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Assessment of Flood Impact on Residents' Well-being in Vulnerable Communities of Southwest Nigeria

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ABSTRACT

Decades of recurrent flooding in Nigeria have inflicted lasting and irreparable damage on communities, threatening human survival and leaving enduring scars. Therefore, the study assessed impact of flood on residents' well-being in South west Nigeria. Four-staged sampling technique was adopted for selection of 250 households through questionnaire administration. Data were analysed using descriptive statistics, chi-square, canonical correlation analysis at α0.05. Most residents in flood-prone parts of Southwest Nigeria identified flooding was a common occurrence in their communities. However, 60% of residents signified that flooding was mitigated in most communities. The study showed a significant association of flooding in communities with residents' housing wellbeing; mud house affected (χ^2 = 7.46, p = 0.02), consequences on mud house affected (χ^2 =7.85, p =0.02), increased brick house dilapidation (χ^2 =7.33, p =0.03). Worsen brick houses (p =0.01*, β= 0.608), food production and access (p =0.03*, β= 0.252), ethno-medicine affordability (p =0.04*, β=0.240), usefulness of motorcycle for farming activities (p =0.03*, β=0.734) were significant and positively influenced by flooding in communities. Residents' wellbeing was implicated by flooding in communities in flood-prone parts of South-western Nigeria, and align with contribution to the achievement of SDG 13 (Climate Action) SDG 15 (Life on Land) in Nigeriay.

1. Introduction

Flooding and its associated consequences have become increasingly frequent across the globe, posing serious threats to human lives, livelihoods, and infrastructure (Aderogba, 2012). In Nigeria, despite abundant water resources, flooding and water stress remain major environmental challenges that demand sustained and intensive interventions (Akolokwu, 2012). Flooding has been identified as a recurring phenomenon in wetlands worldwide, largely exacerbated by climatic and anthropogenic factors (Bariweni et al., 2012). Global warming has contributed significantly to rising sea levels, thereby increasing flood risks in many coastal and low-lying regions of the world (Magani et al., 2015). The impacts of flooding in Southwest Nigeria are multidimensional, encompassing loss of lives, destruction of residential buildings, collapse of infrastructure, loss of livelihoods, disease outbreaks, and food insecurity (Adetunji and Oyeleye, 2018; Kolawole et al., 2011).

Over the past three decades, recurrent flood events have resulted in widespread devastation of urban settlements, farmlands, and public utilities, with significant economic and social consequences (Nwigwe

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& Emberga, 2014). Empirical studies have attributed flooding primarily to high rainfall intensity and prolonged precipitation events (Ologunorisa & Tersoo, 2006).

In Southwest Nigeria, flood occurrences have been linked not only to climatic factors but also to anthropogenic activities, weak policies, and institutional failures (Nkwunonwo, 2016).

Onwuka et al. (2015) categorized flood causative factors into meteorological (torrential rainfall), hydrological (surface runoff and land saturation), and anthropogenic drivers, including rapid population growth, urbanization, poor waste management, and climate change.

Poor urban planning and informal settlement patterns have further aggravated urban flooding in many Nigerian cities (Adetunji & Oyeleye, 2013). Heavy rainfall combined with inadequate drainage infrastructure and indiscriminate waste disposal has left many urban residents homeless and economically distressed (Agbonkhese et al., 2014). In addition to rainfall-induced flooding, dam failures and controlled releases of excess water from reservoirs have also contributed to flood disasters (Etuonovbe, 2011).

Olawunmi et al. (2015) reported that flooding in Ibadan metropolis is largely driven by indiscriminate dumping of refuse into waterways, poor channelization, floodplain encroachment, extensive paved surfaces, and excessive rainfall, particularly in low-lying settlements near rivers. While previous studies have examined household coping and adaptation strategies to flooding and ecosystem degradation (Armah et al., 2010), recent evidence suggests that adaptive measures and government interventions can mitigate some livelihood losses associated with flood disasters (Abbass et al., 2022; Butu et al., 2022).

Nevertheless, empirical understanding of how flooding directly influences residents' overall well-being in flood-prone communities of Southwest Nigeria remains limited. This gap underscores the need for a systematic assessment of flood occurrence, impacts, and their implications for household well-being in the region.

Accordingly, this study aimed to:

- ✧ examine flood occurrences in flood-prone parts of Southwest Nigeria;
- ✧ assess the impacts of flooding on residents' well-being in flood-prone communities;
- ✧ estimate the influence of flooding on residents' well-being in Southwest Nigeria.

The study tested the following null hypotheses:

H_{01}: There is no significant association between flooding in communities and residents' well-being.
H_{02}: Flooding does not significantly influence residents' well-being in vulnerable communities of Southwest Nigeria.

2. Literature Review

Flooding as a Global Phenomenon

Flooding is a widespread environmental hazard and one of the most destructive natural phenomena globally, accounting for greater loss of lives and property than any other natural disaster (Magani et al., 2015). In recent decades, flood events have increased in both frequency and intensity, largely due to

climate variability and global climate change (Collins & Simpson, 2007). Rising global temperatures have contributed to changes in precipitation patterns and sea-level rise, thereby escalating flood risks, particularly in coastal and low-lying regions (Dyson, 2000). Flooding is closely linked to river systems, where increased precipitation leads to higher river discharge, overtopping riverbanks and inundating adjacent low-lying areas. Over time, repeated flooding results in the gradual development of floodplains (Cornell, 2018). While floodplains naturally serve as water retention zones that absorb and store excess water during the rainy season, thereby moderating floods, cooling the environment, and supporting biodiversity, that is their ecological functions are increasingly compromised by human activities.

Flooding in Nigeria and Southwest Nigeria

In Nigeria, flooding has emerged as a major environmental and developmental challenge, affecting both rural and urban communities. The 2012 flood episode remains the most severe in the country's recent history, in terms of spatial coverage, severity, displacement of people, and socio-economic impacts as reported by the Federal Government of Nigeria in 2013 (FGN, 2013). Flooding has resulted in large-scale displacement of populations, with vulnerable households experiencing disproportionate losses of lives, homes, and livelihoods (Etuonovbe, 2011). Southwest Nigeria is particularly flood-prone due to its climatic conditions, extensive river networks, and low-lying topography. Most cities and towns in the region experience flooding annually during the rainy season (Nwigwe & Emberga, 2014). The susceptibility of communities is further heightened by the presence of floodplains that traverse many states, exposing settlements along riverbanks to recurrent flood hazards. Studies have shown that floodplain exploitation for agriculture, fisheries, and timber extraction such as in the Oyan floodplain of Ogun State, with significantly increased flood risks in the region (Babatunde & Nimrod, 2011).

Causes of Flooding

Flooding in Nigeria results from a complex interaction of natural and anthropogenic factors. In recent years, the rainy season has been characterized by unusually heavy downpours, leading to river overflows and inundation of communities located along riverbanks (Olanrewaju et al., 2019). Increased rainfall intensity raises river volumes beyond channel capacity, causing water to spill into adjacent settlements and floodplains (Cornell, 2018). Anthropogenic factors have significantly worsened flood conditions. Most riverbanks in Nigeria are either built-up or used as waste dump sites, which narrow river channels and obstruct natural water flow, thereby increasing flood occurrence (Uchegbu, 2003). Poor urban planning, inadequate drainage infrastructure, indiscriminate waste disposal, floodplain encroachment, extensive paved surfaces, and uncontrolled urbanization are major contributors to urban flooding (Agbonkhese et al., 2014; Olawunmi et al., 2015).

In addition, dam failures and controlled releases of excess water from reservoirs have also triggered flood disasters in several parts of the country (Etuonovbe, 2011). Given these challenges, effective management of floodplains and wetlands has become imperative in Nigeria, as poor governance and weak institutional frameworks have intensified flood impacts over the past few decades (Oladokun & Proverbs, 2016).

Socio-Economic Well-Being Impacts of Flooding

Flooding has severe and far-reaching impacts on the socio-economic well-being of affected populations. Over the past three decades, recurrent flood events in Nigeria have caused extensive loss of lives, destruction of residential buildings, collapse of bridges and roads, and damage to schools, hospitals, and other critical infrastructure. These tangible losses are quantifiable in monetary terms and include destruction of personal property, livestock losses, crop failure, disruption of services, reduction in property values, and costs associated with emergency response, evacuation, relief, and rehabilitation of flood victims (Del Giudice et al., 2024).

Empirical evidence indicates that flooding has devastated livelihoods, particularly in agrarian and riverine communities. Ibrahim & Abdullahi (2016) reported that major flood events in Nigeria damaged over 500 homes and more than 100 vehicles. Similarly, Garg (2010) documented the socio-economic and cultural impacts of the Kolo Creek floods in Bayelsa State, where 99.4% of residents lost their means of livelihood, including farms, buildings, bridges, and access roads. Flooding also disrupted educational systems, as damaged infrastructure and mobility constraints hindered school attendance and communication. Overall, these impacts exacerbate poverty, food insecurity, health challenges, and social vulnerability among affected households.

The Research Gap

Despite the extensive literature on flooding in Nigeria, most studies have focused on flood causes, physical impacts, and infrastructural damage, with limited empirical emphasis on how flooding influences the overall well-being of residents in vulnerable communities, particularly in Southwest Nigeria. While floodplains provide important ecological services, increasing human encroachment and poor floodplain management have heightened exposure to flood risks without adequate understanding of their long-term implications for household well-being. Furthermore, existing studies often examine flood impacts in isolation, without systematically linking flood occurrence, intensity, and frequency to multidimensional indicators of residents' socio-economic well-being.

This gap underscores the need for a comprehensive assessment of flood occurrences, their socio-economic impacts, and the extent to which flooding influences residents' well-being in flood-prone communities of Southwest Nigeria, an objective that this study seeks to address.

3. Methods

The study was conducted in southwest Nigeria with a focus on household dwellers in vulnerable areas to flood. Southwest is a geopolitical region in Nigeria and is the hometown of Yoruba people having land size of 114.271km². The projected population figure for Nigeria in 2022 was 216,783,381 comprising 108,350,410 males and 108,432,971 females with southwest region estimated having an approximate figure of 20.44 percent of Nigeria's population according to National Bureau of Statistics (2022). Southwest region of Nigeria has six (6) states which are Oyo, Osun, Ogun, Lagos, Ondo and Ekiti respectively. The major tribe of this geopolitical zone is Yoruba with several dialects coupled with other ethnicity in Nigeria like Hausa, Igbo and so on. A multistage random sampling technique adopted in selecting households in the area. According to Nnodim (2023) and Cirella et al. (2018), Oyo, Ogun and Lagos States were purposively selected based on the frequent flood occurrences and flood volume in

the three states as the 1st stage. In the 2nd stage, Local Government Areas, and the wards in LGAs having water bodies, and with frequent and pronounced flood occurrence in the selected states were also purposively selected.

Thus, Ido and Oluyole were selected in Oyo state, Obafemi Owode and Abeokuta South were selected in Ogun state, while Alimosho and Ikorodu were selected in Lagos state. The following number of wards were the selected LGAs in all: Ido comprises 10 wards, Oluyole comprises 10 wards, Obafemi Owode comprises 12 wards, Abeokuta South comprises 15 wards, Alimosho comprises 11 wards, and Ikorodu comprises 19 wards, respectively as reported by Nnodim (2023) and Cirella et al. (2018). In the 3rd stage a random selection was adopted for selection of 22 communities from high flood-prone communities of selected wards.

The selected communities were Apete/Awotan, Omi-Adio and Idi-Iya in Ido; Odo-ona Elewe/Ikereku, Odo-Ona Kekere, and Odo-Ona Nla in Oluyole LGA of Oyo state; Ofada/Mokoloki, Mowe, Ibafo, and Asese in Obafemi Owode; Obantoko, Igbore/Itori/Ago-Oba, and Ago-Ijesha/Ijeun Titun in Abeokuta South LGA of Ogun state; while Shasha/Akowonjo, Egbe/Agodo, and Ikotun/Ijegun in Alimosho; Ijede II, Ibeshe, Odogunyan, Agura/Iponmi, Isiu and Ipakodo in Ikorodu LGA of Lagos state. In the 4th stage households listing was carried out in the selected communities to obtain a sample population. Then the sample size was selected with a systematic random sampling technique whereby every 5th household was selected in the selected communities. A total sample size of 250 respondents was selected.

The test instrument used for collection of information from the respondents was a well-structured questionnaire and interview section. Data analyses were conducted with frequencies, simple percentages, chi-square and canonical correlation analysis model.

Table 1. Analysis of Sampling Procedures and Sample Size of Residents

Selected Southwestern States	Selected LGAs	Communities from Selected LGAs	Households Listing from Communities	Systematic Households Selection
Oyo	Ido	Apete/Awotan	110	22
		Omi-Adio	75	15
		Idi-Iya	55	11
	Oluyole	Odo-ona Nla	66	13
		Odo-ona Elewe/Ikereku	70	14
		Odo-ona Kekere	60	12
Ogun	Obafemi-	Ofada/Mokoloki	80	16
	Owode	Mowe	45	9
		Ibafo	40	8
		Asese	35	7
	Abeokuta	Igbore/Itori / Ago Oba	45	9
	South	Obantoko	55	11
		Ago Ijesha/Ijeun Titun	65	13
Lagos	Alimosho	Shasha/Akowonjo	50	10
		Ikotun/Ijegun	65	13
		Egbe/Agodo	40	8
	Ikorodu	Odogunyan	80	16

Selected Southwestern States	Selected LGAs	Communities from Selected LGAs	Households Listing from Communities	Systematic Households Selection
		Ipakodo	50	10
		Ijede II	45	9
		Ibeshe	40	8
		Isiu	35	7
		Agura/Iponmi	45	9
Total				250

Source: Field survey, 2021

3.1 Analytical Tools

i. Chi-square Analysis

$$\chi^2 = \sum\left[\frac{(f_0-f_e)^2}{f_e}\right] \text{..... Equation 1}$$

Where:

χ^2 = Chi-Square

Σ = Sum

f_O = frequencies of observed nominal variables such as sex, religion, marital status; that is the socioeconomic variables and other qualitative variables for the study.

fe = expected frequencies of occurrence determined from response categories.

ii. Canonical Correlation Analysis

The canonical correlation analysis was adopted for analysis of forestry land use strategies for flood management in Southwestern Nigeria. CCA is a statistical method that extracts the information common to two data tables measuring quantitative variables on the same set of observations (Abdi et al., 2018). "A canonical variate is a new variable formed by making a linear combination of two or more variates (variables) from a data set". For multiple X and Y, the canonical correlation analysis constructs two variates.

$$CVX_1 = A_1X_1 + A_2X_2 + A_3X_3 + \ldots + a_nx_n \quad \text{..... Equation 2}$$

$$CVY_1 = B_1Y_1 + B_2Y_2 + B_3Y_3 + \ldots + b_ny_n \quad \text{..... Equation 3}$$

Where: Yi = residents' wellbeing in the flood-prone parts of South-western Nigeria;

1. Housing types
2. Food utilities
3. Health facilities
4. Toilet systems
5. Electricity supply
6. Water resources

7. Social participation

8. Educational access

9. Transportation system

Xi = Flooding occurrences and its consequences as covariate factors which were used as independent variables include:

X1 = flooding in communities

X2 = Consequences of flooding

X3 = Curbing of flooding.

4. Results

Flooding Occurrences in in vulnerable communities of Southwest Nigeria

Table 2 presented the distribution of residents affected by flooding in the flood-prone parts of South-western Nigeria which exemplifies flood occurrence was a common event in the communities of southwest Nigeria.

The Table highlights that majority of residents (66.7%) experience flooding constantly in flood-prone areas, flood consequences (54.4%), and awareness about flood mitigation (57.6%).

Table 2. Flooding occurrences in vulnerable communities of Southwest Nigeria

Flooding occurrences in flood-prone parts	Yes	No
Flooding in flood-prone communities	167 (66.8)	83 (33.2)
Flooding consequences	136 (54.4)	114 (45.6)
Mitigation of flooding	144 (57.6)	106 (42.4)

Figures in parentheses are in percentages

Source: Field survey (2021)

Floods' influence in communities on residents' well-being in the flood-prone parts of Southwest Nigeria

Table 3 presented the Chi-square results of the association between flooding in communities and residents' well-being in respect to household indices in flooded areas of southwest Nigeria. The results revealed significant association between flooding in communities and mud housing being affected (p=.02, χ^2=7.46), flood consequences (FC) and mud housing (p=.02, χ^2=7.85), FC and worsen brick housing (p=.02, χ^2=10.34), also increased brick house dilapidation (p=.02, χ^2=7.33) depicting both flood incessant occurrence and its consequences having relationship with housing types. In contrast, flood incessant occurrence and its consequences do not have significant relationship with food access, health systems, toilet facilities, electricity, water supply, cooking resource, social participation, education and transportation system.

Table 3. Chi-square Analysis showing Association of flooding in communities on residents' well-being

Flooding Variables	Residents' Well-being				
	Housing Indices				
Flooding in community	Mud house affected	Worsen brick house	Difficulty upgrading brick house	Increased brick house dilapidation	Dilapidation of mud house
	7.46 (.02)*	0.83 (.36)^{ns}	4.07 (.39)^{ns}	3.57 (.17)^{ns}	1.69 (.64)^{ns}
Flood consequences	7.85 (.02)*	10.34 (.02)*	1.78 (.78)^{ns}	7.33 (.03)*	0.51 (.92)^{ns}
	Food Access Indices				
Flooding in community		Food Production & Access	Affordability	Food Intake not Adequate	
		3.43 (.18)^{ns}	0.25 (.89)^{ns}	3.21 (.36)^{ns}	
Flood consequences		5.42 (.25)^{ns}	1.64 (.44)^{ns}	1.57 (.67)^{ns}	
	Health Indices				
Flooding in community		Affordable ethno-medicine	Preference for trado-healthcare	High cost of Orthodox medicine	
		1.58 (.29)^{ns}	1.14 (.29)^{ns}	2.19 (.14)^{ns}	
Flood consequences		0.12 (.73)^{ns}	0.04 (.84)^{ns}	0.02 (.88)^{ns}	
	Toilet System Indices				
		Pit latrine maintenance	Water-cistern maintenance	Water-cistern void of cholera	
Flooding in community		2.29 (.32)^{ns}	2.35 (.31)^{ns}	2.31 (.32)^{ns}	
Flood consequences		1.12 (.57)^{ns}	0.26 (.88)^{ns}	0.52 (.77)^{ns}	
	Electricity Supply Indices				
Flooding in community		Electricity Supply by Generator	Electricity Supply from Government Source	Non-frequent Electricity Government Source	
Flood consequences		1.25 (.26)^{ns} 0.00 (.99)^{ns}	1.25 (.26)^{ns} 0.00 (.99)^{ns}	0.06 (.80)^{ns} 0.35 (.55)^{ns}	
	Water Supply Indices				
Flooding in community		Inaccessible Borehole			
		1.25 (.26)^{ns}			
Flood consequences		0.00 (.99)^{ns}			
	Cooking Resource Indices				
Flooding in community		Preference for fuel wood	Effective Charcoal	Kerosene Stove Affordable	
		1.25 (.26)^{ns}	2.01(.37)^{ns}	2.01(.37)^{ns}	
Flood consequences		0.00 (.99)^{ns}	0.95 (.33)^{ns}	0.003 (.55)^{ns}	
	Social Participation Indices				
	Source of fund for social &environmental development	Help meet urgent needs	Help cope with flood hazards	Source of information for flood issues	Help social connection with assurance
Flooding in community	1.25 (.26)^{ns}	1.25 (.26)^{ns}	1.25 (.26)^{ns}	1.25 (.26)^{ns}	1.25 (.26)^{ns}
Flood consequences	0.00 (.99)^{ns}	0.00 (.99)^{ns}	0.00 (.99)^{ns}	0.00 (.99)^{ns}	0.00 (.99)^{ns}

Flooding Variables	Residents' Well-being				
	Housing Indices				
	Education Access Indices				
Flooding in community		Affordable education	Motivation for land use education		
		0.35 (.55)^{ns}	2.57 (.28)^{ns}		
Flood consequences		0.14 (.71)^{ns}	0.26 (.61)^{ns}		
	Transportation System Indices				
Flooding in community		Motorcycle useful for farming	Farm products sales thrive in community		
		1.13 (.29)^{ns}	0.001 (.97)^{ns}		
Flood consequences		0.64 (.42)^{ns}	0.51 (.48)^{ns}		

Note: χ^2 - values outside parentheses, p-values are in parentheses, ns - not significant and * Significant @$\alpha_{0.05}$

Source: Field survey (2021)

Impact of flooding on residents' well-being in vulnerable communities of Southwest Nigeria

Table 4a-j presented the estimate of floods' influence on residents' well-being conducted through canonical correlation analysis. The results showed that flood in communities has a strong influence on worsen brick housing (p = .01, β = 0.608), and flood consequences influence difficulty in upgrading housing (p = .03, β = 1.324), increased dilapidation (p = .02, β = 1.294), and dilapidation of mud house (p = .03, β = 1.324) for indices on housing types. For indices of food utilities, flood in communities had significant influence on food production and access (p = .03, β = 0.252), and lack of improvement in feeding (p = .04, β = 0.465). Other results and their influences are shown in Table 4 (c-j) below.

Table 4 (a-j). Canonical Correlation of Estimates of Influence of Flooding on residents' well-being

Predictor Variables	Indices of housing type wellness (a)				
	Mud house is same as before	Worsen brick house	Difficulty in Upgrading mud houses	Increased dilapidation of brick houses	Dilapidation of mud house
Flood in community	-0.156 (0.23)ns	0.608 (.01*)	0.222 (0.58)ns	0.046 (0.86)ns	0.198 (0.62)ns
Flood consequences	0.331 (0.11)ns	0.343 (0.31)ns	1.324 (.03*)	1.294 (.02*)	1.324 (.03*)
Curbing flood	-.565 (.02*)	-1.049 (.01*)	-1.549 (.03*)	-1.055 (.03*)	-1.549 (.03*)
R^2	0.028	0.05	0.021	0.05	0.05
Predictor Variables	Indices of Food Utilities wellness (b)				
	Food production & access		No Improvement in feeding		
Flood in community	0.252 (.03*)		0.465 (.04*)		
Flood consequences	0.140 (0.44)ns		0.147 (0.67)ns		
Curbing flood	-.315 (0.12)ns		-0.543 (0.16)ns		
R^2	0.019		0.007		
	Indices of Health Condition wellness (c)				
Predictor Variables	Ethno-medicine affordability	Preference for traditional health care/self-medication	High cost of Orthodox medicine	Access to Government Hospital visit difficult	
Flood in community	0.240 (.04*)	0.228 (.05*)	-0.213 (.05*)	0.654 (.02*)	

Predictor Variables	Indices of housing type wellness (a)				
	Mud house is same as before	Worsen brick house	Difficulty in Upgrading mud houses	Increased dilapidation of brick houses	Dilapidation of mud house
Flood consequences	0.140 (0.43)ns	0.140 (0.43)ns	-0.066 (0.69)ns	0.176 (0.68)ns	
Curbing flood	-0.315 (0.11)ns	-0.315 (0.12)ns	0.238 (0.23)ns	-0.679 (0.16)ns	
R^2	0.02	0.018	0.016	0.020	
	Indices of Toilet System wellness (d)				
Predictor Variables	Pit latrine maintenance	Water-cistern maintenance	Water-cistern better and void of cholera	Pit latrine maintenance	
Flood in community	0.689 (.04*)	-0.675 (.04*)	-0.641 (.05*)	0.689 (.04*)	
Flood consequences	0.125 (0.81)ns	-0.147 (0.77)ns	-0.184 (0.72)ns	0.125 (0.81)ns	
Curbing flood	-0.587 (0.31)ns	0.592 (0.29)ns	0.587 (0.31)ns	-0.587 (0.31)ns	
R^2	0.018	0.018	0.011	0.018	
	Indices of Lighting System wellness (e)				
Predictor Variables	Light supply via generator	Access to light from government source	Infrequent light supply from govt. source	Light supply from govt. is unaffordable	
Flood in community	-0.245 (.03*)	-0.245 (.03*)	0.979 (.03*)	-0.966 (.03*)	
Flood consequences	-0.074 (0.67)ns	-0.074 (0.67)ns	0.294 (0.67)ns	-0.294 (0.67)ns	
Curbing flood	0.272 (0.16)ns	0.272 (0.16)ns	-1.087 (0.16)ns	1.087 (0.16)ns	
R^2	0.021	0.007	0.015	0.008	
	Index of Water Resources wellness (f)				
Predictor Variables	Borehole not accessible				
Flood in community	-.966 (.03*)				
Flood consequences	-.294 (0.66)ns				
Curbing flood	1.087 (0.16)ns				
R^2	0.021				
	Indices of Cooking Resources wellness (g)				
Predictor Variables	Preference for firewood	Effectiveness of Charcoal pot	Kerosene stove affordable		
Flood in community	-.979 (.03*)	-.671 (.01*)	-.227 (.01*)		
Flood consequences	-.294 (0.66)ns	-.088 (0.83)ns	-.044 (0.74)ns		
Curbing flood	1.087 (0.16)ns	.636 (0.15)ns	.223 (0.15)ns		
R^2	0.021	0.015	0.015		
	Indices of Social Participation wellness (h)				
Predictor Variables	Source of fund for social and Environmental Development	Help meet urgent needs	Help cope with flood hazards	Information source for flood issues	Social connection assured
Flood in community	-0.734 (.03*)	-0.245 (.03*)	-0.245 (.03*)	-0.245 (.03*)	-0.245 (.03*)
Flood consequences	-0.211 (0.66)ns	-0.074 (0.66)ns	-0.074 (0.66)ns	-0.074 (0.66)ns	-0.074 (0.66)ns
Curbing flood	0.815 (0.15)ns	0.272 (0.16)ns	0.272 (0.16)ns	0.272 (0.16)ns	0.272 (0.16)ns
R^2	0.021	0.021	0.021	0.021	0.021
	Indices of Education Access wellness (i)				

Predictor Variables	Indices of housing type wellness (a)				
	Mud house is same as before	Worsen brick house	Difficulty in Upgrading mud houses	Increased dilapidation of brick houses	Dilapidation of mud house
Predictor Variables	Affordability of Education	Motivation on land use education			
Flood in community	-0.071 (0.79)ns	0.002 (0.98)ns			
Flood consequences	-0.897 (.04*)	-0.368 (.04*)			
Curbing flood	0.723 (0.13)ns	0.348 (0.07)ns			
R^2	0.008	0.024			
	Indices of Transportation System wellness (j)				
Predictor Variables	Motorcycle useful for livelihood activities	Products sales occur in the communities			
Flood in community	-0.734 (.03*)	0.006 (0.98)ns			
Flood consequences	0.221 (0.66)ns	-1.471 (.04*)			
Curbing flood	-0.815 (0.15)	1.391 (0.07)			
R^2	0.018	0.007			

Note: β (Beta Coefficient); R^2 = Coefficient of Determination; p-values = in parentheses; ns - not significant and * - Significant @$\alpha_{0.05}$

Source: Field survey (2021)

4.1. Discussion

Flooding Occurrences in in vulnerable communities of Southwest Nigeria

Results in Table 2 revealed that most residents (66.8%) in flood-prone parts of South-western Nigeria signified that flooding occurrence was a common event in their communities from year to year. This indicates that flooding occurrence is a recurring issue year in year out in southwest Nigeria. This corroborates findings of Alimi et al. (2022) that have been severe sufferings from incessant flood occurrence yearly in some vulnerable hinterlands of Southwest Nigeria. Furthermore, it was observed that about 54% of residents experienced flood consequences in the vulnerable communities. This implies that half of the residents were affected by flooding which indicates that their lives, businesses, and properties were destroyed and lost being a flood occurrence. This result aligns with the findings of Alimi et al. (2022) that frequent flooding has resulted into destruction of human lives and properties within the hinterlands of Southwest Nigeria. In addition, about 57% of residents submitted that flooding was curbed in their communities using the best-known indigenous methods and available government interventions. This finding indicates that some more residents in the communities had flooding mitigated by interventions of government in their flood-prone areas.

This result concurred with the submission of Yazid et al. (2017) that agencies of government were responsible for flood control in flood-prone districts using qualitative approach.

Influence of floods in communities on residents' well-being in Southwest Nigeria

The Chi-square results in Table 3 showed that there was significant association between flooding in communities and residents' well-being in respect of mud house being affected (χ^2 = 7.46, p = 0.02), consequences of flooding on mud house being affected (χ^2 =7.85, p =0.02), worsen brick house (χ^2

=10.34, p =0.02) and increased brick house dilapidation (χ^2 =7.33, p =0.03). These findings indicate that flooding with its consequences have serious negative effect on residents' shelter as their housing properties were badly damaged. These results corroborate report of HumAngle (2021) that across the states of Ogun, Oyo and Lagos there are total damage and loss of many houses which led to destruction of lives and businesses. This supports Umar & Gray (2023) that there is devastating effect of floods on housing properties and loss of people's economy. However, there was no observed significant relationship between flooding with its consequences in communities and other residents' well-being indices such as food access, health, toilet system, electricity supply, water supply, cooking resource, social participation, education access and transportation system. Hence, flooding with its consequences in communities do have significant relationship more with the housing well-being of residents than other well-being indices of residents in the flood-prone parts of South-western Nigeria.

Floods' impact on residents' well-being in vulnerable communities of Southwest Nigeria

Table 4(a) reveals that the influence of flooding on residents' well-being was estimated with canonical correlation analysis in the study area. The study found significant and positive influence between flooding in community and residents well-being of the worsening state of brick houses (p = .01, β= 0.608) while flooding consequences also had positive influence on perception of difficulty in upgrading of mud houses (p = .03, β= 1.324) and increased dilapidation of brick houses (p = .02, β=1.294). This implies that the chances of disruptive housing well-being increase by 5% with consequences of flooding rising by 2.1%. This suggests that the more popular flooding and its consequences, the more the probability of disruptive housing in the flood-prone parts of Southwest Nigeria. However, significant but negative influence existed between curbing flooding and residents' perception on unchanging status of mud houses (p = .02, β= -0.565), worsening of brick houses (p = .01, β= -1.049), difficulty in upgrading mud houses (p = .03, β= -1.549), increased dilapidation of brick house (p = .03, β= -1.055) and dilapidation of mud houses (p = .03, β= -1.549). This implies that probability of having a better housing well-being among residents decreases by 2.8%, 5%, 2.1% respectively as curbing flooding increases. This suggests that rising and effective mitigation of flooding might not bring about a better housing well-being for the residents. Thus, flooding can be inferred as having significant influence on residents' housing well-being at α0.05. Furthermore, in Table 4(b) consent of residents on flooding in their community was found to have significant positive influence on residents' perception of food production and access (p = .03, β= 0.252) as well as lack of improvement in feeding (p = .04, β= 0.654). This implies that the probability of improved food production and access well-being increases by 1.9% as flooding rises. This suggests that as flooding increases, the more the chances of residents' access to improved food production. Thus, flooding can be inferred as having a significant influence on food production/security as a well-being utility at α0.05. Also, Table 4(c) shows that a significantly positive influence was established between flooding in the community and residents' perception of ethno-medicine affordability (p = .04, β= 0.240); preference for self-medication (p = .05, β= 0.228). This implies that the chances of residents' well-being on ethno-medicine affordability and self-medication increases by 2% and 1.8% as flooding rises in the communities. This suggests that as flooding occurrences become rampant, the more residents seek affordable ethno-medicinal treatment and self-medication. Implicitly, flooding had significant influence on residents' health maintenance as a factor in their well-being at α0.05. In addition, Table 4(d) shows that significant and positive influence existed between flooding in the community and residents' perception of pit latrine maintenance (p = .04, β= 0.689). This implies that the chances of residents'

well-being on pit latrine maintenance increases by 1.8% as flooding rises in the communities. This suggests that as flooding occurrences become rampant, there is more efficient maintenance of users of pit latrine among residents. However, a negative correlation with using water-cistern (p = .04, β=- 0.675) as well as water-cistern being better and void of cholera (p = .05, β=- 0.641) as toilet systems. This implies that probability of utilizing water-cistern toilets by residents decreases by 1.8%. This suggests that as flooding becomes massive and incessant, the lower the probability of embracing water-cistern toilets usage by residents, indicating that residents can be reckless with disposing defecation into the deluge of floodwater creating polluted environment. Thus, it can be inferred that flood had significant influence on residents' toilet system as an index of their well-being at α0.05.

In Table 4(e), flooding had influence on residents' well-being of electricity supply. This shows a that flooding has a significant and negative correlation with residents' perception of electricity supply via generator (p = .03, β=- 0.245), access to light from government source (p = .03, β=- 0.245). This implies that the chances of accessing electricity through generator decreases by 0.7% as flooding increases. This suggests that as flooding becomes popular, the lower the probability of accessing electricity through generator by residents because electricity infrastructure are exposed to massive water which are estrange to their efficient functioning. By implication, flood significantly influences the study area lighting system as a factor in residents' well-being at α0.05. Furthermore, Table 4(f) shows that flooding had influence on residents' well-being of water resources. This shows that flooding has a significant and negative correlation with residents' perception of borehole accessibility (p = .03, β=- 0.979). This implies that the chance of accessing borehole decreases by 2.1% as flooding increases. This suggests that as flooding becomes popular, the lower the probability of accessing borehole by residents because sediment and silt overload might hinder sinking and amplify pollution of water sources. This may significantly influence access to water resources where other sources are limited. In Table 4(g), consent on flooding in communities was equally found to have influence on residents' wellbeing of cooking resources. This shows that flooding has a significant and negative correlation with residents' perception on preference for fuel wood (firewood) (p = .03, β=- 0.979), effectiveness of charcoal pot (p = .01, β=- 0.671) and affordability of kerosene stove (p = .01, β=- 0.227) as cooking resource. This implies that the chances of accessing fuel wood, effective charcoal pot, and affordable cooking stove decreases by 2.1%, 1.5% and 1.0% respectively as flooding increases. This suggests that as flooding becomes popular, the lower the probability of accessing fuel wood, effective charcoal pot, and affordable cooking stove by residents because there is difficulty in the use of fuel wood and charcoal especially as result of space. Invariably, flooding could be inferred to significantly influence cooking resources as a factor in residents' well-being at α0.05.

Also, Table 4(h) reveals that consent on flooding was also found to have influence on residents' well-being on sources of funds. This shows that flooding has a significant and negative correlation with residents' perception on sources of funds for social and environmental development (p = .03, β=- 0.734), meeting urgent needs (p = .03, β=- 0.245), coping with flood hazards (p = .03, β=- 0.245) as well as sourcing information and getting social connection (p = .03, β=- 0.245) through social gatherings and participation. This implies that the chances of sourcing funds for social and environmental development, meeting urgent needs, coping with flood hazards, information and getting social connection decreases by 2.1% as flooding increases. This suggests that as flooding becomes popular, the lower the chances of getting funds for social and environmental development, meeting urgent needs, coping with flood

hazards, information and getting social connection because excuses would start trickling in from government agency based on the need to build infrastructure to combat the floods, thereby limiting the well-being of residents. Implicitly flood significantly influenced negatively social participation as a well-being factor at α0.05.

Table 4(i) shows that the consequences of flood on residents were found to influence affordability of education (p = .04, β=- 0.071), and motivation on land use education (p = .04, β=- 0.368). This implies that the chances of affordable education, and motivation on land use education decreases by 0.8% and 2.4% as flooding increases. This suggests that as flooding increases, the lower the probability of residents' access to affordable education and motivation on land use education because flooding creates limitation to movement of people from transiting from one place to another. By implication, flood has a significant influence negatively on education because residents are unable to make better choices for their wards, which may hamper their performance as a well-being factor at α0.05.

Table 4(j) shows that residents' consent to occurrence of flooding in the study area was found to bear positive correlation with their perception on the usefulness of motorcycle for livelihood activities (p = .03, β=0.734). This implies that the chances of residents' well-being on the usefulness of motorcycle for farming activities increases by 1.8% as flooding rises in the communities. This suggests that as flooding occurrences become rampant, there is constant use of motorcycle for livelihood activities among residents in the vulnerable communities because vehicular movement is easier with motorcycles based on its ability to maneuverer ponded areas than other motor vehicles.

5. Conclusion

This study demonstrates that flooding is an incessant occurrence and structurally embedded hazard in vulnerable communities of southwest Nigeria, with statistically significant and multidimensional impacts on residents' well-being. The findings show that flooding most severely affects housing infrastructure, particularly mud and brick houses while also exerting indirect but significant influences on food security, health-seeking behaviour, sanitation systems, energy access, water resources, education, social participation, and livelihood mobility. These outcomes underscore flooding as a major climate-induced stressor, consistent with SDG 13 (Climate Action), highlighting the urgency of adaptive and mitigation strategies that enhance community resilience to climate variability and extreme hydrological events.

Furthermore, the observed degradation of land-based assets, housing stability, water sources, fuelwood availability, and sanitation systems reflects broader pressures on terrestrial ecosystems and human–land interactions, aligning with SDG 15 (Life on Land). Recurrent flooding not only undermines sustainable land use and settlement patterns but also accelerates environmental degradation, weakens ecosystem services, and constrains long-term livelihood sustainability. While some indigenous coping strategies and government interventions exist, their limited effectiveness suggests that current flood management approaches are insufficient to secure improved well-being outcomes. Overall, the study establishes flooding as a critical nexus between climate change, land degradation, and human vulnerability in Southwest Nigeria.

- Based on the study findings, the following recommendations are proposed to salvage resident's exposure to incessant flood disaster in southwest Nigeria:

- Integrated Climate Adaptation and Land-Use Planning (SDG 13 & 15): Government and planning authorities should mainstream flood-risk assessments into land-use planning, housing development, and settlement zoning to reduce exposure of vulnerable communities to recurrent flooding.
- Nature-Based and Ecosystem-Oriented Solutions (SDG 15): Restoration of wetlands, riparian buffers, and floodplains, alongside afforestation and sustainable watershed management, should be prioritized to enhance natural flood regulation and protect terrestrial ecosystems.
- Climate-Resilient Housing and Infrastructure (SDG 13): Promotion of flood-resilient building materials, improved housing designs, and climate-proofed infrastructure is essential to reduce housing dilapidation and long-term livelihood losses.
- Community-Based and Indigenous Knowledge Integration (SDG 13): Indigenous flood-mitigation practices should be scientifically validated and integrated with modern engineering interventions to strengthen locally appropriate and cost-effective adaptation strategies.
- Sustainable Energy, Water, and Sanitation Systems (SDG 13 and 15): Investment in decentralized, flood-resilient water, sanitation, and clean energy systems will reduce environmental pollution, protect land and water resources, and enhance public health during flood events.
- Policy Support, Education, and Institutional Coordination (SDG 13): Strengthening institutional coordination, funding mechanisms, and climate-focused education particularly land-use and environmental education will enhance adaptive capacity and promote sustainable development in flood-prone landscapes.
- Collectively, these measures will advance climate resilience, protect terrestrial ecosystems, and improve human well-being, thereby contributing meaningfully to the achievement of SDG 13 (Climate Action) and SDG 15 (Life on Land) in vulnerable regions of Nigeria.

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