,448)} = 14.08$; $p = 0.000$). Therefore, the null

hypothesis which states that there is no significant difference in the perception of the respondents is rejected, implying that the respondents across the 3 states perceived the causes of coastal flooding differently from one another. This is because the causes of coastal flooding are many and varied. Within the 3 States of the study, there could be variations on the virulence of the disposing factors. These could affect the perceived causes among the environments. Again, with the States varying in the respondent formal school attainment, years of experience, use of information sources, and group activities, the perceived causes could also vary. In some States where the variables were poorly rated it might be situations where causes were misconstrued for effects and vice versa.

Table 4: ANOVA showing significant difference in perceived causes of coastal flooding among crop farmers and artisanal Fisher Folks across the three selected States of South-South, Nigeria

Source	SS	Df	MS	F	p-value
Between Groups	2688.54	2	1344.27	14.08	0.000
Within Groups	42745.76	448	95.41		
Total	45434.3	450	1439.68		

Source: Computed from Field Survey data (2024)

CONCLUSION AND RECOMMENDATIONS

The study includes that the causes of flooding which has caused severe damages in the South-South of Nigeria include heavy rainfall, blockage of drainages, poor urban planning and land use as well as building on flood plain were perceived as major causes of flooding. Addressing the causes and impacts of coastal flooding in the South-South region of Nigeria requires a comprehensive and coordinated effort. By improving drainage systems, enforcing urban planning regulations, developing effective waste management strategies, integrating climate adaptation measures, engaging communities, and strengthening governance, the region can mitigate flood risks and enhance its resilience to future challenges. These strategies, underpinned by robust policies and adequate funding, will contribute to sustainable development and improve the quality of life for the residents of the South-South region.

The following recommendations are therefore made:

- Enhancing and maintaining drainage infrastructure is crucial to preventing blockages and ensuring efficient water flow. This can be achieved by investing in the construction and regular maintenance of drainage channels. The government should allocate adequate resources to identify and clear existing blockages and expand drainage networks in flood-prone areas.
- State governments in the region should implement stringent regulations that control land use and construction activities in flood-prone areas will mitigate the risk of flooding. Urban planners should integrate flood risk assessments into development plans, ensuring that new constructions are resilient to flooding. Such as, enforcing zoning laws and

conducting regular inspections can prevent illegal structures from obstructing natural water flow. Additionally, creating green belts and open spaces can act as natural water retention areas, reducing flood risks.

- Government should establish efficient waste collection and disposal systems, promoting recycling, and educating the public on the environmental impacts of improper waste disposal. Municipal authorities should invest in infrastructure such as waste bins, recycling centers, and landfill sites, such as through public-private partnerships to enhance waste management services by leveraging private sector efficiency and innovation. Community-based initiatives, like waste segregation at source, can also play a significant role in reducing refuse in drainage channels.
- There should be periodic public education campaigns to inform residents about the risks of flooding and the importance of maintaining drainage systems and proper waste disposal. Establishing community-based flood management committees can facilitate local participation in identifying risks and implementing mitigation measures.

Reference

Agbonkhese, O., Agbonkhese, E., Alaka, E., Joe-Abaya, J., Ocholi, M., & Adekunle, A. (2014). Flood menace in Nigeria: Impacts, remedial and management strategies. *Civil and Environmental Research*, 6(4), 32–40.

Aja, G. N., & Olaore, A. Y. (2014). The impact of flooding on the social determinants of health in Nigeria: A case for North-South institutional collaboration to address climate issues. *Developing Country Studies*, 4(22), 6–12.

Akukwe, T. I., Krhoda, G. O., & Oluoko-Odingo, A. A. (2018). Principal component analysis of the effects of flooding on food security in agrarian communities of Southeastern Nigeria. *International Journal of Hydrology*, 2(2), 205–212.
<https://doi.org/10.15406/ijh.2018.02.00070>

Akukwe, T. I. (2014). Spatial analysis of vulnerability to flooding in Port Harcourt Metropolis, Nigeria. *SAGE Open*, 5(1), 21582440155755.

Allen, M. N. (2016). Spatio-temporal change analysis of flood affected areas using remote sensing. *Journal of Water and Climate Change*, 2(5), 286-293.

Asthana, A. K. L., & Kumar, A. (2013). Assessment of landslide hazards induced by extensive rainfall event in Janimu and Kashmir Himalaya, Northwest India. *Geomorphology*, 284, 72–82.

Blaikie, P., Wisner, B., Cannon, T., & Davies, I. (2014). *At risk: Natural hazards, people's vulnerability and disasters*. Taylor & Francis.

Efobi, K., & Anierobi, C. (2013). Impact of flooding on riverine communities: The experiences of Omambala and other areas in Anambra State, Nigeria. *Journal of Economics and Sustainable Development*, 4(18), 58–63.

IPCC. (2001). *Climate change: The scientific basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change*. IPCC.

National Bureau of Statistics. (n.d.). <https://www.nigerianstat.gov.ng>

Nicholas, P. (2007). Extreme flood-driven fluvial bank erosion and sediments/loads: Direct process measurement using integrated mobile laser scanning mis and hydro-acoustic technique. *Ecology Letters*, 2(5), 286–293.

Nicholas, R. E. (2017). Regional flood risk predictions under climate change. *Journal of Hydrometeorology*, 22(9), 2259–2274.

Nwafor, J. C. (2006). *Environmental impact assessment for sustainable development: The Nigerian perspective*. Enugu: EL'DEMAK Publications.

Nwigwe, C., & Emberga, T. (2014). An assessment of causes and effects of flood in Nigeria. *Standard Scientific Research and Essays*, 2(7), 307–315.

Obot, U., Chendo, M., Udo, S., & Ewona, I. (2010). Evaluation of rainfall rates in Nigeria for 30 years (1978–2007). *Academic Journal of Environmental Sciences*, 2(4), 284-293.

Osang, E., & Udo, A. B. (2014). Empirical study of seasonal rainfall effect in Calabar, Cross River State, Nigeria. *IOSR Journal of Applied Physics*, 5(5), 7–15.

UN-OCHA. (2018). *Report on identification of current priorities for research in humanitarian action: Proceedings of the first Annual UN-OCHA Policy and Research Conference*. UN Office for the Coordination of Humanitarian Affairs.

Uyigue, E., & Agho, M. (2007). Coping with climate change and environmental degradation in the Niger Delta of Southern Nigeria. *Community Research and Development Centre (Price of Oil)*.

World Bank Publications. (2003). *Reaching the rural poor: A reviewed strategy for rural development*.

World Bank. (2020). *World Bank report on disaster risk reduction*.