



## An Assessment of Government Interventions in Strengthening Climate Resilience for Sustainable Livelihoods among Small-Scale Fishers in Zanzibar

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### Abstract

Small-scale fisheries (SSF) are vital to Zanzibar's coastal economy, providing essential food security, employment and income. However, the sector faces severe threats from climate change, including rising sea temperatures and unpredictable rainfall, which disrupt livelihoods and increase poverty risks. Apart from these challenges, fishers exhibit low adaptive capacity that revealing a gap between climate risks and the effectiveness of government supports mechanisms. This study examines how government interventions specifically on policy implementation, financial support, resilience capability and capacity building influence livelihood prosperity of small-scale fishers in Zanzibar. The study employed a quantitative correlational research design, targeting fishers across six coastal villages on Unguja and Pemba islands. Data were collected from 257 participants using a structured 5-point Likert scale questionnaire. Analysis included descriptive statistics, factor analysis (EFA and CFA) and multiple regression to determine the predictive relationships between government interventions and livelihood outcomes. Results indicate that overall, the model explains approximately 40% of the variation in livelihood outcomes. Individually, financial supports are the most influential driver of livelihood outcomes ( $\beta = 0.400$ ,  $p = 0.001$ ). Capacity building ( $\beta = 0.212$ ,  $p = 0.001$ ) and policy enforcement ( $\beta = 0.149$ ,  $p = 0.001$ ) also significantly enhance livelihoods, while resilience capability ( $\beta = 0.090$ ,  $p = 0.031$ ) also remains a meaningful predictor. In conclusion, while government efforts are recognized, current interventions are insufficient to fully shield fishers from climate shocks. Strengthening financial access through micro-credit and improving maritime policy enforcement are critical. To ensure long-term sustainability, the government must transition toward targeted capacity-building programs that empower fishers to move beyond coping mechanisms toward genuine prosperity.

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### 1. Introduction

Small-scale fisheries (SSF) constitute as one of the most vital components of the global food security, economic stability, cultural identity and livelihood prosperity (Amadu *et al.*, 2021) <sup>[3]</sup>. Globally, it is estimated that about 120 million people derive their livelihoods directly or indirectly from fisheries sector, with over 90 percent of this population engaged in the small-scale fisheries (Limuwa, 2018) <sup>[28]</sup>. This sector is particularly dominant in developing countries, coastal regions and island economies, where

it serves as a critical source of food, employment and income for millions of households (Macusi *et al.*, 2021) <sup>[30]</sup>. Either, small-scale fisheries provides a major share of fish consumed locally and regionally, contributing significantly to food and nutrition security, poverty reduction and socioeconomic development (George, 2025) <sup>[15]</sup>. Beyond their economic role, small-scale fisheries (SSFs) embody deep social, cultural and traditional significance. They sustain generational knowledge, foster social cohesion and underpin community identities that have evolved around fishing practices (Al-hafidz *et al.*, 2024) <sup>[2]</sup>. The sector plays a pivotal role in achieving several Sustainable Development Goals (SDGs), notably SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 5 (Gender Equality), SDG 8 (Decent Work and Economic Growth) and SDG 14 (Life Below Water). As a result, the sustainability and resilience of SSFs are increasingly recognized as essential for global and regional development agendas (Kihupi *et al.*, 2025) <sup>[25]</sup>. In Africa, small-scale fisheries are a cornerstone of rural livelihoods and food systems. Countries such as Tanzania, Kenya, and Mozambique possess extensive coastlines and inland water bodies that sustain millions of people through fishing and related activities. The sector contributes significantly to national GDP, employment and household nutrition. In Tanzania, for instance, fisheries contribute around 1.8 percent of GDP and provide direct employment to more than 200,000 people, while supporting an additional 4 million indirectly through processing, marketing and distribution (Mramba & Mkude, 2022; Schubert *et al.*, 2022; Musuka *et al.*, 2024) <sup>[34, 42, 36]</sup>.

However, despite this recognition, small-scale fisheries remain among the most vulnerable and under-supported livelihood systems (Islam *et al.*, 2021) <sup>[23]</sup>. The sector faces multifaceted challenges (Imikendu *et al.*, 2023) <sup>[22]</sup>, their high exposure to environmental change, dependence on natural resources and weak institutional support make them particularly susceptible to external shocks especially those arising from climate change, resource depletion and economic marginalization (Bhattacharya *et al.*, 2024) <sup>[6]</sup>. Climate-driven environmental transformations, such as rising sea surface temperatures, ocean acidification and wind patterns have disrupted traditional fishing cycles and ecosystems (Macho *et al.*, 2022) <sup>[29]</sup>. These changes influence fish migration, reproduction, and abundance, thereby undermining the productivity and predictability of fishing livelihoods. Furthermore, the increasing occurrence of extreme weather events such as storms, floods and droughts has directly impacted fishing operations, damaged equipment and increased occupational risks for fishers (Lammers *et al.*, 2020) <sup>[26]</sup>.

Beyond climate factors, small-scale fisheries are also affected by anthropogenic pressures such as overfishing, habitat destruction and pollution (Villasante *et al.*, 2021) <sup>[49]</sup>. The encroachment of large-scale industrial fishing vessels into nearshore areas, where most small-scale fishers operate, has led to heightened competition for dwindling resources (Eriksson *et al.*, 2018) <sup>[12]</sup>. Moreover, weak regulatory frameworks, limited access to credit and markets and inadequate representation of fishers in policy dialogues exacerbate the socio-economic vulnerability of these communities (Apresentaç & Rangel, 2024) <sup>[4]</sup>. Given these challenges, the concept of livelihood vulnerability has become central to research and policy debates concerning SSFs. Livelihood vulnerability refers to

the degree to which individuals or households are exposed to and unable to cope with adverse changes in their environment, economy, or social structure (Vogel *et al.*, 2024) <sup>[50]</sup>. In this regard, the Livelihood Vulnerability Index (LVI) and the Sustainable Livelihood Framework (SLF) have emerged as key analytical tools for assessing and enhancing the resilience of fishing communities. The Livelihood Vulnerability Index (LVI) provides a composite measure of vulnerability by integrating multiple dimensions; exposure, sensitivity and adaptive capacity allowing researchers to evaluate how different stressors affect the well-being of households (Weis *et al.*, 2016) <sup>[53]</sup>. Meanwhile, the Sustainable Livelihood Framework (SLF) emphasizes the role of five forms of capital; natural, human, social, physical and financial in determining livelihood outcomes (Y. He & Ahmed, 2022) <sup>[20]</sup>. Studies employing these frameworks across regions such as Ghana, Bangladesh and Indonesia consistently highlight the importance of collective action, institutional support and social networks in strengthening adaptive capacity (Freduah, 2018; Mojibul *et al.*, 2023; Rahman & Toiba, 2021) <sup>[13, 33, 38]</sup>.

The vulnerabilities of SSFs are most pronounced in tropical and subtropical developing countries, where dependence on natural resources is high, and adaptive capacity remains constrained. In Bangladesh, for example, studies on the Hilsa shad fishery reveal how altered rainfall patterns and river flows have disrupted traditional breeding cycles, forcing fishers to modify their fishing grounds and methods (Macusi *et al.*, 2021) <sup>[30]</sup>. Similarly, in Southeast Asia, particularly in Indonesia and the Philippines, communities reliant on coral reef and mangrove fisheries face declining catches due to habitat degradation and temperature-induced coral bleaching (Dharmawan & Nissa, 2020; Stiles, 2024) <sup>[5]</sup>. Empirical research from West Africa, including Ghana and Senegal, underscores how socio-economic marginalization, combined with weak governance and illegal industrial fishing, exacerbates vulnerability among small-scale fishers. Initiatives to promote community-based management, cooperatives and microfinance have demonstrated potential in reducing these vulnerabilities by fostering social cohesion and diversifying income sources (Freduah, 2018; Raphael & Uwazuruike, 2023) <sup>[13, 40]</sup>.

Tanzanian fisheries face mounting environmental and socio-economic pressures. Climate variability has resulted in unpredictable weather conditions, changes in water temperature, and altered fish distribution patterns. These shifts have reduced catch volumes and income stability for many fishing households (Sekadende *et al.*, 2020) <sup>[43]</sup>. Coastal communities such as those in Tanga and Bagamoyo experience recurrent losses from damaged fishing gear, reduced fish stocks and declining profitability. Inland fisheries in Lake Victoria and Lake Tanganyika face similar threats, with declining water quality, invasive species and overfishing compounding the problem (Ulega *et al.*, 2023) <sup>[48]</sup>. Women, who play crucial roles in post-harvest processing and trade, are often excluded from decision-making structures and have limited access to financial services. In response to these growing challenges, Tanzanian fishing communities have adopted various adaptation strategies which involves intensifying current fishing practices through improved technology. Either, they entails diversifying into non-fishing livelihood activities such as agriculture, petty trade and tourism (Makame *et al.*, 2023; Rosemarie Mwaipopo, 2020) <sup>[31]</sup>. The success of these strategies,

however, depends heavily on access to resources such as capital, training and supportive institutional frameworks. Governmental and non-governmental initiatives have sought to promote sustainable fisheries through co-management systems, the establishment of Beach Management Units (BMUs) and capacity-building programs. Enhancing social capital through cooperatives, savings groups and community organizations has proven instrumental in improving resilience, yet these mechanisms require stronger policy and financial support to be effective (Bulengela, 2024; Katikiro & Mahenge, 2022) [8, 24].

Small-scale fisheries constitute the backbone of Zanzibar's coastal economy, providing the primary source of food security, employment and income for the majority of the population (Makame *et al.*, 2023) [31]. However, this vital sector is under severe threat from climate change, manifested through rising sea temperatures, sea-level rise, unpredictable rainfall patterns and increasingly intense extreme weather events. These environmental stressors are causing significant declines in fish catch and disrupting traditional livelihoods, placing fishing communities at a heightened risk of poverty and food insecurity. Despite these escalating risks, a substantial portion of the fishing population exhibits low adaptive capacity, with recent studies revealing that over 80% of fishers have not implemented effective adaptation strategies to cope with these changes (Ekstedt *et al.*, 2024) [11]. The central problem facing these communities is the gap between the escalating climate risks and the effectiveness of government-led support systems designed to build resilience. While the Blue Economy initiatives and others government policies promise sustainable development and livelihood improvement, there are critical deficiencies in their implementation and accessibility (Torre-castro *et al.*, 2022) [47]. Specifically, fishing communities often lack access to essential livelihood assets such as financial capital, advanced fishing gear and reliable early warning systems for weather which are necessary to adapt to changing oceanic conditions. For instance, despite the availability of meteorological data, fishers face significant challenges in accessing timely and credible weather forecasts from government agencies, often forcing them to rely on traditional, less reliable prediction methods that compromise their safety and economic planning (Hamad & Ghazi, 2025) [52]. Furthermore, there is a disconnect between national level adaptation policies and the tangible prosperity of local livelihoods. Evidence suggests that real adaptation on the ground is limited compared to the attention given in policy documents, and institutional structures often fail to anchor interventions in the daily realities of fishers. Even where livelihood interventions such as seaweed farming have been promoted, they have not consistently resulted in lower poverty incidence or higher monetary returns compared to traditional fisheries, indicating that current strategies may not be effectively addressing the root causes of economic vulnerability (Kihupi *et al.*, 2025) [25]. Consequently, without a comprehensive assessment of how specific government roles ranging from capacity building and resource management to financial support directly correlate with the resilience capacities of these fishers, government interventions risk being ineffective. This leaves small-scale fishers trapped in a cycle of vulnerability, unable to transition from mere coping to long-term livelihood prosperity (Ramadhani, 2023) [39].

Understanding how households perceive, respond to and recover from environmental shocks is vital for designing

targeted interventions that enhance livelihood resilience. This study, therefore, aims to provide an in-depth examination of the adaptive strategies and resilience mechanisms of small-scale fishers in Zanzibar Island. It seeks to contribute empirical evidence that informs both policy and practice, supporting the design of sustainable fisheries management systems that are equitable, inclusive, and responsive to local realities. Specifically, study assess the influence of government policy implementation, support on financial resources, capacity building program as a means of climate resilience capability and way of improving the livelihood of small scale fishers in Zanzibar.

## 2. Literature Review

### 2.1. The Sustainable Livelihood Framework

This study is anchored in the Sustainable Livelihood Framework (SLF), originally conceptualized by Chambers and Conway (1992) and later operationalized by DFID (1999). The SLF conceptualizes livelihoods as sustainable when they can withstand and recover from shocks, maintain or enhance capabilities and assets and avoid undermining the natural resource base. The framework situates households within a vulnerability context shaped by external shocks, trends, and seasonality, while recognizing the mediating role of transforming structures and processes such as institutions, policies and governance systems. In the context of small-scale fisheries, government climate adaptation policies, financial support mechanisms and capacity building programs function as transforming structures that influence fishers' access to livelihood assets (natural, financial, human, physical, and social capital). The SLF is therefore particularly relevant for examining how institutional interventions shape climate resilience capacity and livelihood outcomes. By integrating vulnerability, asset access, institutional processes and livelihood strategies, the framework provides a multidimensional lens for analyzing the relationship between climate governance and fisher livelihood prosperities (Hanika *et al.*, 2025; Bisthoven *et al.*, 2025; Kihupi *et al.*, 2025) [17, 7, 25].

### 2.2. Vulnerability of Small-Scale Fisheries in the Context of Climate Change

Small-scale fisheries (SSF) are widely recognized as among the most climate vulnerable livelihood systems globally. Their vulnerability is rooted in high dependence on natural resources, direct exposure to environmental variability and limited capacity for geographic mobility. Climate-induced stressors such as rising sea surface temperatures, ocean acidification, sea-level rise, and increased frequency of extreme weather events directly affect fish distribution, abundance, and ecosystem stability. However, climate vulnerability does not occur in isolation. It interacts with pre-existing socio-economic constraints including poverty, limited access to formal financial services, inadequate infrastructure, low educational attainment, weak governance systems, and health-related challenges. Empirical evidence from Bangladesh, Indonesia, Ghana, Spain, and other coastal regions demonstrates that livelihood vulnerability emerges from the combined effects of exposure, sensitivity, and limited adaptive capacity. Declining fish catches, a recurrent finding across geographical contexts, represent both an ecological and socio-economic crisis. Reduced catches undermine income security, food availability, and social stability within fishing households. Thus, vulnerability in

SSF is systemic, multidimensional, and deeply embedded in broader development challenges (Handayati *et al.*, 2025; Sarower *et al.*, 2024; Katikiro & Mahenge, 2022; Macho *et al.*, 2022) <sup>[16, 41, 24, 29]</sup>

### 2.3. Conceptualizing Livelihood Resilience

The growing emphasis in the literature has shifted from vulnerability assessment to resilience-building. Livelihood resilience refers to the capacity of households or communities to absorb shocks, reorganize, and adapt without collapsing into long-term poverty or resource degradation (Amadu *et al.*, 2021) <sup>[3]</sup>. A widely adopted analytical framework conceptualizes resilience through three interrelated dimensions:

#### 2.3.1. Buffer Capacity

Buffer capacity refers to the ability of households or communities to withstand shocks without significant disruption to their livelihoods. It is strengthened through financial savings, physical assets, diversified income sources, and access to natural resources. In coastal areas such as Zanzibar, small-scale fishers face climate-related risks including unpredictable weather and declining fish stocks. Households that own productive assets such as boats, fishing gear, and savings are better able to cope with these challenges by maintaining consumption, repairing equipment, or temporarily shifting to alternative livelihood activities. Empirical studies show that asset ownership and access to financial services significantly improve the resilience of small-scale fishers. Government support through fisheries management, training programs, and promotion of alternative livelihoods also enhances buffer capacity. These initiatives help fishing communities invest in productive assets, diversify income sources, and better absorb climate-related shocks, thereby improving long-term livelihood resilience and prosperity (Sun *et al.*, 2023; Ekstedt *et al.*, 2024) <sup>[11]</sup>.

#### 2.3.2. Capacity for Self-Organization

This is ability of communities to collectively coordinate actions, manage common resources, and participate in governance structures that influence their livelihoods. In small-scale fishing communities, this capacity is often reflected through the formation and active participation of fishers in cooperatives, community-based organizations, and social networks that promote collaboration and shared decision-making. These collective arrangements strengthen institutional linkages, improve access to information, and enhance the ability of fishers to respond to environmental and economic shocks. According to the study Assessment of Government Role on Climate Resilience Capacities for Livelihood Prosperity among Small Scale Fishers, self-organization is an important component of climate resilience as it enables fishers to mobilize collective resources, engage with government institutions, and implement locally driven adaptation strategies. The study further highlights that supportive government policies and institutional frameworks play a key role in strengthening fisher organizations and encouraging participatory governance, which ultimately contributes to improved resilience and sustainable livelihood outcomes among small-scale fishing communities (Al-hafidz *et al.*, 2024; Amadu *et al.*, 2021) <sup>[2, 3]</sup>.

#### 2.3.3. Capacity for Learning

Learning capacity reflects the ability to innovate, integrate new information, and adjust practices in response to environmental change. Several studies identify this as the weakest dimension in many fishing communities, suggesting the need for enhanced training and knowledge exchange mechanisms. These three dimensions are mutually reinforcing. Buffer capacity strengthens self-organization; self-organization enhances learning; and learning improves long-term adaptive performance (Mulyasari *et al.*, 2023) <sup>[35]</sup>.

#### 2.4. Adaptive Capacity and Knowledge Systems

Adaptive capacity extends beyond absorbing shocks to include the ability to reorganize and implement incremental adjustments in response to environmental pressures. Research highlights that inadequate adaptive capacity is a primary driver of vulnerability in coastal communities. A critical issue identified in the literature is limited access to scientific climate information. While fishers rely heavily on experiential and traditional knowledge, the integration of Indigenous and Local Knowledge (ILK) with formal scientific systems remains insufficient. Studies recommend bridging this gap through participatory knowledge-sharing platforms and inclusive governance mechanisms. Policy interventions aimed at enhancing adaptive capacity include expanding training programs, increasing access to informal and formal credit, strengthening health services, promoting cooperative development, and investing in institutional capacity at multiple governance levels (Sun *et al.*, 2023; Mramba & Mkude, 2022) <sup>[34]</sup>

#### 2.5. Coping, Adaptation and Transformation

Resilience literature increasingly distinguishes between coping, adaptation, and transformation. Coping strategies are short-term responses aimed at restoring equilibrium following shocks. These often include seasonal migration, temporary non-fishing employment, or small-scale alternative income activities. Evidence suggests that the majority of documented responses fall within this category (Katikiro & Mahenge, 2022) <sup>[24]</sup>. Adaptive strategies involve medium-term adjustments such as modifying fishing patterns, targeting new species, adopting improved gear, or engaging in aquaculture and fish processing. Fishers who adopt adaptive strategies demonstrate significantly higher livelihood resilience than those who do not (Siguan, 2022) <sup>[44]</sup>. When environmental decline becomes sustained and severe, transformative change becomes necessary. Transformation entails fundamental shifts in livelihood systems, including complete exit from fisheries or permanent diversification into alternative sectors. Studies from Mexico and Southeast Asia show that large sustained reductions in catch can trigger such decisions. Transformative change, however, typically requires external institutional support, including government programs and non-governmental interventions (Ilosvay, 2024) <sup>[21]</sup>

#### 2.6. Social Capital, Governance and Institutional Dynamics

Social capital plays a central role in shaping resilience pathways. Participation in fisher associations, cooperatives, and community-based organizations enhances access to credit, information, collective bargaining power,

and adaptive learning opportunities. However, governance challenges persist. As small-scale fisheries integrate into global food systems, issues of power asymmetry, unequal benefit distribution, and limited local decision-making authority become more pronounced. Weak local government support further constrains adaptation potential. Reform frameworks emphasizing wealth creation, rights-based approaches, and resilience-oriented governance highlight the need for inclusive, participatory, and adaptive institutional systems (Tabares *et al.*, 2022; García-lorenzo *et al.*, 2024)<sup>[46, 14]</sup>.

## 2.7. Livelihood Diversification and Economic Restructuring

Livelihood diversification is consistently identified as the most significant strategy for enhancing resilience. Diversification reduces income dependence on declining fisheries and spreads risk across multiple economic activities. Common diversification pathways include aquaculture, small-scale business ventures, agricultural engagement, seasonal migration, and informal employment. Household characteristics such as education level, labor availability, asset ownership, and access to social support significantly influence diversification choices. While diversification strengthens resilience, structural barriers limited capital access, weak infrastructure, and inadequate institutional support often constrain successful transitions (Chen *et al.*, 2023; Su *et al.*, 2021)<sup>[9, 45]</sup>.

## 2.8. Research Gaps and Justification

Although substantial research has examined climate vulnerability and resilience in small-scale fisheries, three key gaps remain evident:

1. **Limited integration of institutional analysis and livelihood outcomes:** Many studies focus either on ecological vulnerability or household coping mechanisms without systematically examining how government interventions shape resilience pathways.
2. **Insufficient empirical analysis of transforming structures:** While the SLF emphasizes institutions and policies, fewer studies rigorously assess the effectiveness of climate adaptation policies, financial mechanisms, and capacity-building programs in improving livelihood prosperity.
3. **Context-specific gaps in developing coastal economies:** There is limited empirical evidence linking government-led climate resilience initiatives to multidimensional livelihood outcomes within specific local contexts.

Addressing these gaps requires a holistic analytical approach that integrates vulnerability, institutional dynamics, adaptive strategies and livelihood outcomes within a unified conceptual framework. To address these identified gaps, the current study adopts a comprehensive and integrative analytical framework that simultaneously examines vulnerability, institutional dynamics, adaptive strategies, and livelihood outcomes. By doing so, it seeks to provide a more holistic understanding of how these interconnected dimensions shape resilience and livelihood sustainability,

thereby contributing to both theoretical advancement and evidence-based policy formulation.

## 3. Material and Methods

### 3.1. Study Areas

The study was conducted within the Zanzibar coastal zone of the United Republic of Tanzania, a strategically significant archipelago situated off the eastern coast of Africa in the Western Indian Ocean. As a semi-autonomous region of mainland Tanzania, Zanzibar holds critical importance for its extensive small-scale fisheries sector, which constitutes a fundamental pillar of both the local economy and nutritional security for coastal communities. Zanzibar archipelago comprises two principal islands, Unguja and Pemba, along with numerous smaller islets. The island is internationally renowned for its exceptionally diverse and relatively pristine marine ecosystems, which support intensive artisanal fishing activities that form the backbone of local livelihoods. The island's coral reefs and coastal waters are characterized by high biodiversity and have historically sustained productive fisheries, making them particularly valuable for understanding climate change impacts on small-scale fishing communities. To ensure comprehensive spatial coverage and representativeness across the archipelago and to effectively assess the differential impacts of climate change on coastal fishing livelihoods, six coastal villages were strategically selected as primary study sites through purposive sampling. The selection criteria incorporated factors such as geographical distribution, proximity to critical ecosystems, intensity of fishing activities, accessibility and the presence of active fishing communities' dependent on marine resources. On Unguja Island, three villages were selected; Unguja Ukuu, Matemwe and Chwaka. On Pemba Island, three corresponding villages were selected to provide geographical balance and comparative insights; Makombeni, Weshi, and Msuka. The six-village sampling framework was designed to capture the heterogeneity of small-scale fishing contexts across the archipelago while maintaining analytical coherence. The research specifically targeted small-scale fishers operating from designated landing sites within these six selected villages, as this population constitutes the primary resource users directly engaged with marine ecosystems and most vulnerable to climate-related environmental changes.

### 3.2. Study Design

The present study adopted a quantitative research approach, employing a correlational research design to systematically investigate the government's role in building climate resilience capacities for livelihood prosperity among small-scale fishers in the Zanzibar archipelago. This methodological framework was selected due to its effectiveness in examining relationships between variables and its capacity to generate empirically testable findings through statistical analysis. The correlational design was particularly appropriate for this research as it enabled the exploration of associations between government interventions and livelihood outcomes without manipulating the natural setting of the fishing communities. The target population for this research comprised small-scale fishers

operating from designated landing sites within six strategically selected coastal villages distributed across Zanzibar's two principal islands: Unguja and Pemba. The study employed a probability sampling procedure to ensure statistical representativeness and minimize selection bias. The sampling strategy was executed through a two-stage process. In the first stage, cluster sampling was utilized, with the six pre-identified coastal villages serving as distinct clusters. This approach was justified by the geographical dispersion of fishing communities and the need to capture variations across different coastal zones. Subsequently, simple random sampling was implemented within each cluster to select individual participants. This second stage ensured that every fisher within the selected villages had an equal probability of inclusion in the study, thereby enhancing the generalizability of the findings. The combination of cluster and simple random sampling techniques provided a robust sampling framework that balanced practical feasibility with methodological rigor.

### 3.3. Data Collection Methods

Data collection was conducted using a structured, close-ended questionnaire specifically designed for this research. The questionnaire served as the primary instrument for gathering standardized quantitative data from the respondents. The instrument was carefully constructed to operationalize the study's key variables, including government interventions on policy implementation, resources provision, capacity building and livelihood prosperity indicators. To ensure consistency and facilitate quantitative analysis, the questionnaire predominantly employed a 5-point Likert scale, which allowed respondents to express their level of agreement, frequency of occurrence or intensity of experience regarding various statements related to the research objectives. Prior to full-scale data collection, the questionnaire underwent a rigorous validation process, including expert review and pilot testing to ensure content validity, clarity of items and reliability of measurements. The data collection process was executed systematically across all six coastal villages, with trained research assistants administering the questionnaires to ensure uniformity in data gathering procedures. Through this comprehensive data collection exercise, the study successfully obtained responses from 257 small-scale fishers, constituting the final sample size for analysis. This sample size was deemed adequate for conducting robust statistical analyses and drawing meaningful conclusions about the research questions.

### 3.4. Data Analysis

The quantitative data gathered from the field underwent a comprehensive and systematic analysis process to address the study's objectives. The analytical framework incorporated four principal statistical approaches; descriptive analysis, exploratory analysis, confirmatory analysis and regression analysis. Each analytical method served a distinct but complementary purpose in the overall data interpretation strategy. Descriptive statistical analysis was employed as the foundational analytical approach to summarize and present the characteristics of the collected data. This analysis involved the computation of measures of central tendency (means, medians) and measures of dispersion (standard

deviations) for key variables. It provides essential baseline information and facilitated the identification of patterns and trends within the dataset. Exploratory and Confirmatory factors analysis, specifically were utilized to validate the measurement model and assess the construct validity of the research instruments. These analytical techniques examined whether the observed variables adequately represented the underlying theoretical constructs being measured. The factors also evaluated the reliability and validity of the measurement scales, ensuring that the questionnaire items consistently and accurately measured the intended concepts. Regression analysis that include model fit indices used to determine how well the proposed measurement model corresponded with the observed data structure. Either, the analysis was employed to assess the predictive relationships and determine the extent to which government interventions explained variance in livelihood outcomes. These techniques enabled the research to move beyond mere description to draw evidence-based conclusions about causal relationships and the effectiveness of government interventions in promoting livelihood prosperity among small-scale fishers in the Zanzibar.

### 3.5. Model Specification

To formally analyze the relationship, the study specified a multivariate econometric model where livelihood outcomes are treated as the dependent variable and policy enforcement, financial supports, capacity building and resilience capability as independent variables.

The functional relationship expressed as:

$$LO_i = f(PE_i, FS_i, CB_i, RC_i)$$

Whereas:

$LO_i$  = Livelihood Outcomes

$PE_i$  = Policy Enforcement

$FS_i$  = Financial Supports

$CB_i$  = Capacity Building

$RC_i$  = Resilience Capability

$\epsilon_i$  = Error term

While econometric model suggested the linear regression model specified as:

$$LO_i = \beta_0 + \beta_1 PE_i + \beta_2 FS_i + \beta_3 CB_i + \beta_4 RC_i + \epsilon_i$$

The model hypothesis that:

1. **H1:** There is a positive and significance relationship between policy enforcement and livelihood outcomes
2. **H2:** There is a positive and significance relationship between financial supports and livelihood outcomes
3. **H3:** There is a positive and significant relationship between capacity building and livelihood outcomes
4. **H4:** There is a positive and significant relationship between resilience capability and livelihood outcomes

The model was estimated using Ordinary Least Squares (OLS), assuming linearity, no perfect multicollinearity, homoscedasticity and normally distributed errors. This specification provides a clear empirical framework to assess how government intervention factors influence livelihood outcomes.

## 4. Results

### 4.1. Descriptive Results

**Table 1:**

Variables	Minimum	Maximum	Mean	Std. Deviation
Financial Supports	7.00	25.00	21.3220	3.49135
Capacity Building	7.00	25.00	19.8683	5.01316
Livelihood Outcomes	7.00	25.00	19.9439	4.17517
Policy Enforcement	7.00	25.00	18.9463	4.05368
Resilience Capability	7.00	25.00	17.7317	4.31648

The descriptive statistics provide an overview of the key variables examined in the study on government interventions and climate resilience among small-scale fishers in Zanzibar. The results indicate that all variables have relatively high mean scores, suggesting a generally positive perception of government interventions and their outcomes. Financial support records the highest mean (21.32) with a relatively low standard deviation (3.49), implying that most respondents consistently perceive financial assistance as adequate and less variable across the sample. Capacity building (mean = 19.87; SD = 5.01) and livelihood outcomes (mean = 19.94; SD = 4.18) also demonstrate relatively high averages, though with greater dispersion, indicating some variation in how respondents experience training initiatives

and improvements in livelihoods. Policy enforcement shows a moderately high mean (18.95) with a standard deviation of 4.05, suggesting that while regulatory frameworks are generally acknowledged, their implementation may not be uniform across all areas. Resilience capability has the lowest mean (17.73) and a moderate standard deviation (4.32), indicating comparatively lower levels of adaptive capacity among fishers despite existing interventions. Overall, the findings suggest that while government efforts particularly in financial support and capacity building are recognized, there remains variability in policy implementation and resilience outcomes, which may affect the overall sustainability of livelihoods.

### 4.2. Exploratory Factor Analysis

**Table 2:**

Variable	Item	Factor loading	KMO & Bartlett's test
Policy enforcement	PE1	0.835	KMO = 0.855 Bartlett's test = 1110.427 Sig. = 0.000
	PE2	0.819	
	PE3	0.835	
	PE4	0.828	
	PE5	0.837	
Financial supports	FR1	0.892	KMO = 0.903 Bartlett's test = 1735.079 Sig. = 0.000
	FR2	0.889	
	FR3	0.894	
	FR4	0.907	
	FR5	0.898	
Resilience capability	CR1	0.859	KMO = 0.805 Bartlett's test = 1400.490 Sig. = 0.000
	CR2	0.812	
	CR3	0.868	
	CR4	0.837	
	CR5	0.855	
Capacity building	CB1	0.844	KMO = 0.899 Bartlett's test = 1469.460 Sig. = 0.000
	CB2	0.866	
	CB3	0.873	
	CB4	0.889	
	CB5	0.897	
Livelihood outcomes	LO1	0.782	KMO = 0.743 Bartlett's test = 700.428 Sig. = 0.000
	LO2	0.745	
	LO3	0.703	
	LO4	0.764	
	LO5	0.729	

The Exploratory Factor Analysis (EFA) results indicate that the data are suitable for factor extraction and demonstrate strong construct validity across all study variables. The adequacy of the sample is confirmed by high Kaiser-Meyer-Olkin (KMO) values for all constructs, ranging from 0.743 to 0.903, which exceed the recommended threshold of 0.6.

Additionally, Bartlett's Test of Sphericity is statistically significant ( $p = 0.000$ ) for all variables, indicating that the correlation matrices are not identity matrices and are therefore appropriate for factor analysis. The results confirm that all variables policy enforcement, financial supports, resilience capability, capacity building and livelihood

outcomes have strong factor structures with high loadings and satisfactory sampling adequacy. This indicates that the measurement model is valid and reliable and the extracted

factors are appropriate for subsequent analyses of multiple regression.

### 4.3. Confirmatory Factor Analysis

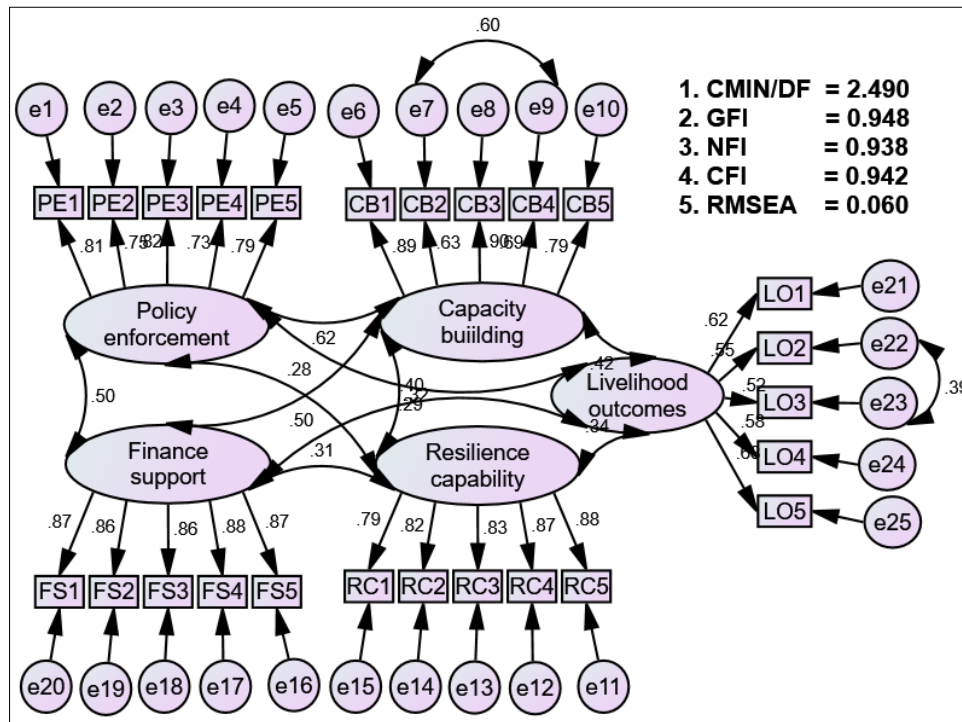


Fig 1:

The Confirmatory Factor Analysis (CFA) results demonstrate that the proposed measurement and structural model fits the data well and supports the hypothesized relationships among the constructs. The overall model fit indices indicate an acceptable to good fit: Chi-square/degrees of freedom (CMIN/DF) is 2.490, which is below the recommended threshold of 3, suggesting a reasonable fit between the model and the observed data. The Goodness-of-Fit Index (GFI = 0.948), Normed Fit Index (NFI = 0.938) and Comparative Fit Index (CFI = 0.942) all exceed the commonly accepted cutoff

value of 0.90, confirming strong model fitness. Additionally, the Root Mean Square Error of Approximation (RMSEA = 0.060) falls within the acceptable range ( $\leq 0.08$ ), indicating a satisfactory approximation error. The results confirm that the measurement model is reliable and valid and the structural model supports the hypothesized relationships. The findings highlight that policy enforcement and financial supports play critical roles in enhancing capacity building and resilience capability, which in turn significantly improve livelihood outcomes.

### 4.4. Multiple Regression Analysis

Table 3:

Variable	Beta	Std. Error	t-value	p-value
Policy enforcement	0.149	0.040	3.563	0.001
Financial support	0.400	0.052	9.161	0.001
Resilience capability	0.090	0.043	2.163	0.031
Capacity building	0.212	0.038	4.669	0.001
R-square	0.395			
Adjusted R-square	0.388			
F-ratio	65.841			
F-probability	0.001			

Dependent variable: Livelihood outcomes; significance levels are denoted by two asterisks (\*\*) at the 5% level.

The multiple regression results demonstrate that the model provides a strong and statistically significant explanation of livelihood outcomes. The coefficient of determination ( $R^2 = 0.395$ ) indicates that approximately 40% of the variation in livelihood outcomes is explained by policy enforcement, financial support, resilience capability and capacity building. Furthermore, the overall model is highly significant, as

evidenced by the F-statistic ( $F = 65.841, p = 0.001$ ), confirming that the independent variables jointly exert a statistically significant effect on livelihood outcomes. At the individual predictor level, financial support emerges as the most influential variable, exhibiting a strong positive and statistically significant effect on livelihood outcomes ( $\beta = 0.400, t = 9.161$  and  $p = 0.001$ ). This implies that an increase

in financial capability is associated with a substantial improvement in livelihood outcomes, holding other factors constant. Similarly, capacity building shows a significant positive effect ( $\beta = 0.212$ ,  $t = 4.669$ ,  $p = 0.001$ ), indicating its critical contribution to enhancing livelihoods. Policy enforcement also demonstrates a positive and statistically significant relationship with livelihood outcomes ( $\beta = 0.149$ ,  $t = 3.563$ ,  $p = 0.001$ ), although its magnitude is relatively smaller compared to financial supports and capacity building. This suggests that while policy enforcement plays a meaningful role, its practical impact is comparatively moderate. Resilience capability has the smallest coefficient ( $\beta = 0.090$ ,  $t = 2.163$ ,  $p = 0.031$ ) but remains statistically significant at the 5% level, suggesting that the ability to adapt to shocks and stresses still plays an important contribution in livelihoods. Overall, the results suggest a complementary relationship among the variables, where improvements in financial access, institutional effectiveness, resilience mechanisms and capacity building programs collectively enhance livelihood outcomes, with financial supports acting as the key driver for small scale fishers managing sustainable livelihoods.

## 5. Discussion

The multiple regression analysis provides strong empirical support for the proposed model, demonstrating substantial explanatory power in predicting livelihood outcomes. The coefficient of determination ( $R^2 = 0.395$ ) indicates that approximately 40% of the variation in livelihood outcomes is explained by policy enforcement, financial support, resilience capability and capacity building. The overall model is statistically significant ( $F = 65.841$ ,  $p < 0.001$ ), confirming that the independent variables jointly have a significant effect on livelihood outcomes.

In relation to hypothesis testing, the results provide clear evidence for accepting the study hypotheses. The first hypothesis (H1), which posits that policy enforcement has a significant positive effect on livelihood outcomes, is accepted. The results show a positive and statistically significant relationship ( $\beta = 0.149$ ,  $p = 0.001$ ), indicating that effective enforcement of fisheries policies improve livelihood outcomes to the small scale fishers. This finding is consistent with prior studies (Demeke, 2024; Li & Luo, 2023) [10, 27] that emphasize the importance of institutional effectiveness and regulatory frameworks in enhancing socio-economic welfare of people in coastal regions. The findings of this study suggest a need for the government to recalibrate fisheries policies to enhance their implementability. Robust enforcement of regulations targeting illegal, unreported and unregulated fishing, habitat degradation particularly coral reef destruction and overfishing is vital for ecological resilience. By instituting rigorous accountability mechanisms and penalties, the government can ensure a sustainable marine environment. Such policy stability is a prerequisite for fishers to derive equitable economic returns, ensuring that their livelihood outcomes reflect their labor and investments in a changing climate.

The second hypothesis (H2), which states that financial support significantly and positively influences livelihood outcomes, is accepted. Financial support exhibits the largest coefficient among all predictors ( $\beta = 0.400$ ,  $p < 0.001$ ), indicating that it is the most influential determinant in the model. This result aligns with existing literatures (Agusalim *et al.*, 2025; Wang *et al.*, 2023) [1, 51], which highlight

financial literacy, access to financial services and sound financial management as critical drivers of income generation, poverty reduction and economic resilience, particularly in developing countries. The finding of this study suggest that provision of government-led financial mechanisms, including concessional loans and subsidies, would empower small-scale fishers to invest in climate-resilient fishing technologies. By enhancing their adaptive capacity against adverse maritime conditions, these interventions facilitate higher productivity. Consequently, improved income levels would strengthen household food security and socio-economic stability among the fishing communities in Zanzibar.

For the third hypothesis (H3), the statistical results support that resilience capability has a positive and significant relationship with the livelihood of small-scale fishers, as evidenced by a path coefficient of 0.090 and p-value of 0.031 ( $\beta = 0.090$ ,  $p < 0.031$ ). This results suggest that as fishers strengthen their adaptive and transformative capacities, their overall livelihood outcomes encompassing economic stability and food security proportionately improve. These findings are consistent with the sustainable livelihoods framework and some literatures (He *et al.*, 2023; He *et al.*, 2024) [18, 19], which argue that resilience serves as a critical buffer against the inherent vulnerabilities of maritime life, such as climate-induced shocks and market volatility. While the modest coefficient indicates that resilience is one of several contributing factors, the results confirm that empowering fishers with the tools to navigate adversity is a statistically valid strategy for enhancing their long-term well-being and socio-economic status. This finding also underscore that enhancing the resilience of small-scale fishers requires an environment that fosters both physical safety and economic viability. Resilience in this context is intrinsically linked to financial capital; the acquisition of modern fishing gears and climate-resilient vessels are primary determinant of a fisher's ability to navigate increasingly volatile sea states. Additionally, the integration of advanced and traditional knowledge serves as a labor-saving mechanism. By optimizing fishing efforts through improved technical "know-how," fishers can mitigate the need for excessive physical exertion while maximizing their catch per unit effort, ultimately stabilizing their livelihood outcomes.

The fourth hypothesis (H4), which posits that capacity building has a significant positive effect on livelihood outcomes is accepted. The results indicate a strong and statistically significant relationship ( $\beta = 0.212$ ,  $p < 0.001$ ), confirming that improvements in skills, knowledge and institutional capacity significantly enhance livelihood outcomes of small scale fishers. This finding is consistent with earlier empirical studies (Yaseen & Ameen, 2015; Prayitno *et al.*, 2025) [54, 37] that underscore the importance of human capital development in improving productivity, employability and income-generating opportunities. The results of this study highlight the necessity for government-led strategic interventions aimed at synthesizing professional technical training with traditional ecological knowledge (TEK). Enhancing fishers' understanding of the spatiotemporal dynamics of the marine environment allows for more precise navigation of seasonal fluctuations and resource availability. This dual-approach education empowers fishers to identify productive fishing zones and optimal harvesting windows with greater efficiency.

Ultimately, strengthening this cognitive resilience directly correlates with increased catch per unit effort, thereby bolstering the economic livelihood outcomes of small-scale fishing communities.

Comparatively, the findings reinforce the broader empirical consensus that financial support, capacity building and policy enforcement are the most critical drivers of livelihood improvement. Studies across developing economies, including those in Sub-Saharan Africa, have consistently shown that individuals with higher financial literacy and access to financial services are better positioned to invest, save and manage risks effectively. Similarly, capacity building initiatives, such as training and skills development programs about marine, have been widely documented to improve economic outcomes and long-term sustainability of fishers. While Strengthening laws that prohibit illegal fishing, coral reef destruction and overfishing is essential for maintaining a healthy marine ecosystem. On the other hand, the relatively smaller contribution of resilience capability on livelihood outcomes contrasts with some studies that highlight its importance in coping with shocks, particularly in climate-vulnerable regions. However, this discrepancy may be explained by differences in context, measurement or model specification. It is also possible that resilience operates indirectly, potentially through capacity building, financial capability or adapting fisheries policy, rather than exerting a direct influence on livelihood outcomes.

## 6. Conclusion

The findings of this study demonstrate that the proposed model provides a strong and reliable explanation of livelihood outcomes, with a substantial proportion of variation explained by the selected predictors. The overall regression results confirm that policy enforcement, financial support, capacity building and resilience capability are significant determinants of livelihood outcomes, thereby validating most of the study hypotheses. Specifically, financial support emerges as the most influential factor, indicating that enhancing financial capacity is critical for improving livelihoods of fishers. Capacity building also plays a vital role, highlighting the importance of skills development and institutional strengthening in promoting sustainable economic outcomes. Policy enforcement and resilience capability although comparatively weaker, still contribute significantly by creating an enabling environment that supports livelihood improvement.

## Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this study.

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## References

1. Agusalim M, Ratnawati K, Djazuli A. Enhancing fishermen's sustainable livelihoods: the role of financial literacy, networking, and funding decisions. *Int J Sustain*

- Dev Plan. 2025;20(7):3123–32.
2. Al-hafidz Z, Susilowati I, Waridin W. Enhancing livelihood resilience: a comprehensive analysis of small-scale fishers. *J Sustain Res.* 2024;6(3):e240064. doi:10.20900/jsr20240064.
3. Amadu I, Ato F, Worlanyo D, Atanga C. A study on livelihood resilience in the small-scale fisheries of Ghana using a structural equation modelling approach. *Ocean Coast Manag.* 2021;215:105952. doi:10.1016/j.ocecoaman.2021.105952.
4. Apresentaç S, Rangel M. Towards sustainability: a framework for evaluating Portuguese small-scale fisheries. *Sustainability.* 2024;16:3174. doi:10.3390/su16083174.
5. Dharmawan AH, AN ZN. Kerentanan dan kelentingan nafkah rumahtangga pedesaan: sebuah tipologi yang ditarik dari studi kasus petani dan nelayan skala kecil di Indonesia. *J Sosiologi Pedesaan.* 2020;8(1):1–13. doi:10.22500/8202028458.
6. Bhattacharya S, Das BK, Roy A, Nayak PK, Saha A, Parida PK, *et al.* Assessment in small-scale fisheries of Lower Gangetic flood plain wetland: an initiative towards achieving wetland ecosystem sustainability and community well-being. *Sustainability.* 2024;16(21):9583. doi:10.3390/su16219583.
7. De Bisthoven LJ, Pijpen I, Nkurikiye O, Rochette A, Slimbrouck J, Vandommele A, *et al.* What does resilience of social-ecological systems mean in Burundi? A qualitative approach. *Land.* 2025;14(12):2301. doi:10.3390/land14122301.
8. Bulengela G. Politics in fisheries management: consultation with fishing communities in the Indian Ocean, Tanzania. *Eur J Theor Appl Sci.* 2024;2(1). doi:10.59324/ejtas.2024.2(1).22.
9. Chen S, Wu J, Zhou K. Livelihood resilience and livelihood construction path of China's rural reservoir resettled households in the energy transition. *Front Sustain Food Syst.* 2023. doi:10.3389/fsufs.2022.1046761.
10. Demeke LE. The contribution of livelihood diversification activities to poverty mitigation in Dodota Woreda, Arsi Zone, Central Ethiopia. *J Econ Sustain Dev.* 2024;15(5). doi:10.7176/JESD/15-5-05.
11. Ekstedt J, Jiddawi NS, Pike F, Lindström L. Dynamic livelihoods, gender and poverty in marine protected areas: case study from Zanzibar, Tanzania. *Ambio.* 2024;1218–33. doi:10.1007/s13280-024-02010-x.
12. Eriksson H, Friedman K, Amos M, Bertram I, Pakoa K, Fisher R, *et al.* Geography limits island small-scale fishery production. *Fish Fish.* 2018;19(2):308–20. doi:10.1111/faf.12255.
13. Freduah G. Adaptive capacity of small-scale coastal fishers to climate and non-climate stressors in the Western region of Ghana. *Geogr J.* 2019;185(1):1–15. doi:10.1111/geoj.12282.
14. García-Lorenzo I, Varela-Lafuente M, Garza-Gil MD. Social and solidarity economy in small-scale fisheries: an international analysis. *Ocean Coast Manag.* 2024;253:107166. doi:10.1016/j.ocecoaman.2024.107166.
15. George H. Using fishing information to enhance climate change adaptation strategies among small-scale fishers in Pangani District, Tanzania. *J Inform.* 2025;5(1):22–46. doi:10.59645/tji.v5i1.536.

16. Handayati P, Munjin A, Indah N, Idris S, Kumar P. From vulnerable to resilience: an assessment of small-scale fisheries livelihood in South Malang of Indonesia. *Discov Sustain*. 2025. doi:10.1007/s43621-025-00810-z.
17. Hanika IM, Syamtar IA, Varlina V, Vikaliana R. The faint sound of the coast: a study of the adaptation of Aru Bay fishers to climate change through the sustainable livelihood framework approach. *Dinasti Int J Educ Manag Soc Sci*. 2025;7(1):848–62. doi:10.38035/dijemss.v7i1.5500.
18. He J, Fan X, Chen L, Huang Z, Zhao Y, Zhang C. Improving the livelihood resilience of poverty-stricken population under rural revitalization: a case study of Chongqing M Reservoir Area. *Sustainability*. 2023;15:13766. doi:10.3390/su151813766.
19. He X, Yan J, Yang LE. Linking smallholders' livelihood resilience with their adaptation strategies to climate impacts: insights from the Tibetan Plateau. *Ecol Soc*. 2024;29(2):7. doi:10.5751/ES-14639-290207.
20. He Y, Ahmed T. Farmers' livelihood capital and its impact on sustainable livelihood strategies: evidence from the poverty-stricken areas of Southwest China. *Sustainability*. 2022;14(9):4955. doi:10.3390/su14094955.
21. Ilosvay XÉE. Determinants of small-scale fisheries' transformative responses under increasing climate change impacts in Nayarit, Mexico. *Ecol Soc*. 2024;29(4). doi:10.5751/ES-15661-290438.
22. Imikendu Imbwe SA, W S. Socio-economic and environmental challenges of small-scale fisheries: prognosis for sustainable fisheries management. *Sustainability*. 2023;15(4):3179. doi:10.3390/su15043179.
23. Islam RR, Bashawir A, Abdul H. Assessing the impact of climate change on small-scale fisheries livelihood vulnerability index. *Acad Strateg Manag J*. 2021;20(4).
24. Katikiro RE, Mahenge J. Small pelagic marine fisheries for food sovereignty? The case of the dagaa fishery at three coastal sites in Tanzania. *WIO J Mar Sci*. 2022;1:119–34.
25. Kihupi ML, Mwalimu T, Memorial N, Zanzibar POB. Sustainability of fisheries in the context of climate change and variability in the Zanzibar Archipelago. *Int J Sci Archit Technol Environ*. 2025;2(5):50–66.
26. Lammers PL, Richter T, Mantilla-Contreras J. From safety net to point of no return: are small-scale inland fisheries reaching their limits? *Sustainability*. 2020;12(18):7299. doi:10.3390/su12187299.
27. Li X, Luo Y. Effects of targeted poverty alleviation on the sustainable livelihood of poor farmers. *Sustainability*. 2023;15:6217. doi:10.3390/su15076217.
28. Limuwa MM. Evaluation of small-scale fishers' perceptions on climate change and their coping strategies: insights from Lake Malawi. *Climate*. 2018;6(2):34. doi:10.3390/cli6020034.
29. Macho G, Silva MRO, Balsa CM, Olabarria C, Va E. Resilience and social adaptation to climate change impacts in small-scale fisheries. *Front Mar Sci*. 2022;9:1–18. doi:10.3389/fmars.2022.802762.
30. Macusi EDES, Camaso KL, Barboza A, Macusi EDES. Perceived vulnerability and climate change impacts on small-scale fisheries in Davao Gulf, Philippines. *Front Mar Sci*. 2021;8:1–13. doi:10.3389/fmars.2021.597385.
31. Makame MO, Shackleton SE, Leal Filho W. Coping with and adapting to climate and non-climate stressors within the small-scale farming, fishing and seaweed growing sectors, Zanzibar. *Nat Hazards*. 2023;116:3377–99. doi:10.1007/s11069-023-05813-5.
32. Mojibul M, Mozumder H, Schneider P, Monzer A, Nur AU. Climate change adaptation strategies for small-scale Hilsa fishers in the coastal area of Bangladesh: social, economic, and ecological perspectives. *Front Mar Sci*. 2023. doi:10.3389/fmars.2023.1151875.
33. Mramba RP, Mkude KE. Determinants of fish catch and post-harvest fish spoilage in small-scale marine fisheries in the Bagamoyo district, Tanzania. *Heliyon*. 2022;8(6):e09574. doi:10.1016/j.heliyon.2022.e09574.
34. Mulyasari G, Trisusilo A, Windirah N. Resilience to climate change among small-scale fishery on the Northern Coastal of Bengkulu Province, Indonesia. *Coast Fish Mar Manag*. 2023:1–6.
35. Musuka CG, Montshwari M, Ngoepe TK, Mphande J, Ndebele-Murisa MR, Bokhutlo T, *et al*. Contribution of fish to food and nutrition security in Southern Africa: challenges and opportunities in fish production. *Front Nutr*. 2024;11:1424740. doi:10.3389/fnut.2024.1424740.
36. Prayitno G, Auliah A, Efendi A, Hayat A, Subagiyo A. The role of livelihood assets in affecting community adaptive capacity in facing shocks in Karangrejo Village, Indonesia. *Economies*. 2025;13(1):13. doi:10.3390/economies13010013.
37. Rahman MS, Toiba H. The impact of climate change adaptation strategies on income and food security: empirical evidence from small-scale fishers in Indonesia. *Sustainability*. 2021;13(14):7905. doi:10.3390/su13147905.
38. Ramadhani JA. Unlocking the perceptions of fishing communities for a credible and effective weather forecasting and early-warning system in Zanzibar, Tanzania. *Int J Innov Res Dev*. 2023;12(11):59–68. doi:10.24940/IJIRD/2023/V12/I11/NOV23005.
39. Raphael A, Uwazuruike A. Migration and the right to survival: an empirical study of three fishing communities in Senegal. *J Rural Stud*. 2023;99:71–78. doi:10.1016/j.jrurstud.2023.02.007.
40. Sarower G, Rouf MA, Khanom M. Climate change effects on the small-scale fisheries in the Northern Part of Bangladesh and associated adaptation. *Khulna Univ Stud*. 2024;21(1). doi:10.53808/KUS.2024.21.01.1168-1s.
41. Schubert A, B WN, C PT, D CMA, D KO, E JM, *et al*. Reconstructing Kenya's total freshwater fisheries catches. *Mar Freshw Res*. 2022;73:57–70. doi:10.1071/MF21189.
42. Sekadende B, Scott L, Anderson J, Aswani S, Francis J, Jacobs Z, *et al*. The small pelagic fishery of the Pemba Channel, Tanzania: what we know and what we need to know for management under climate change. *Ocean Coast Manag*. 2020;197:105322. doi:10.1016/j.ocecoaman.2020.105322.
43. Siguan AA. Developing livelihood resilience through adaptive strategies and government interventions during the COVID-19 pandemic: a case study on the small-scale fishermen in Tacloban City, Philippines. *Philipp Soc Sci J*. 2022;5(4). doi:10.52006/main.v5i4.603.
44. Su F, Song N, Ma N, Sultanaliev A, Ma J, Xue B. An assessment of poverty alleviation measures and

- sustainable livelihood capability of farm households in rural China: a sustainable livelihood approach. *Agriculture*. 2021;11(12):1230. doi:10.3390/11121230.
45. Tabares A, Londoño-Pineda A, Cano JA, Gómez-Montoya R. Rural entrepreneurship: an analysis of current and emerging issues from the sustainable livelihood framework. *Economies*. 2022;10(6). doi:10.3390/economies10060142.
  46. De Torre-Castro M, Lindström L, Jiddawi NS, Pike F, Max A. Women and adaptive capacity to climate change in East African seascapes – Zanzibar as an example. *Front Mar Sci*. 2022;9:1–19. doi:10.3389/fmars.2022.931883.
  47. Ulega AH, Mgaya YD, Lokina RB, Mushy R. The contribution of marine fisheries to socio-economic development in Tanzania Mainland: reflections on the blue economy concept from selected coastal villages. *J Geogr Assoc Tanzan*. 2023;42(2):1–22. doi:10.56279/jgat.v42i2.229.
  48. Villasante S, Tubío A, Gianelli I, Pita P. Ever changing times: sustainability transformations of Galician small-scale fisheries. *Front Mar Sci*. 2021;8:1–19. doi:10.3389/fmars.2021.712819.
  49. Vogel J, Guerin G, Neill DWO, Steinberger JK. Safeguarding livelihoods against reductions in economic output. *Ecol Econ*. 2024;215:107977. doi:10.1016/j.ecolecon.2023.107977.
  50. Wang F, Mao J, Liu Y, Cai Q. Influencing mechanism of rural households' livelihood capital on entrepreneurial behavior: evidence from the CFPS. *Agriculture*. 2023;13:1766. doi:10.3390/agriculture13091766.
  51. Waziri AH, Gazi MNI. Government support initiatives and access to livelihood assets: an alternative strategies of blue economy adoption for sustainable livelihood of fisher. *J Crit Rev*. 2025;12(1):26–33. doi:10.53555/jcr.v12.
  52. Weis SWM, Agostini VN, Roth LM, Gilmer B, Schill SR, Knowles JE, *et al.* Assessing vulnerability: an integrated approach for mapping adaptive capacity, sensitivity, and exposure. *Clim Change*. 2016;615–29. doi:10.1007/s10584-016-1642-0.
  53. Yaseen M, Ameen M. Role of capacity building and training for sustainable livelihood of farming community in Pakistan. *Eur Acad Res*. 2015;3(3):3085–96.

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