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EMPOWERING SMALL-SCALE FISHERS: OVERCOMING STRUCTURAL CONSTRAINTS IN KENYA'S BLUE ECONOMY

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ABSTRACT

Small-scale fisheries support millions of livelihoods across the Global South, yet fishing households remain among the most vulnerable to poverty, climate shocks, and institutional exclusion. This study examines the determinants of livelihood vulnerability and resilience among small-scale fishers in Mbita Sub-County, Kenya, within the context of climate variability, governance constraints, and limited access to productive assets. Drawing on the Sustainable Livelihoods Framework and operationalizing insights from structural violence theory, the study employs a mixed-methods design combining a household survey of 450 fishing households with focus group discussions and key informant interviews. Quantitative data are analyzed using multivariate regression models to identify factors associated with livelihood vulnerability, while qualitative evidence contextualizes institutional and socio-cultural dynamics shaping livelihood outcomes. The results show that climate variability, weak fisheries governance, limited access to financial services, and inadequate post-harvest infrastructure significantly increase livelihood vulnerability, while participation in social organizations, education, and livelihood diversification enhances resilience. Female-headed households face disproportionately higher vulnerability due to gendered access to assets and institutions. The findings highlight persistent structural constraints within the Blue Economy framework that undermine small-scale fishers' adaptive capacity. Policy implications emphasize the need for inclusive fisheries governance, gender-responsive financial services, and targeted livelihood diversification strategies to promote equitable and resilient small-scale fisheries in Kenya and similar contexts.

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INTRODUCTION

Small-scale fisheries provide livelihoods for more than 90 percent of the world's capture fishers and play a critical role in food security, employment, and local economies across the Global South (FAO, 2015; Béné et al., 2016). Despite their economic and nutritional importance, small-scale fishing households remain among the most vulnerable populations, facing persistent poverty, livelihood insecurity, and increasing exposure to climate and ecological shocks (Allison and Ellis, 2001; Béné, 2003; Cinner et al., 2018). Nowhere are these vulnerabilities more pronounced than in inland fisheries systems such as Lake Victoria, where fishing livelihoods are shaped by environmental variability, institutional weaknesses, and uneven integration into national Blue Economy strategies (LVFO, 2016; Downing et al., 2022). Recent policy increasingly views the Blue Economy as a pathway to inclusive growth, sustainable

resource use, and poverty reduction in fisheries-dependent regions (UNEP, 2018; World Bank, 2021). Yet, evidence shows Blue Economy interventions often reinforce inequalities. They favor industrial actors, infrastructure, and export-driven value chains, which marginalize small-scale fishers (Bennett et al., 2021; Childs and Hicks, 2019). Small-scale fishing communities face weak governance, limited access to finance, inadequate post-harvest infrastructure, and restricted participation in decision-making (Jentoft, 2017; FAO, 2015). These constraints, coupled with climate-related stressors, worsen vulnerability and limit adaptive capacity (Badjeck et al., 2010; Adger et al., 2005).

Research documents challenges such as climate change impacts, overfishing, market exclusion, and policy bias faced by small-scale fishers (Allison et al., 2009; Béné et al., 2010; Cinner et al., 2012). While these studies identify key stressors, most catalogue constraints rather than explain persistent vulnerability or the emergence of resilience under structural disadvantages (Fabinyi et al., 2014; Said et al., 2020). Empirical studies using multivariate analysis to assess the relative roles of climatic, institutional, and socioeconomic drivers are still limited, especially for inland fisheries in sub-Saharan Africa (Imbwae et al., 2023; Opondo et al., 2024). Concepts such as resilience, sustainability, and adaptation are widely cited but are often not linked to the political–economic structures that govern access to resources, markets, and institutions (Scoones, 2015; Ribot, 2014). Structural violence theory helps explain how institutionalized inequalities restrict livelihood opportunities and expose small-scale fishers and women-headed households to higher risks (Galtung, 1969; Farmer, 2004). However, few fisheries studies empirically link these constraints to measurable livelihood outcomes (Béné et al., 2016; Bennett et al., 2021).

Within this theoretical context, gendered aspects of livelihood vulnerability in small-scale fisheries remain underexplored. Women are integral to fishing economies—processing, trading, and managing households—yet often face exclusion from assets, finance, and governance (Weeratunge et al., 2010; Harper et al., 2020). Studies note gender disparities but rarely analyze gender as a factor in vulnerability and resilience (Frangoudes et al., 2019).

This study examines the drivers of livelihood vulnerability and resilience among small-scale fishers in Mbita Sub-County, Kenya. It integrates the Sustainable Livelihoods Framework (Chambers and Conway, 1992; Scoones, 1998) with a structural violence perspective. The analysis primarily focuses on the household level, capturing the dynamics of individual, interpersonal, and collective factors. The study addresses three questions: (i) how climate and ecological stressors affect vulnerability; (ii) how governance, finance access, and group membership at the community level shape adaptive capacity; and (iii) to what extent gender mediates livelihood outcomes at both individual and household levels.

This study makes three central contributions. First, it clarifies how climatic, institutional, and socioeconomic factors contribute to persistent vulnerability. Second, it applies structural violence theory to livelihoods, showing how governance failures and exclusion create measurable outcomes. Third, it offers a gender-sensitive analysis illustrating how gendered access to assets and institutions shapes adaptive capacity and resilience. Addressing these drivers, the study provides evidence for more inclusive, equitable, and resilient small-scale fisheries and Blue Economy strategies in Kenya and comparable inland fisheries systems.

Literature Review

Livelihood Vulnerability in Small-Scale Fisheries

Small-scale fisheries are widely recognized for their contribution to food security, employment, and poverty reduction, particularly in the Global South. However, a substantial body of literature shows that fishing households remain disproportionately vulnerable to poverty and livelihood insecurity (Allison and Ellis, 2001; Béné, 2003; FAO, 2015). This paradox has been attributed to the interaction of environmental shocks, weak governance systems, and limited access to productive assets, rather than to individual behaviour or occupational choice. The Sustainable Livelihoods Framework has been extensively used to analyze these dynamics, highlighting how vulnerability arises from exposure to shocks combined with constrained access to human, social, financial, physical, and natural capital (Chambers and Conway, 1992; Scoones, 1998). In fisheries contexts, livelihood outcomes are particularly sensitive to environmental variability and institutional arrangements that regulate access to resources, markets, and decision-making processes (Allison et al., 2009; Béné et al., 2016).

Climate Variability and Ecological Stressors

Climate variability and ecological degradation are consistently identified as major drivers of vulnerability in small-scale fisheries. Rising temperatures, altered rainfall patterns, extreme weather events, and ecosystem degradation have been shown to reduce fish stocks, restrict fishing effort, and increase physical risks for fishers (Adger et al., 2005; Badjeck et al., 2010; Cinner et al., 2018). Recent studies emphasize that climate change acts less as an episodic shock and more as a chronic stressor that cumulatively undermines livelihoods over time (Eriksen et al., 2021).

In inland and coastal fisheries across sub-Saharan Africa, climate impacts are compounded by pollution, invasive species, and habitat degradation, leading to declining catches and increased livelihood instability (Opondo et al., 2024). Evidence from Lake Victoria and other inland water bodies shows that invasive aquatic weeds, such as water hyacinth, disrupt access to fishing grounds, damage gear, and increase health and safety risks, thereby intensifying vulnerability among fishing households (Kiyemba et al., 2023; Degaga, 2019).

Importantly, climate impacts are unevenly distributed. Households with limited financial reserves, weak social networks, and restricted livelihood options are less able to absorb or adapt to environmental stress, reinforcing the view that climate change functions as a threat multiplier that amplifies existing inequalities (Ribot, 2014; Cinner et al., 2018).

Governance, Institutions, and Market Exclusion

Beyond environmental stressors, governance failures and institutional constraints play a central role in shaping livelihood vulnerability in small-scale fisheries. Numerous studies document how weak regulatory frameworks, limited enforcement capacity, and policy biases favouring industrial fisheries undermine the sustainability of small-scale fishing livelihoods (Jentoft, 2017; FAO, 2015; Bennett et al., 2021). In many contexts, small-scale fishers face restricted access to finance, insurance, and post-harvest infrastructure, limiting their ability to invest, manage risk, and improve returns from fishing activities.

Market exclusion further exacerbates vulnerability. Small-scale fishers often lack bargaining power, product differentiation, traceability, and access to formal markets, leaving them dependent on intermediaries and exposed to exploitative pricing arrangements (Abila, 2000). Similar patterns have been documented across Africa and Asia, where inadequate public infrastructure and limited financial services constrain value addition and livelihood upgrading (Smithrithee and Chamsai, 2022; FAO, 2019). Illegal, unreported, and unregulated (IUU) fishing represents another governance-related challenge, both as a driver and a consequence of vulnerability. Weak enforcement, corruption, and high entry costs into legal fishing operations often push poorer fishers into informal or illegal practices, further entrenching marginalization and ecological degradation (Jallow et al., 1999; Temple et al 2022).

Structural Violence and Livelihood Outcomes

While the challenges facing small-scale fisheries are well documented, fewer studies explicitly link these constraints to broader political–economic structures. Structural violence theory provides a useful framework for understanding how institutionalized inequalities restrict access to resources and opportunities, producing persistent livelihood vulnerability (Fobosi & Malima, 2025; Farmer, 2004). In fisheries contexts, structural violence is reflected in exclusionary governance systems, inequitable market relations, and policy regimes that prioritize large-scale actors at the expense of small-scale fishers (Blue Justice, 2019; Bennett et al., 2021).

Despite its conceptual relevance, structural violence remains underutilized in empirical fisheries research. Most studies acknowledge governance failures descriptively but stop short of operationalizing them analytically or linking them to measurable livelihood outcomes. This gap limits understanding of why vulnerability persists even where adaptation and diversification strategies are promoted.

Gendered Dimensions of Vulnerability and Livelihood Strategies

Gender inequality is a critical yet insufficiently analyzed determinant of livelihood vulnerability in small-scale fisheries. Women play essential roles in post-harvest processing, fish trading, and household livelihood management, but remain structurally disadvantaged in access to productive assets, financial services, training opportunities, and fisheries governance institutions (Weeratunge et al., 2010; Harper et al., 2020). These institutional and market barriers translate into differentiated livelihood outcomes, with female-headed households often facing disproportionate exposure to

income instability, food insecurity, and limited adaptive capacity.

Although existing scholarship acknowledges women's marginalization in fisheries, gender is frequently treated descriptively rather than analytically, and is not integrated into empirical models explaining vulnerability and resilience (Frangoudes et al., 2019). As a result, the intersection of gender with climate stress, governance constraints, and livelihood strategies remains under-examined, particularly in inland fisheries systems where gendered labor divisions and institutional exclusion are pronounced.

Across the broader fisheries literature, climate variability, governance failures, market exclusion, and gender inequality are consistently identified as major stressors shaping livelihood vulnerability (Atieno et al., 2024). However, three persistent gaps remain. First, much of the evidence remains descriptive, offering limited empirical assessment of the relative importance of different vulnerability drivers. Second, political–economic perspectives linking institutional constraints to livelihood outcomes—such as structural violence—are rarely operationalized in quantitative analysis. Third, gendered dimensions of vulnerability are inadequately embedded within analytical frameworks, limiting insight into how institutional exclusion differentially affects men and women.

Addressing these gaps, this study integrates the Sustainable Livelihoods Framework with an empirically operationalized structural violence perspective to examine how climate exposure, institutional access, and gendered constraints jointly shape livelihood vulnerability and resilience among small-scale fishers in Mbita Sub-County, Kenya

Theoretical Framework: Structural Violence and Livelihood Vulnerability

This study is anchored in structural violence theory (Galtung, 1969, 2008) and the Sustainable Livelihoods Framework (SLF)(UNDP, 2017). to explain persistent livelihood vulnerability among small-scale fishers. According to Galtung, violence is more than physical harm; it includes social arrangements that prevent people from meeting basic needs. Structural violence, therefore, refers to systemic social, economic, and political arrangements that constrain individuals' ability to meet basic needs and achieve wellbeing. In small-scale fisheries, such violence manifests through institutional exclusion, inequitable governance, limited access to financial services, and policy biases favoring industrial actors.

In this study, structural violence is conceptualized through measurable livelihood constraints, including weak fisheries governance, lack of access to credit and insurance, inadequate post-harvest infrastructure, and exclusion from decision-making processes. These constraints interact with climate-induced shocks—such as weather variability and ecological degradation—to intensify livelihood vulnerability.

The Sustainable Livelihoods Framework complements this perspective by emphasizing how access to human, social, financial, physical, and natural capital shapes households' capacity to cope with shocks and pursue resilient livelihood strategies. Social organizations, education, and livelihood diversification are treated as resilience-enhancing mechanisms that can mitigate structural disadvantages.

By integrating structural violence theory with the SLF, the study advances an analytical framework that links macro-level institutional failures to micro-level livelihood outcomes, allowing for empirical testing of how governance and social inequalities shape vulnerability and resilience in small-scale fisheries.

Testable Hypotheses

H1: Climate variability significantly increases livelihood vulnerability among small-scale fishers.

H2: Limited access to fisheries governance and financial services increases livelihood vulnerability among small-scale fishers.

H3: Participation in social organizations reduces livelihood vulnerability among small-scale fishers.

H4: Female-headed fishing households experience higher livelihood vulnerability than male-headed households.

H5: Livelihood diversification reduces vulnerability among small-scale fishing households.

METHODOLOGY

Study Area and Research Design

The study was conducted in Mbita Sub-County, located along the Kenyan shores of Lake Victoria, an inland fisheries system characterized by high dependence on small-scale fishing and increasing exposure to climatic, ecological, and institutional stressors. A mixed-methods research design was employed to capture both the

measurable determinants of livelihood vulnerability and the institutional and social processes shaping fishing livelihoods. Quantitative data were collected through a structured household survey administered to 450 small-scale fishing households. A stratified sampling approach was applied using the landing site as the primary stratification variable (Koguna, Nyamasare, Litare, Lwanda Rombo). Within each stratum, household lists obtained from Beach Management Units (BMUs) served as the sampling frame. Proportional allocation ensured representation consistent with household distribution across sites. Simple random sampling was then applied within each stratum.

The sample size of 450 households was determined using Cochran's (1977) formula for proportions, assuming a 95% confidence level, 5% margin of error, and maximum variability ($p = 0.5$). Given the estimated population of registered fishing households across the four landing sites, the calculated minimum sample was 384 households. This was inflated by 15% to account for potential non-response and incomplete questionnaires, yielding a final target sample of 442. A total of 450 completed surveys were obtained, exceeding the minimum requirement and ensuring adequate statistical power for multivariate modelling.

Qualitative Sampling Strategy

Participants for the qualitative component were selected using purposive sampling to ensure representation across gender, age groups, occupational roles (fishers, traders, processors), and institutional positions. A maximum variation sampling strategy was applied to capture diverse experiences and perspectives across landing sites and governance levels. Qualitative data were collected through six Focus Group Discussions (FGDs), each comprising 8–10 participants, and twelve Key Informant Interviews (KIIs). The FGDs brought together diverse fishing community members to capture collective perspectives on climate stress, governance, and livelihood strategies, while the KIIs were conducted with Beach Management Unit (BMU) leaders, fisheries officers, women fish traders, and cooperative representatives to obtain institutional and gender-informed insights. This combined approach facilitated triangulation between household-level experiences and broader governance and market dynamics, thereby strengthening the depth and credibility of the qualitative findings.

Coding Process

All interviews and focus group discussions were audio-recorded, transcribed verbatim, and analyzed using NVivo 14 software. A hybrid deductive–inductive coding approach was employed, combining theory-driven codes derived from the Sustainable Livelihoods Framework and structural violence constructs with emergent themes from the data.

Saturation

Data saturation was reached after the fifth focus group discussion and the tenth key informant interview, as no substantially new themes emerged. Two additional interviews were conducted to confirm thematic stability and ensure analytical completeness.

Measurement of Livelihood Vulnerability

Dependent Variable: Livelihood Vulnerability Index (LVI)

Livelihood vulnerability was operationalized using a composite Livelihood Vulnerability Index (LVI) derived from indicators adapted from the Progress out of Poverty Index (PPI) and the Sustainable Livelihoods Framework (SLF). The Livelihood Vulnerability Index (LVI) was constructed using 18 indicators organized into five capital domains consistent with the Sustainable Livelihoods Framework: human capital (education years, dependency ratio, health access), financial capital (income stability, savings, credit access), physical capital (housing quality, asset ownership), social capital (group membership, institutional participation), and natural capital exposure (climate disruptions, lake access volatility). All indicators were standardized using min–max normalization to scale values between 0 and 1. Equal weighting was applied across indicators to reflect theoretical multidimensional parity and the absence of a strong empirical basis for differential weighting. Robustness checks using principal component analysis (PCA)-derived weights yielded substantively similar results, supporting the stability of the index construction.

The binary vulnerability threshold was defined using the sample median LVI score. Households above the median were classified as vulnerable (1) and those below as non-vulnerable (0). Sensitivity analysis using tertile and poverty-line-based thresholds yielded consistent model coefficients, reinforcing robustness. Internal consistency of the composite LVI was assessed using Cronbach's

alpha (α = 0.79), indicating acceptable reliability (Azpitarte et al., 2020).

Independent Variables

Key explanatory variables were selected based on existing literature and study objectives. Climate variability exposure captures the frequency of adverse weather events, lake condition volatility, and fishing disruptions. Access to financial services measures household access to credit, savings, and insurance instruments. Fisheries governance strength reflects perceived institutional effectiveness in regulation, enforcement, and policy support. Social organization membership indicates participation in cooperatives, self-help groups, or savings associations, capturing social capital effects. Additional covariates include the gender of the household head, years of formal education, and livelihood diversification, defined as engagement in non-fishing income-generating activities. Control variables include age of the household head, household size, and years of residence in the fishing area to account for demographic and locational heterogeneity.

Econometric Model Specification

Diagnostic tests were conducted to assess potential violations of model assumptions. Variance Inflation Factors (VIFs) were calculated to evaluate multicollinearity among explanatory variables. All VIF values were below 3.5, well below the commonly used threshold of 10, indicating that multicollinearity is unlikely to bias coefficient estimates. To identify determinants of livelihood vulnerability, three complementary econometric models were estimated.

Model 1: Binary Logistic Regression

A binary logit model estimates the probability that household i is classified as vulnerable:

$Pr(Vulnerability_i = 1) = f(Climate_i, Institutions_i, Finance_i, Gender_i, X_i)$. Eq.....1

where X_i represents a vector of control variables. Coefficients are interpreted in terms of marginal effects on the probability of vulnerability.

Model 2: Ordered Logit Model

Given the ordinal structure of vulnerability categories, an ordered logit model was estimated:

$$Vulnerability_i^* = \beta_0 + \beta_1 Climate_i + \beta_2 SocialCapital_i + \beta_3 Gender_i + \beta_4 Diversification_i + \varepsilon_i$$

Observed vulnerability categories correspond to threshold cut-points on the latent vulnerability distribution, allowing assessment of how covariates shift households across vulnerability levels.

Model 3: Interaction Model (Gender × Institutions)

To test whether institutional access differentially affects vulnerability by gender, an interaction model was specified:

$$Vulnerability_i = \beta_0 + \beta_1 Climate_i + \beta_2 Gender_i + \beta_3 Finance_i + \beta_4 (Gender_i \times Finance_i) + \varepsilon_i$$

This specification captures gender-mediated institutional effects, enabling evaluation of whether financial access exerts a stronger protective effect for female-headed households.

RESULTS

Descriptive Statistics

Table 1 presents descriptive statistics for all variables used in the econometric analysis. The results indicate considerable variation in livelihood conditions across fishing households. Climate variability exposure exhibits a relatively high mean value, reflecting frequent weather-related disruptions affecting fishing activity. Access to financial services and participation in social organizations remain unevenly distributed, suggesting significant institutional disparities within fishing communities.

Determinants of Livelihood Vulnerability

Table 2 presents estimates from the binary logit and ordered logit models assessing the determinants of livelihood vulnerability among small-scale fishers. Climate variability exhibits a strong and statistically significant positive association with vulnerability, indicating that households experiencing frequent adverse weather events and lake disruptions face a substantially higher risk of livelihood insecurity. Weak fisheries governance is also positively associated with vulnerability, underscoring the role of institutional failures in shaping livelihood outcomes. Access to financial services significantly reduces vulnerability, suggesting that credit, savings, and insurance mechanisms enhance households' capacity to smooth income and manage risk. Similarly, participation in social organizations and engagement in diversified livelihood activities exert protective effects, highlighting the buffering role of social capital and income diversification. Education is associated with lower vulnerability, reflecting the contribution of human capital to adaptive capacity.

Table 1. Descriptive Statistics of Variables Used in the Econometric Analysis.

Variable	Mean	Std. Dev	Min	Max
Livelihood Vulnerability Index	0.52	0.17	0.12	0.89
Climate variability exposure	0.61	0.20	0.10	0.95
Access to financial services	0.41	0.24	0	1
Social organization membership	0.46	0.50	0	1
Livelihood diversification	0.39	0.49	0	1
Female-headed household	0.35	0.48	0	1
Education (years)	7.8	3.6	0	15
Household size	5.4	2.1	1	12
Years in fishing	13.6	7.4	1	40

Values are based on household survey data collected in Mbita Sub-County, Kenya (2024).

Table 2. Determinants of Livelihood Vulnerability among Small-Scale Fishers.

Variables	Binary Logit (1)	Ordered Logit (2)
Climate variability exposure	0.842*** (0.192)	0.765*** (0.174)
Weak fisheries governance	0.531** (0.214)	0.487** (0.201)
Access to financial services	−0.719*** (0.203)	−0.654*** (0.189)
Social organization membership	−0.402** (0.188)	−0.356** (0.171)
Livelihood diversification	−0.628*** (0.179)	−0.591*** (0.165)
Female-headed household	0.463** (0.198)	0.421** (0.184)
Education (years)	−0.071* (0.038)	−0.063* (0.035)
Age of household head	0.014 (0.012)	0.011 (0.010)
Household size	0.087* (0.048)	0.079* (0.045)
Years in fishing	−0.019 (0.015)	−0.017 (0.014)
Constant / Cut-points	−1.324*** (0.411)	Yes
Observations = 450		
Pseudo R^2 = 0.27 (Logit), 0.31 (Ordered Logit)		
Log-Likelihood = −214.6, −201.8		

Standard errors in parentheses Significance levels: * p < 0.10, ** p < 0.05, *** p < 0.01

Table 3 reports results from the interaction model testing whether financial access differentially affects male- and female-headed households. The interaction term between gender and financial access is negative and statistically significant, indicating that access to financial services yields stronger vulnerability-reducing effects for female-headed households. Predicted probability estimates are illustrated in Figure 1. Data reflected in the figure further show that while women-headed households face higher baseline vulnerability, improved financial inclusion substantially narrows this gap.

Table 4 presents average marginal effects, which indicate that a one-unit increase in climate exposure raises vulnerability probability by approximately 19 percentage points, whereas access to financial services reduces vulnerability by about 17 percentage points. Livelihood diversification lowers vulnerability by 15 percentage points, reinforcing its importance as a resilience strategy. These findings demonstrate that livelihood vulnerability is jointly shaped by climate stress, institutional access, social capital, and gendered constraints.

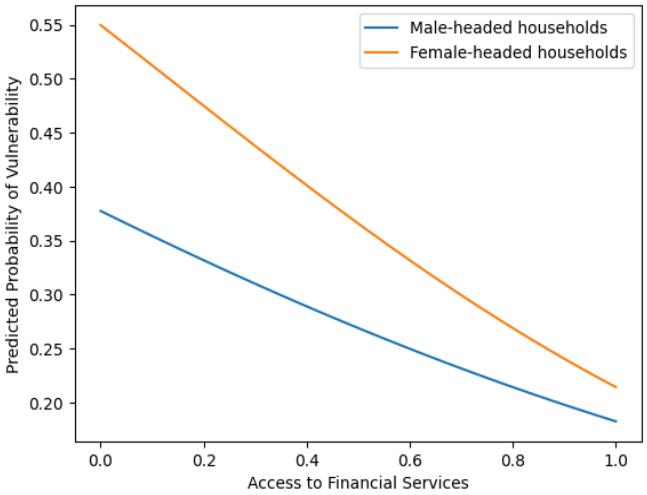

Figure 1. Predicted probability of livelihood vulnerability by gender and financial access.

Table 3. Interaction Model (Gender × Financial Access).

Variables	Coefficient	Std. Error
Climate variability exposure	0.812***	(0.184)
Female-headed household	0.468**	(0.196)
Access to financial services	−0.732***	(0.201)
Gender × Financial access	−0.421**	(0.178)
Social organization membership	−0.354**	(0.169)
Livelihood diversification	−0.602***	(0.164)
Education (years)	−0.065*	(0.034)
Household size	0.082*	(0.043)
Constant	−1.298***	(0.402)
Observations: 450		
Pseudo R^2: 0.29		

Dependent Variable: Livelihood Vulnerability (Binary Logit) Standard errors in parentheses

Significance levels: * p < 0.10, ** p < 0.05, *** p < 0.01

Table 4. Average Marginal Effects on Probability of Vulnerability.

Variable	Marginal Effect (Δ Probability)	Std. Error
Climate variability exposure	0.19***	(0.04)
Access to financial services	−0.17***	(0.05)
Social organization membership	−0.09**	(0.03)
Livelihood diversification	−0.15***	(0.04)
Female-headed household	0.11**	(0.04)
Education (years)	−0.03*	(0.02)

Standard errors in parentheses Significance levels: * p < 0.10, ** p < 0.05, *** p < 0.01

DISCUSSION

This study explains why livelihood vulnerability persists among small-scale fishing households despite the sector's widely acknowledged input to food security, employment, and local economies. By integrating the Sustainable Livelihoods Framework with an operationalized structural violence perspective, the findings demonstrate that livelihood outcomes in Mbita Sub-County are shaped less by individual effort or occupational choice and more by the interaction of climate variability, governance constraints, and unequal access to productive assets. This supports a growing body of scholarship arguing that vulnerability in small-scale fisheries is fundamentally structural rather than behavioural (Allison and Ellis, 2001; Béné et al., 2010). These findings illustrate differentiated impacts across SLF capitals: financial capital deficits increase vulnerability; social capital buffers risk; human capital enhances adaptation; and institutional failures constrain asset conversion.

Climate Variability as a Structural, Not Episodic, Shock

The results show that climate and weather variability are the most significant drivers of livelihood vulnerability among small-scale fishers. While much of the early climate–fisheries literature conceptualized climate impacts as episodic shocks—such as storms, floods, or extreme temperature events—the evidence from Mbita Sub-County indicates that climate variability constitutes a chronic and structural condition that continuously undermines livelihood stability. Reduced fishing days, gear destruction, and heightened physical risk translate into sustained income losses and labour constraints, rather than temporary disruptions.

This finding is consistent with recent work emphasizing that climate change operates as a slow-onset stressor in small-scale fisheries, gradually eroding adaptive capacity and reinforcing existing socioeconomic inequalities (Adger et al., 2005; Badjeck et al., 2010; Cinner et al., 2018). Importantly, the study extends this literature by empirically demonstrating that climate stress interacts with institutional and financial constraints, producing cumulative vulnerability rather than isolated impacts.

Moreover, climate impacts are shown to be socially differentiated. Households with limited access to savings, credit, and alternative income sources are less able to absorb climatic shocks, confirming arguments that climate change functions as a threat multiplier

rather than a neutral environmental process (Ribot, 2014; Eriksen et al., 2021). From a policy perspective, this challenges technocratic adaptation approaches that focus narrowly on environmental management or climate information services without addressing underlying socioeconomic and institutional barriers.

Governance Constraints & Institutionalized Exclusion

Beyond climate stress, the findings identify weak fisheries governance and limited institutional support as central mechanisms through which livelihood vulnerability is produced and sustained. According to Kalina et al (2019) institutional exclusion constitutes a form of structural violence insofar as it systematically constrains access to essential livelihood resources, thereby limiting fishers' capacity to meet basic needs and exercise agency. Households reporting poor access to fisheries institutions, financial services, and post-harvest infrastructure were significantly more vulnerable, underscoring the role of governance failures in shaping livelihood outcomes. This aligns with critical fisheries governance literature showing that small-scale fishers are often systematically excluded from policy processes, resource allocation, and market opportunities (Jentoft, 2017; FAO, 2015).

From a structural violence perspective, such governance failures constitute a form of indirect violence that constrains access to essential resources and opportunities (Galtung, 1969; Farmer, 2004). The absence of affordable credit, insurance schemes, and storage infrastructure limits fishers' ability to smooth income, reduce post-harvest losses, and invest in adaptive strategies. These constraints are not accidental or temporary; rather, they reflect entrenched institutional arrangements that privilege industrial and export-oriented fisheries over small-scale and locally embedded systems (Bennett et al., 2021; Blue Justice, 2019). The findings therefore, help explain why livelihood diversification and resilience remain limited despite long-standing policy recognition of the importance of small-scale fisheries. Without substantive reforms in governance and institutional support, policy commitments risk remaining rhetorical rather than transformative.

Social Capital as a Buffer against Vulnerability

Participation in social organizations—including self-help groups, savings associations, and community-based organizations—emerged as a significant factor reducing livelihood vulnerability. This supports extensive livelihoods and fisheries literature emphasizing the role of social capital in enhancing coping capacity, facilitating information exchange, and enabling collective action in contexts where formal institutions are weak (Pretty and Ward, 2001; Allison and Horemans, 2006; Béné et al., 2016).

In Mbita Sub-County, social organizations function as informal safety nets, providing access to credit, labour-sharing arrangements, and mutual support during periods of climatic or economic stress. However, the findings also reveal the limits of social capital. While community-based networks enhance household-level resilience, they cannot fully compensate for systemic institutional failures. Over-reliance on informal mechanisms risks shifting responsibility for adaptation from the state to communities, potentially obscuring deeper governance deficiencies (Cleaver, 2012; Ribot et al., 2014). This tension underscores the need to conceptualize social organizations not as substitutes for public institutions, but as complementary mechanisms whose effectiveness depends on supportive and inclusive policy environments.

Gendered Dimensions of Livelihood Vulnerability

The analysis reveals that female-headed fishing households experience significantly higher levels of livelihood vulnerability, even after controlling for education, climate exposure, and livelihood strategies. This finding confirms that vulnerability in small-scale fisheries is deeply gendered, reflecting structural inequalities in access to assets, finance, and decision-making power (Weeratunge et al., 2010; Harper et al., 2020). Although women play a central role in post-harvest processing, trading, and household livelihood management, they remain systematically marginalized within formal fisheries governance and financial systems. The persistence of gendered vulnerability cannot be explained solely by household-level characteristics; rather, it reflects institutional arrangements that privilege male-dominated capture fisheries while rendering women's economic contributions less visible and less valued (Frangoudes et al., 2019).

By empirically demonstrating gender-differentiated vulnerability, this study advances fisheries scholarship that has often acknowledged gender inequality

descriptively but failed to integrate it analytically. The findings suggest that resilience-building interventions that do not explicitly address gendered access to resources risk reinforcing existing inequalities rather than reducing vulnerability.

Livelihood Diversification: Necessary but Insufficient

Livelihood diversification is widely promoted as a pathway to resilience in small-scale fisheries, and the findings support its protective effect against vulnerability. Households engaged in diversified income-generating activities—such as small-scale farming, trade, or aquaculture—exhibited lower vulnerability than those solely dependent on capture fisheries. This is consistent with broader livelihoods research showing that diversification can reduce exposure to sector-specific shocks (Ellis, 2000; Béné et al., 2015). However, the findings also demonstrate that diversification opportunities are unevenly distributed. Access to land, capital, skills, and markets shapes who can diversify and how effectively, indicating that diversification is not simply an individual choice but an outcome conditioned by structural factors. Policies that promote diversification without addressing barriers to entry—particularly for women and poorer households—are therefore unlikely to produce equitable resilience outcomes (Scoones, 2015). Effective diversification strategies must be embedded within broader institutional reforms that expand access to assets, finance, and skills development.

Implications for Blue Economy and Fisheries Policy

The findings in this paper challenge dominant Blue Economy narratives that frame small-scale fisheries primarily as engines of growth, innovation, and entrepreneurship. The evidence suggests that without deliberate attention to governance reform, financial inclusion, and gender equity, Blue Economy initiatives risk reproducing—or even exacerbating—existing livelihood vulnerabilities (Bennett et al., 2021; Childs and Hicks, 2019). Resilience in small-scale fisheries emerges not merely from individual adaptation, but from institutional environments that enable or constrain livelihood choices. By empirically linking climate variability, governance constraints, and gendered exclusion to measurable livelihood outcomes, this study contributes to a growing body of work calling for more inclusive, justice-oriented, and livelihood-centred fisheries policies. Addressing livelihood vulnerability among small-scale fishers, therefore, requires moving beyond technical fixes toward interventions that confront the structural inequalities embedded within fisheries governance systems.

CONCLUSION

This study demonstrates that livelihood vulnerability among small-scale fishers is driven primarily by structural factors rather than individual livelihood choices. Climate variability emerges as a chronic stressor that undermines income stability, while weak fisheries governance, limited financial inclusion, and inadequate post-harvest infrastructure reinforce persistent vulnerability. These findings provide empirical evidence that support the argument that vulnerability in small-scale fisheries is socially and institutionally produced, reflecting deeper political–economic inequalities within the Blue Economy framework. At the same time, the analysis identifies key pathways for enhancing resilience. Participation in social organizations, access to financial services, education, and livelihood diversification significantly reduce vulnerability, highlighting the importance of social capital, inclusive finance, and human capital development. The stronger protective effect of financial access for female-headed households further underscores the need for gender-responsive institutional reforms.

By integrating the Sustainable Livelihoods Framework with a structural violence perspective, this study contributes to sustainability scholarship by linking governance, climate stress, and gendered exclusion to measurable livelihood outcomes. The findings challenge growth-oriented Blue Economy narratives that insufficiently address equity and justice and instead call for policy approaches that prioritize inclusive governance, financial access, and social protection. Three actionable policy levers could include the expansion of micro-credit programs to improve financial inclusion, the allocation of co-management seats to ensure equitable governance participation, and the provision of cold-chain grants to enhance post-harvest infrastructure. Sustainable futures for small-scale fisheries will depend not only on ecological management but also on institutional reforms that expand opportunities, reduce inequality, and strengthen the adaptive capacity of marginalized fishing communities. To bridge scholarship and practice, a participatory action

research pilot in Mbita could serve as a model for collaborative governance, inviting practitioners and local stakeholders to engage in inclusive decision-making.

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