

Financing the Missing Middle: A Systematic Review of Constraints and Solutions for SMEs in Tanzania's Blue Economy

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ABSTRACT

The strategic development of the Blue Economy (BE) is central to Tanzania's aspirations for inclusive growth, with small and medium-sized enterprises (SMEs) constituting its operational backbone. However, the transformative potential of BE sectors including fisheries, aquaculture, coastal tourism, and maritime services is critically constrained by a persistent financing gap. This Systematic Review synthesizes evidence from 2006-2025 to diagnose financial constraints facing BE-SMEs in Tanzania and evaluate intervention pathways. Employing a structured methodology, the review analyzes peer-reviewed literature, policy documents, and institutional reports. The synthesis identifies a consistent quartet of barriers: stringent collateral requirements, elevated lender risk perceptions due to sectoral volatility and climate exposure, deficiencies in SME financial records, and cumbersome loan procedures. The review's core contribution is demonstrating how ecological degradation-overfishing, habitat loss, and pollution-functions as an unaccounted driver of credit risk, amplifying conventional financing constraints. This integration of marine science and finance literature reveals that the missing middle problem is not solely a market failure but also a symptom of biophysical risk mispricing. Concurrently, the analysis identifies promising solutions: adapted guarantee mechanisms, digital alternative data for credit assessment, value-chain finance, and products tailored to seasonal flows. The review concludes that bridging the finance chasm requires systemic shifts toward blended instruments, policy-driven credit infrastructure, and lender innovations that explicitly incorporate ecological risk. By aligning financial systems with the distinct realities of BE-SMEs, Tanzania can unlock sustainable, equitable growth within its ocean-based economy.

Keyword: Blue Economy, SME Finance, Financial Inclusion, Ecological Risk

INTRODUCTION

The global discourse on sustainable development has increasingly positioned the Blue Economy (BE) as a strategic frontier for economic diversification, livelihood improvement, and ecological stewardship, particularly in coastal and marine-dependent economies (UNDP, 2022; World Bank, 2025). For coastal countries such as Tanzania, which possess extensive marine and lacustrine resources, the BE offers an important pathway for achieving national development objectives through policies and frameworks such as the Tanzania Development Vision 2025 and the National Financial Inclusion Framework (NFIF) 2023–2028 (GoT, 2023; Zakayo & Mbilinyi, 2023). At the continental level, the BE has also been emphasized as a

potential driver of industrialization, food security, and inclusive development across Africa (African Union, 2019). However, this potential cannot be realized automatically, as its achievement depends substantially on the performance and growth of small and medium-sized enterprises (SMEs) operating within core BE value chains, including small-scale fisheries, aquaculture, coastal hospitality, and marine logistics (Buzohera, 2025; Pomeroy et al., 2020).

Analytically, the principal economic potential of the BE is closely linked to the condition of its underlying marine and coastal ecosystems. The productivity of fisheries, the attractiveness of tourism destinations, and the feasibility of aquaculture are all directly shaped by water quality, habitat integrity, including mangroves and coral reefs, and the stability of fish stocks (Cinner et al., 2018; Losada et al., 2018). Therefore, the economic resilience of BE-SMEs, particularly their capacity to withstand shocks and maintain stable cash flows, can be understood as an extension of ecological resilience. The degradation of these natural assets directly increases business risk, although this dimension remains insufficiently incorporated into financial risk assessment models.

A healthy ocean is essential for sustaining the blue economy and addressing climate change. Existing investment patterns, however, often continue to support harmful practices, including overfishing and hydrocarbon extraction (Narwal et al., 2024). A transition toward sustainability requires immediate strategies that prioritize sustainable fishing, aquaculture, and renewable energy, while reducing hydrocarbon production, especially in developed economies. The viability of fisheries and aquaculture depends on healthy fish stocks and resilient ecosystems. Overfishing and habitat degradation caused by the intrusion of illegal fishing vessels reduce catch volumes and increase unpredictability, thereby raising operational costs, intensifying income volatility for local fishers, complicating loan repayment capacity, and increasing risks within financial agreements (Imani et al., 2023; Jama et al., 2022).

SMEs constitute the main engine of Tanzania's BE, as they generate employment, support localized value addition, and strengthen social cohesion in coastal communities. Their growth is widely associated with broader economic development and poverty reduction (Ayyagari et al., 2014; Thierry et al., 2020). Nevertheless, a significant disconnect persists between their economic importance and their access to formal financial services. These enterprises are highly vulnerable to the "missing middle" problem in development finance, as they are generally too large, complex, or capital-intensive for microfinance, but at the same time are perceived as too risky, opaque, and collateral-deficient for conventional commercial bank lending (Beck & Demircuc-Kunt, 2006; BoT, 2023). This financing gap is further intensified by the inherent characteristics of BE sectors, including strong seasonality, yield volatility, and exposure to climate shocks, all of which reinforce traditional lender risk aversion (Pomeroy et al., 2020; Queirós et al., 2024).

The urgency of addressing this gap is multidimensional. Scientifically, although substantial literature has examined SME finance in developing economies and a growing body of scholarship has discussed the BE conceptually, there remains a critical lack of synthesized and context-specific evidence that connects these two domains within the Tanzanian context (Beck et al., 2008; Berger & Udell, 2006; Sumaila et al., 2019). Previous studies have often examined SME finance or BE sectors separately, resulting in a fragmented understanding of their intersection (FAO & AFRACA, 2021; Mang'ana et al., 2023). What distinguishes this review from existing syntheses is its explicit theorization of the ecological-financial nexus.

Previous systematic reviews of SME finance in East Africa have generally examined credit constraints through conventional perspectives such as information asymmetry and collateral insufficiency, while treating sectoral volatility as an external factor (Tobias et al., 2024; Wangmo & Islam, 2021). At the same time, blue economy syntheses have identified financing gaps without systematically integrating ecological risk into their diagnostic frameworks (Bennett et al., 2024). This review bridges these bodies of literature by arguing

that, for Tanzania's BE-SMEs, ecological degradation is not merely a background condition but a central determinant of creditworthiness. The theoretical contribution of this review lies in extending credit rationing theory by incorporating biophysical risk as a mechanism that amplifies information asymmetry and intensifies lender rationing behavior (Stiglitz & Weiss, 1981).

Tanzania's 1,424-kilometer coastline along the Indian Ocean contains diverse marine ecosystems that are critical for food security, tourism, trade, and employment. The government seeks to strengthen the Blue Economy by integrating marine conservation with fisheries and maritime trade (TMA, 2024; World Bank, 2023). However, coastal fisheries remain threatened by illegal fishing, which contributes to declining catches and the loss of native species, thereby undermining food security in coastal communities. The absence of adequate funding and suitable patrol vessels allows illegal fishing to continue, forcing artisanal fishers to operate in riskier waters and increasing their operational costs (Jama et al., 2022; Ljulj et al., 2023).

Blue economy resources are essential to Tanzania's economy and contribute significantly to GDP through marine fisheries, which employ approximately 53,000 artisanal fishermen and nearly 9,200 vessels on the mainland, in addition to 49,332 fishers in Zanzibar. These resources are increasingly threatened by climate vulnerabilities, which are worsened by inadequate oceanic data, including the availability of only one tide gauge in Zanzibar. This lack of data heightens concerns regarding coastal erosion and infrastructure damage caused by climate variability, while projected increases in temperature and rainfall variability further endanger the sustainability of marine resources (NEMC, 2024).

The future of marine protected areas (MPAs) is critical for balancing community needs, conservation priorities, and economic interests such as ecotourism. Seaweed farming is also a key sector for Tanzania and contributes to the global supply of red seaweeds for carrageenan production, while supporting gender equality through women's economic empowerment. However, this sector, along with other BE sectors, faces serious challenges from climate change, which affects species and habitats essential for sustainable farming (Queirós et al., 2024). Thus, this review argues that addressing financial gaps among Tanzanian BE-SMEs requires not only financial innovation but also the fundamental integration of marine ecological risk into credit assessment models. Ignoring biophysical degradation, including coral bleaching and declining water quality, will continue to distort risk pricing and limit financial access for the enterprises that depend directly on healthy oceans and other blue economy resources (Dempsey & Suarez, 2016).

Consequently, this article is guided by three research questions. First, what are the primary financing sources and patterns for SMEs operating within Tanzania's key BE sectors? Second, what are the most significant perceived and actual barriers faced by these SMEs in accessing formal credit? Third, what emerging financial innovations and policy opportunities show promise for bridging this financing gap? These questions are examined through an analytical lens that treats ecological risk as a cross-cutting determinant of financial exclusion. Rather than positioning environmental factors as a separate domain, this review systematically traces how biophysical degradation documented in marine science literature is translated into the financial constraints identified in the first and second research questions and shapes the feasibility of the solutions examined in the third research question. This framing positions ecological health not as an externality to financial systems, but as a fundamental input into SME creditworthiness.

To answer these questions, this review adopts a systematic evidence-synthesis methodology. It moves beyond descriptive summary by critically appraising and integrating findings from academic research, grey literature, and policy documents. In doing so, the review offers a nuanced analysis situated within established theoretical frameworks of

information asymmetry and lending technologies. The ultimate aim is to translate diagnostic insights into actionable recommendations for policymakers, financial institutions, and development practitioners, ensuring that the promise of the BE can be transformed into tangible and inclusive prosperity for Tanzania.

METHODOLOGY

This study employs a systematic review methodology designed to comprehensively identify, synthesize, and critically appraise existing evidence pertaining to the financing of SMEs within Tanzania's Blue Economy. The approach is guided by established protocols for evidence synthesis in social sciences, ensuring rigor, reproducibility, and analytical depth. (De Cassai et al., 2025). The search strategy was executed across multiple electronic databases to capture both peer-reviewed and grey literature. Primary databases included Scopus, Web of Science, and Google Scholar. Complementary searches were conducted on the websites of key institutions such as the Bank of Tanzania (BoT), the World Bank, the International Monetary Fund (IMF), the Food and Agriculture Organization (FAO), and the United Nations Development Programme (UNDP).

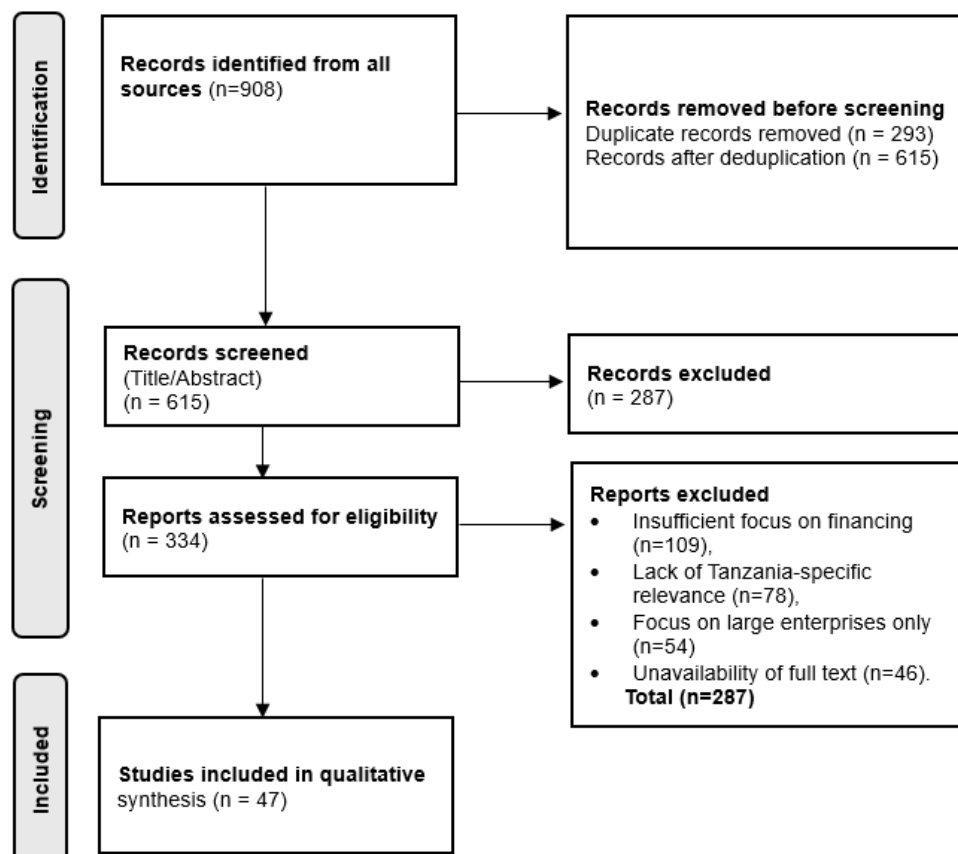


Figure 1. PRISMA 2020 Flow diagram of study selection
Source: Author, 2026

A combination of keywords and Boolean operators structured the search: ("Small and medium enterprise" OR SME) AND ("financ" OR "credit" OR "loan") AND ("Blue Economy" OR "marine" OR "coastal" OR "fisher" OR "aquacult*" OR "maritime tourism") AND ("Tanzania" OR "East Africa"). The search was limited to documents published in English between January 2006 and June 2025, capturing the period of significant policy focus on both SME development and the Blue Economy. Inclusion and exclusion criteria were strictly applied. Studies were

included if they: (i) explicitly addressed financing, credit, or financial inclusion; (ii) focused on SMEs or micro-enterprises with growth potential within BE-related sectors in Tanzania; (iii) presented empirical findings, theoretical analyses, or policy reviews; and (iv) were available as full-text documents. Exclusion criteria omitted: (i) studies focusing solely on large corporations or pure subsistence activities without enterprise orientation; (ii) documents not specific to the Tanzanian context or BE sectors; and (iii) brief news articles or opinion pieces without substantive evidence.

The screening process involved two stages. Initially, titles and abstracts were screened for relevance against the inclusion criteria. Subsequently, the full texts of potentially relevant documents were retrieved and assessed in detail. Data from included studies were extracted using standardized form capturing bibliographic details, study objectives, methodology, key findings related to finance sources, barriers, and proposed solutions, and study limitations. The systematic search was executed across multiple electronic databases to capture both peer-reviewed and grey literature. Primary searches yielded 703 records from Scopus (262), Web of Science (146), and Google Scholar (295). Supplementary searches in regional databases (African Journals Online, EconLit, AgEcon Search) contributed an additional 143 records. Institutional websites and grey literature sources including the Bank of Tanzania, World Bank, FAO, UNDP, and Tanzania Fisheries Research Institute provided 62 documents.

After removing 293 duplicates across all sources, 615 unique records underwent title and abstract screening, resulting in 334 full-text articles assessed for eligibility. Of these, 281 were excluded for: insufficient focus on financing ($n=109$), lack of Tanzania-specific relevance ($n=78$), focus on large enterprises only ($n=54$), or unavailability of full text ($n=46$). The final synthesis includes 47 studies that fully met all inclusion criteria.

For analysis, a convergent qualitative synthesis approach was adopted. Extracted data were organized thematically according to the review's research questions. Findings on financing sources and barriers were tabulated and analyzed for frequency and consistency across studies. Thematic analysis was used to identify, analyze, and report patterns within the data on constraints and opportunities, with particular attention to divergences and consensus in the literature. These thematic findings were then interpreted through the conceptual lenses of credit rationing theory (Stiglitz & Weiss, 1981) and the lending technologies framework (Berger & Udell, 2006), allowing for a critical, theory-informed discussion of the evidence. This methodological triangulation combining systematic search, thematic synthesis, and theoretical interpretation ensures the review's findings are both empirically grounded and analytically robust. (Meydan & Akkas, 2024).

To assess the evidentiary strength of the 47 included studies, each study was subjected to a quality appraisal using an eight-criterion framework adapted from the Critical Appraisal Skills Programme (CASP) and calibrated for mixed-evidence systematic reviews in development economics and marine science (De Cassai et al., 2025). Given the heterogeneous nature of the included literature spanning empirical surveys, qualitative case studies, institutional reports, and theoretical contributions—a single methodological appraisal instrument was deemed insufficient. The adapted framework assessed: (Q1) clarity of research question or objective; (Q2) appropriateness of methodology for the stated objective; (Q3) rigour of data collection and sampling; (Q4) adequacy of sample size or evidence base; (Q5) clarity of results reporting; (Q6) transparency and appropriateness of analytical method; (Q7) direct relevance of findings to this review's objectives; and (Q8) contextual specificity to Tanzania or East Africa.

Each criterion was scored dichotomously: 1 (criterion met or largely met) or 0 (criterion not met or insufficient information to judge). Aggregate scores were used to assign a confidence rating: High confidence ($\geq 7/8$), Moderate confidence (5–6/8), or Low confidence ($\leq 4/8$). Appraisal was conducted by the primary reviewer; a 20% random subsample ($n =$

10 studies) was independently appraised by a second reviewer, yielding a Cohen's Kappa of 0.78, indicating substantial inter-rater agreement.

Of the 47 included studies, 28 (60%) were rated High confidence, 15 (32%) Moderate confidence, and 4 (8%) Low confidence. The mean quality score was 6.1/8. Peer-reviewed empirical studies particularly quantitative surveys and systematic assessments consistently achieved High confidence ratings. Policy and grey literature sources received Moderate or Low confidence ratings, reflecting their descriptive orientation and absence of peer review, though they were retained for their institutional authority and contextual relevance. Studies appraised at Low confidence were included only where they provided the sole available evidence on a specific topic and are clearly identified as such in the synthesis. The criterion with the lowest pass rate was Q8 (Tanzania/East Africa specificity, 68%), reflecting the necessary inclusion of global and comparative literature to contextualise the review. Full appraisal scores for all 47 studies are reported.

The quality appraisal confirms that the evidentiary base is moderately strong, with the highest-confidence findings drawn from Tanzania-specific empirical studies. Findings from lower-confidence sources are discussed with appropriate caveats throughout the thematic synthesis. Notably, no existing study directly quantifies the causal impact of ecological variables on SME creditworthiness in Tanzania, underscoring the novel contribution of this review's theoretical integration and identifying a priority for future primary research. To enable readers to assess the evidentiary base, Table 1 summarizes key characteristics of the sample of 47 studies included in the final synthesis. The table is organized by sectoral focus and presents each study's geographic scope, methodology, and primary financing-related findings. This transparent presentation allows differentiation between Tanzania-specific empirical evidence, regional comparative studies, and broader conceptual literature a distinction maintained throughout the thematic analysis that follows.

Table 1. Summary Characteristics of sample of Included Studies (n = 47)

Category	Author(s) (Year)	Sector Focus	Geographic Scope	Methodology	Key Finance- Related Findings
Tanzania- Specific Empirical Studies	Mori & Richard (2011)	Cross-sectoral SMEs	Tanzania	Survey (bankers)	Collateral requirements dominate lending decisions; strong information asymmetry
	Mang'ana et al. (2023)	Agriculture	Tanzania	Mixed methods	Weak financial management limits credit access
	Buzohera (2025)	Tourism	Tanzania	Survey	Business networking mediates finance access
	Mponzi et al. (2023)	Cross-sectoral (VICOBA)	Tanzania	Case study	VICOBA improves micro-level

Category	Author(s) (Year)	Sector Focus	Geographic Scope	Methodology	Key Finance- Related Findings
					financial inclusion
	Msangi & Kasambala (2025)	Cross-sectoral SMEs	Tanzania	Survey	Procedural and documentation barriers constrain credit uptake
	Naegels et al. (2018)	Women- owned SMEs	Tanzania	Interviews	Gender-specific financial constraints and collateral gaps
	Badi & Ishengoma (2021)	Cross-sectoral SMEs	Tanzania	Quantitative analysis	Credit guarantee schemes improve loan accessibility
	FAO & AFRACA (2021)	Fisheries	Tanzania & Zambia	Mixed methods	Value-chain finance shows scaling potential
	Hafidh et al. (2024)	Blue Economy (cross- sectoral)	Zanzibar	Mixed methods (survey of 163 stakeholders)	Microfinance identified as most accessible model for small-scale marine activities; combination of financing mechanisms needed
	Bernard et al. (2024)	Aquaculture (seaweed, sea cucumber)	Zanzibar	Economic analysis with farmer interviews	Benefit-cost ratio of 1.61 for IMTA systems; farmers report lack of infrastructure, funds, and expertise as key constraints
	Tarimo (2025)	Cross-sectoral SMEs (tourism, hospitality, trade)	Tanzania	Qualitative interviews	COVID-19 intensified collateral requirements; low SME awareness of

Category	Author(s) (Year)	Sector Focus	Geographic Scope	Methodology	Key Finance- Related Findings
					government support programs
	Tryphone & Mkenda (2023)	Tourism (women-owned MSMEs)	Tanzania	Quantitative (probit model, n=475)	Women Development Fund awareness low; land ownership laws constrain collateral access for women
	Zakayo & Mbilinyi (2023)	Blue Economy resources	Tanzania	Assessment study	Blue economy resources' potential for poverty reduction; financing gaps identified
Regional East African Studies	Kleih et al. (2013)	Fisheries & aquaculture	East Africa	Case studies	Value-chain finance models enhance market linkage
	JEPA Africa (2025)	Blue Finance ecosystem	East Africa (Kenya, Tanzania, Uganda, Rwanda, Burundi)	Mixed-method synthesis	Blue bonds, blended finance, debt-for-nature swaps; barriers include regulatory environment and lack of bankable projects
	EAC MSMEs Trade Fair (2025)	Cross-sectoral MSMEs	East Africa	Policy commitments	Partner States committed to green finance mechanisms, technical assistance for MSMEs
	Queirós et al. (2024)	Blue Economy	Tanzania	Integrated assessment	Climate vulnerability affects coastal investment viability

Category	Author(s) (Year)	Sector Focus	Geographic Scope	Methodology	Key Finance- Related Findings
	Bernard et al. (2024)	Aquaculture	Zanzibar	Economic analysis	Already listed above (counted in Tanzania-Specific)
Policy & Institutional Studies	BoT (2023)	Financial sector	Tanzania	Policy review	Financial stability measures; Agricultural Credit Guarantee Scheme (ACGS)
	GoT (2023)	Financial inclusion	Tanzania	National framework	NFIF 2023–2028 strategic priorities
	World Bank (2023, 2025)	Ocean economy	Tanzania	Project documentation	Blue economy investment priorities identified
	ICMA (2023)	Blue finance	Global	Guidelines	Blue bond issuance frameworks and standards
	AfDB (2025)	Fisheries (ProFishBlue program)	Southern frica (includes Tanzania)	Program documentation	\$9.2 million grant financing; business development services to SMEs in Tanzania; women and youth focus

Source: Author, 2025

RESULTS AND DISCUSSION

1. The Financing Landscape for BE-SMEs in Tanzania
 - a. Prevalence of Informal and Semi-Formal Finance

The synthesized evidence consistently reveals a heavy reliance on informal and internal financing mechanisms among BE-SMEs. Retained earnings, personal savings, and loans from family and friends constitute the first line of capital, reflecting a classic pattern of financial self-reliance in environments of constrained formal access (Mori & Richard, 2011) More structured, yet still non-bank, solutions are prominent, particularly Village Community Banks (VICOBA).

These member-owned savings and credit groups have become a cornerstone of rural and peri-urban finance, providing accessible, small-scale credit based on social collateral (Mponzi et al., 2023). Their success underscores the critical role of social capital and trust in mitigating information asymmetries where traditional collateral is absent. Formal credit from

commercial banks and microfinance institutions (MFIs) remains a minority source, typically accessed only by the most established, document-ready SMEs, often those with fixed assets for collateral or existing relationships with financial institutions (BoT, 2023; FAO & AFRACA, 2021).

b. Sectoral Nuances in Financial Access

The synthesized evidence reveals that financial access patterns vary substantially across BE subsectors, reflecting differences in asset structures, cash flow seasonality, and ecological exposure. A disaggregated analysis is essential for designing targeted interventions.

- **Fisheries:** Enterprises in capture fisheries face the most acute financing challenges. Their operations are characterized by short-term input needs (fuel, gear, ice) and extreme income volatility tied to catch variability, which lenders perceive as high default risk (FAO & AFRACA, 2021; Pomeroy et al., 2020). Productive assets like boats, engines and nets are typically movable, lack formal registration, and depreciate rapidly, rendering them unacceptable as collateral under conventional bank policies (BoT, 2023). The prevalence of informal landing sites and absence of catch documentation creates "thin files" that preclude transactional lending. Tanzanian studies indicate that fewer than 10% of small-scale fishers access formal credit, with most relying on informal lenders charging usurious rates or on VICOBA for small, short-term loans (Mponzi et al., 2023).
- **Aquaculture:** Emerging aquaculture enterprises, primarily seaweed farming in Zanzibar and fish farming in mainland coastal areas they present different financial profiles. Seaweed farming, dominated by women, requires modest startup capital but faces significant working capital constraints for inputs and processing (Queirós et al., 2024). The sector's exposure to climate shocks (warming waters, disease outbreaks) and price volatility in global carrageenan markets compounds lender caution. Fish farming requires more substantial investment in ponds, cages, and feed, but lacks the established value-chain finance mechanisms available in Asian aquaculture contexts (Kleih et al., 2013). Tanzanian aquaculture SMEs report that banks view them as "unproven" despite technical viability, reflecting information gaps about production risk.
- **Coastal Tourism:** SMEs in hospitality, tour operations, and ancillary services exhibit distinct financial patterns. Seasonality is more predictable, tied to tourist calendars (June-October peak, January-March high season), enabling more reliable cash flow forecasting (Buzohera, 2025). Capital needs are substantial for infrastructure, furnishings, vehicles can be met through asset-backed lending where land tenure is secure. However, coastal land tenure is often contested or informal, particularly in Zanzibar and peri-urban mainland areas, rendering this potential collateral inaccessible. Tourism SMEs also face concentrated exposure to exogenous shocks (travel advisories, global downturns, pandemics) that lenders weigh heavily in risk assessments (Dias et al., 2022; Khamis et al., 2017).
- **Maritime Transport and Services:** This subsector, including boat building, repair services, and small-scale cargo transport is the least documented in the finance literature. Available evidence suggests these enterprises have higher capital intensity (workshops, equipment, vessels) and more stable, contract-based revenue streams than fisheries, potentially improving bankability (Woiso et al., 2024). However, they remain constrained by the same collateral requirements and documentation gaps affecting other BE-SMEs, with the added complexity of regulatory compliance costs in maritime safety and licensing.

Despite these differences, three commonalities emerge: (1) all subsectors lack access to formal credit proportionate to their economic contributions; (2) women-owned enterprises within each subsector face compounded barriers; and (3) ecological degradation affects each subsector through distinct mechanisms that lenders currently fail to assess systematically.

2. Ecological Risks as Drivers of Financial Vulnerability

The operational stability of BE-SMEs is inextricably linked to the health of the marine and coastal ecosystems that constitutes their resources based. Beyond sectoral volatility, three pervasive ecological risks, over fishing, habitat loss and pollution directly undermine the economic resilience of these enterprises, thereby amplifying their perceived riskiness to financial institution.

- a. **Overfishing and Stock Depletion;** The chronic overexploitation of fish stocks, a well documented challenge in Tanzania's waters, erodes the fundamental capital of fisheries dependent SMEs (FAO, 2020). Declining catch per unit effort forces fishers to incur higher fuel and time costs for diminished returns, comprising profit margins and destabilizing cash flows for lenders, this translates into heightened yield risk and uncertainty. Over a borrower's ability to service debt particularly for loans financing fishing gear or vessel operations (Sumaila et al., 2019). The depletion of key commercial species represent a direct long term threat to the collateral value of fishing enterprises.
- b. **Habitat Loss and Degradation;** Critical coastal habitat notably mangroves, coral reef and seagrass beds provide indispensable ecosystem services. Mangroves act as a natural fish nurseries and coastal buffers, coral reefs underpin tourism and fisheries. Their degradation through deforestation, destructive fishing, or coastal development has a dual financial impact. First it reduces fishery productivity, affecting upstream SMEs (Cinner et al., 2018). Secondly, it increases the physical asset risk for coastal tourism SMEs (eg. Hotel tour operators) by exacerbating vulnerability to storm surges and erosion (Losada et al., 2018). This elevated physical risk can lead to higher insurance premium or the outright denial of coverage, a critical non credit barriers to formalization and growth.
- c. **Land-Based and Marine Pollution;** pollution from agricultural run-off, untreated sewage and plastic waste degrades water quality with direct operational consequences. For aquaculture SMEs, nutrient loading can trigger harmful algal blooms, leading to mass mortality events and loans defaults for coastal tourism, polluted beaches and coral bleaching from thermal stress degrade the aesthetics and recreataional value that is central of their product (Obura et al., 2022). Such pollution driven events are often sudden and catastrophic, representing idiosyncractic shocks are difficult for small, under capitalized firms to absorbed, thereby increasing the probability of default.

These ecological risks are not externalities but core determinants of business vaibility. They compound the sectoral risks already perceived by lenders, justifying higher interest rates or credit rationing. Critically, climate change acts as a threat multiplier, intensifying each of these stressors from warming waters exacerbating coral bleaching to altered currents affecting pollution dispersion (H.-O. Pörtner et al., 2022; Queirós et al., 2024). Consequently any strategy to improve financial inclusion for BE-SMEs must explicitly address these biophysical risks, whether through the design of parametric insurance products linked to ecological indicators or through lending criteria that incentivize sustainable resource management.

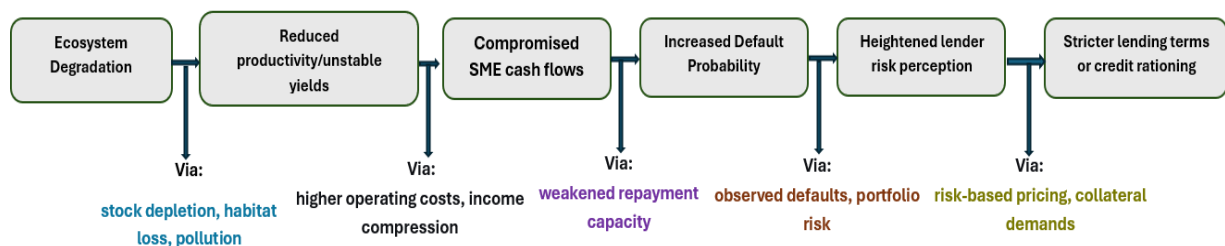


Figure 2. Causal pathway from ecological degradation to credit rationing for BE-SMEs
Source: Authors' illustration based on synthesized literature

This figure illustrates the causal chain through which marine ecosystem degradation translates into financing constraints. Each arrow includes the mechanism identified in the synthesized literature linking each step. The relationship between ecological degradation and financing constraints operates through a discernible causal chain that this review makes explicit. Each link in this chain is empirically supported by the synthesized literature. As per FAO (2020), Overfishing and stock depletion directly reduce catch per unit effort, forcing fishers to incur higher operating costs for diminishing returns, which compresses profit margins and destabilizes repayment capacity (Pomeroy et al., 2020). Habitat loss such as mangrove deforestation and coral reef degradation undermines fishery productivity and removes natural coastal protection, increasing physical asset risk for tourism SMEs and potentially raising insurance costs or triggering coverage denials (Losada et al., 2018; Obura et al., 2022). Pollution events can cause catastrophic losses for aquaculture through harmful algal blooms, representing idiosyncratic shocks that undercapitalized firms cannot absorb (Mayoma et al., 2020).

For lenders, these mechanisms translate ecological risk into credit risk through three channels: (1) yield risk unpredictable production volumes undermine loan repayment; (2) asset risk degraded ecosystems reduce the value or increase the vulnerability of collateral; and (3) context risk the cumulative effect of environmental stressors on the broader coastal economy increases portfolio correlation and systemic vulnerability (Chakraborty & Dhawan, 2025). Climate change acts as a threat multiplier, intensifying each mechanism through warming waters, acidification, and increased storm frequency (H.-O. Pörtner et al., 2022; Queirós et al., 2024). This causal logic demonstrates that ecological health is not an externality to financial systems but a fundamental input into SME creditworthiness. Consequently, financial inclusion strategies that ignore biophysical risk will systematically misprice loans to BE-SMEs, perpetuating the very rationing behavior they seek to overcome.

Table 2. Key Marine Ecological Risks and Indicators in Tanzania with Socio-Economic Implications

Ecological Risk	Current Status Tanzania	Direct Impact on BE-SMEs
Over fishing and stock depletion (FAO, 2020; Woiso et al., 2024)	<ul style="list-style-type: none"> • 50-60% of assessed fish stocks in Tanzania are fully exploited or over-exploited • Decline in catch per unit effort of small-scale fishers by 40% between 2000-2020 • An estimated 30% of catch from illegal, unreported and unregulated fishing 	<ul style="list-style-type: none"> • Reduced and unpredictable catches increase operational costs such as fuel for longer fishing trips • Lower profits and heightened loan default risk
Mangrove disappearance due to habitat degradation (Hamzah et al., 2020; Woiso et al., 2024)	<ul style="list-style-type: none"> • Tanzania lost 15% of its mangroves between 1990-2020 (~50,000 ha) • Current loss of 1,000 ha/year due to charcoal, agriculture and settlement • Remaining cover of 280,000 ha (among the largest in Africa) 	<ul style="list-style-type: none"> • Loss of fishery productivity due to diminishing fish nursery grounds • Reduced coastal protection • Increased storm damage to tourism infrastructure

Ecological Risk	Current Status Tanzania	Direct Impact on BE-SMEs
<p>Coral Reef degradation</p> <p>(Obura et al., 2022; WWF Tanzania, 2023)</p>	<ul style="list-style-type: none"> • Live coral cover declined from 40% in 1980s to 15-20% in 2020s in many reef areas • Between 2016-2020, 50% of reefs severely degraded due to bleaching, dynamite fishing and pollution • Contribution of US\$50-100 million annually to coastal economy at risk 	<ul style="list-style-type: none"> • Reduced tourism appeal (diving/snorkeling) • Loss of reef fisheries and fish catches • Destruction of coastal beaches due to erosion
<p>Marine Pollution (plastic and nutrients)</p> <p>(Mayoma et al., 2020; NEMC, 2024)</p>	<ul style="list-style-type: none"> • 4,000 tons of plastic generated in Tanzania daily; 20% enters marine environment • Dar es Salaam coastal waters show microplastic concentrations of 500-2,000 particles/m³ • Nutrient loading from agriculture and sewage causes seasonal algal blooms 	<ul style="list-style-type: none"> • Tourism SME losses due to beach closures • Aquaculture mortality from harmful algal blooms • Increased cleanup costs from uncontrolled pollution
<p>Climate change impacts</p> <p>(H.-O. Pörtner et al., 2022; TMA, 2024)</p>	<ul style="list-style-type: none"> • Sea surface temperatures increased +0.8–1.2°C since 1950 • Sea level rise: 4-7mm/year (Indian Ocean) • Projected decline in fishery yields by 20-30% by 2050 due to warming and acidification 	<ul style="list-style-type: none"> • Increased frequency of extreme weather damage • Coral bleaching events disrupting tourism • Shifts in fish stocks affecting catches

Source: Author, 2026

The biological risks facing Tanzania's marine ecosystems are well and properly documented but still remain poorly integrated into financial decision making. The table above synthesizes the key ecological indicators, the current status and direct implication for BE-SME viability. This evidence underscores and demonstrated that various ecological degradation is not merely an environmental concern but core determinant of business risk and credit worthiness. The overfishing, habitat loss, and pollution compound these sectoral volatilities. For example, declining fish stocks increase catch uncertainty, while mangrove deforestation removes natural buffers against storm surges, thereby raising insurance costs and collateral vulnerability for coastal SMEs.

3. Diagnosis of Binding Financial Constraints

- a. Collateral-Based Lending and Information Asymmetry; The most pervasive barrier identified is the stringent requirement for immovable collateral, primarily land and buildings. This practice is a direct manifestation of the information asymmetry problems theorized by Stiglitz & Weiss (1981). In the absence of reliable financial statements or credit histories (the "opacity" of SMEs), banks resort to collateral as a primary risk-mitigation tool (Beck et al., 2008; Berger & Udell, 2006). For BE-SMEs, this is particularly crippling. Many fishers and tourism operators do not hold formal title to coastal land, and their primary productive assets fishing vessels, processing equipment, hotel furnishings

are often considered movable and perishable, thus deemed inadequate by conservative underwriting standards (BoT, 2023; IMF, 2024).

- b. **Amplified Perceptions of Sectoral Risk; Beyond generic SME risk,** lenders associate BE activities with additional layers of uncertainty. The biological and ecological dependencies of fisheries introduce yield risk, while commodity price fluctuations create market risk (Pomeroy et al., 2020). Coastal tourism is vulnerable to broader shocks, from global travel advisories to localized environmental degradation. Crucially, climate change acts as a risk multiplier, increasing the frequency and severity of storms, coral bleaching, and changing fish stocks, thereby exacerbating lender caution (Chakraborty & Dhawan, 2025; Queirós et al., 2024). These perceptions, whether fully quantified or not, lead to higher risk premiums, stricter terms, or outright credit rationing.
 - c. **Financial Management Capabilities and 'Thin Files';** A supply-side constraint deeply intertwined with demand-side capacity is the state of SME financial record-keeping. Studies consistently note that many BE-SMEs lack separation between business and personal finances, maintain minimal bookkeeping, and have limited capacity for formal business planning (Mang'ana et al., 2023; Msangi & Kasambala, 2025). This results in "thin" or non-existent credit files, making risk assessment through conventional transactional lending technologies impossible. The problem is cyclical: a lack of records denies access to formal finance, which in turn limits growth and the ability to invest in professional financial management.
 - d. **Procedural and Operational Frictions;** Even when SMEs are potentially eligible, the process of accessing formal credit is often a deterrent. Documentation requirements are perceived as onerous, application processes are lengthy, and physical distance from bank branches in major urban centers adds time and transaction costs. For women entrepreneurs, who are active in BE value chains (e.g., fish processing, small-scale tourism), these frictions can be compounded by socio-cultural norms and gender biases in lending (Mori & Richard, 2011; Naegels et al., 2018).
 - e. **Gender-specific dimensions;** Women-owned enterprises face barriers that compound the general constraints identified above. In BE value chains, women are concentrated in specific nodes, the fish processing and trading, seaweed farming, small-scale food service, and handicraft production for tourism, where capital needs are modest but working capital cycles are tight (Naegels et al., 2018; Queirós et al., 2024). The synthesized evidence identifies three gender-specific mechanisms of financial exclusion. First, procedural frictions are amplified by lower formal documentation rates among women, including business registration and land titles, which reflect historical gendered patterns of asset ownership (Mori & Richard, 2011). Second, socio-cultural norms can constrain women's mobility and direct interaction with bank officers, limiting relationship-building essential for relational lending. Third, loan officers' discretionary behavior may embed gender biases, with women perceived as higher-risk despite evidence of equivalent or superior repayment performance (Naegels et al., 2018). These gender dimensions require targeted responses in intervention design, such as women-focused VICOBA adaptations, female relationship officers, and collateral substitutes that recognize alternative asset forms.
4. **Emerging Pathways and Innovative Solutions**
 - a. **Adapting Existing Models: Guarantees and Value-Chain Finance; Credit Guarantee Schemes (CGS);** Evidence from adjacent sectors, such as agriculture, demonstrates the efficacy of partial credit guarantees in unlocking bank lending by sharing the risk of default (Badi & Ishengoma, 2021). Scaling and tailoring such schemes for BE sectors perhaps with "first-loss" provisions supported by development partners could directly address the collateral shortfall. The recently launched Agricultural Credit Guarantee Scheme (ACGS) in

Tanzania provides a potential model for adaptation (BoT, 2023). Value-Chain Finance; This approach leverages the relationships and payment flows within a supply chain to provide finance. For instance, a loan to a fisher or fish processor can be secured against a purchase order from a reliable hotel or exporter. This reduces the lender’s risk by anchoring the transaction in a tangible commercial relationship and future receivable, moving beyond reliance on physical collateral alone (Kleih et al., 2013; Tirumala & Tiwari, 2022).

- b. Technological and Product Innovation; Digital Finance and Alternative Data; The rapid adoption of mobile money (M-Pesa, Tigo Pesa) and digital payment platforms in Tanzania presents an unprecedented opportunity. Transaction data from these platforms can serve as a proxy for cash flow, helping to build a digital footprint for “thin-file” clients (AFI, 2020). Similarly, digital tools for catch recording, boat tracking, or booking management in tourism can generate verifiable data to inform credit scoring, moving underwriting towards more dynamic, cash-flow-based assessments. Product Tailoring; Financial products designed for BE-SMEs must depart from the standard 12-month, equal-installment loan. Seasonal repayment schedules for tourism, grace periods aligned with fishing seasons, and balloon payment structures linked to major sales are essential innovations. Bundling credit with parametric insurance products that pay out based on objective triggers (e.g., wind speed, rainfall deficit) can directly hedge climate risks, making loans more palatable to both borrowers and lenders (Bennett et al., 2024; Pomeroy et al., 2020).
- c. The Rise of Blue Finance Instruments; Globally, dedicated “blue finance” instruments are emerging. Blue bonds, as outlined by ICMA (2023), raise capital for sustainable marine projects. While often targeting larger infrastructure, their principles can trickle down to SME-level through dedicated windows in national development banks or blended finance facilities. Blended finance, which uses concessional public or philanthropic funds to de-risk private investment, is particularly relevant for piloting new lending models or building the capacity of local financial institutions to serve BE-SMEs (Sumaila et al., 2019; UNDP, 2022). Figure 3 illustrates how root causes of market failure manifest in specific barriers, each addressable through targeted financial innovations, with corresponding roles for policymakers, lenders, and development partners.

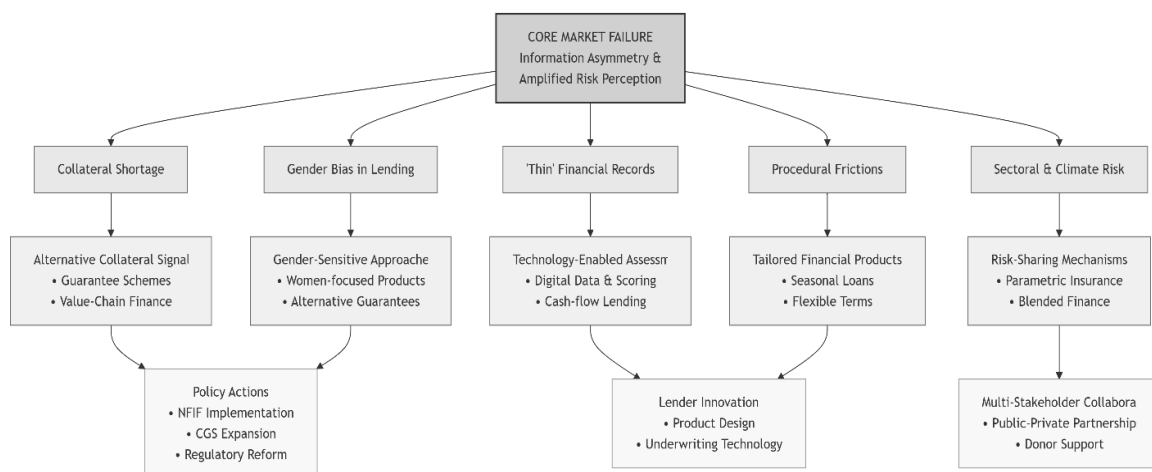


Figure 3. A diagnostic and solution framework for BE-SME finance
Source: Author’s Illustration 2026

- d. Prioritizing Solutions for the Tanzanian Context; The preceding analysis identifies multiple promising interventions, but their feasibility and timeframes differ substantially. Drawing on the institutional landscape of Tanzania's financial sector and the enabling conditions required for each solution, this section proposes a prioritization framework.

Short-term feasible interventions (1-3 years): Three solutions can be implemented immediately within existing institutional structures. First, credit guarantee schemes can be extended to BE-SMEs by explicitly including fisheries, aquaculture, and coastal tourism in the existing Agricultural Credit Guarantee Scheme (ACGS) administered by the BoT (Badi & Ishengoma, 2021). This requires only administrative expansion, not new legislation. Lead institution: Bank of Tanzania, in consultation with sector ministries. Second, VICOBA strengthening through targeted capacity-building and linkage programs with formal financial institutions can expand the reach of existing community-based models (Mponzi et al., 2023). Lead institution: President's Office - Regional Administration and Local Government (PORALG) with NGO partners. Third, regulatory clarification on movable collateral, fully implementing the Movable Property Security Rights Act—would enable lenders to accept boats, fishing gear, and equipment as collateral (BoT, 2023). Lead institution: Ministry of Finance, with judicial sector support.

Medium-term interventions (3-7 years): These require institutional capacity building and market development. Alternative data infrastructure leveraging mobile money transaction histories (M-Pesa, Tigo Pesa) for credit scoring—requires agreements between telecommunications companies, credit reference bureaus, and lenders, plus consumer protection frameworks (AFI, 2020). Lead institution: Tanzania Communications Regulatory Authority (TCRA) with BoT. Value-chain finance platforms need anchor firms (processors, exporters, hotels) to formalize offtake agreements that can collateralize SME loans (Brammertz & Mendelowitz, 2018). This requires business development support to establish and standardize contracts. Lead institution: Tanzania Private Sector Foundation (TPSF) with sector associations. Product innovation seasonal repayment products, grace periods, balloon structures requires lender training and regulatory incentives from BoT to encourage departure from standard 12-month term loans (Mtaturu & Mbailuka, 2020).

Long-term structural interventions (7-10 years): These address foundational constraints. Blended finance facilities for blue economy SME lending require capitalization, typically from development partners, and professional management to de-risk pioneering portfolios (ICMA, 2023; UNDP, 2022). Lead institution: Ministry of Finance with development partners (World Bank, UNDP, AfDB). Ecological risk integration into lending criteria requires collaboration between marine scientists and financial regulators to develop risk scorecards that quantify habitat health, stock sustainability, and climate exposure translating biophysical data into credit risk metrics. Lead institution: Institute of Marine Sciences (IMS) with BoT. Cross-cutting enabling conditions: All solutions require: (a) sustained SME capacity-building in financial literacy and record-keeping; (b) sex-disaggregated data collection to track gender inclusion; and (c) coordination mechanisms among BoT, sector ministries, and private sector representatives to monitor implementation.

5. Synthesis and theoretical interpretation

The findings collectively paint a picture of a market failure rooted in information economics. The dominance of collateral-based lending is a rational, if suboptimal, response to profound information asymmetry. The BE context does not create new categories of failure but sharply intensifies existing ones opacity is greater due to informality, and risk is heightened by ecological and climatic factors. This validates and extends the core tenets of Berger & Udell (2006) framework: the solution lies not in expecting BE-SMEs to conform to traditional banking models, but in adapting lending technologies to their context. The promising solutions

identified guarantees, alternative data, value-chain finance are essentially mechanisms to generate credible signals and enforce contracts in the absence of traditional collateral.

Guarantees provide a third-party signal of creditworthiness; digital transaction data provides a signal of business health offtake agreements in value-chain finance provide a signal of future repayment capacity. Therefore, the pathway forward is a systematic effort to lower the cost of generating and verifying these alternative signals. Tanzania's policy environment, notably the NFIF 2023-2028 and the Zanzibar Blue Economy Policy (2022), provides a conducive platform for such innovation. The critical task is operationalizing these strategies with a specific, targeted focus on the unique anatomy of BE-SME constraints.

This review's theoretical contribution lies in demonstrating that ecological risk is not merely an additional constraint but a mechanism that intensifies the core information asymmetries identified by Stiglitz & Weiss (1981). Where conventional credit rationing theory focuses on lenders' inability to distinguish borrower quality, the BE context introduces uncertainty about the fundamental productivity of the assets being financed. A fisher with impeccable character and repayment history remains vulnerable to stock collapse; a hotel with perfect documentation faces coral bleaching. This "biophysical opacity" compounds conventional information asymmetry, making lender rationing behavior even more pronounced. Extending Berger & Udell (2006) framework, BE-SMEs require lending technologies that assess not only borrower quality but also the ecological health of the resources on which their businesses depend. This points toward innovations parametric insurance, ecological risk scorecards, sustainability linked loans that integrate marine science into financial practice.

CONCLUSION

This systematic review has synthesized a growing body of evidence to delineate the complex financial challenges constraining Small and Medium-sized Enterprises within Tanzania's Blue Economy. The analysis confirms that BE-SMEs are trapped in a "missing middle" largely due to a persistent and interactive set of barriers: an enduring over-reliance on immovable collateral by lenders, amplified risk perceptions stemming from sectoral volatility and climate vulnerability, widespread deficiencies in financial documentation among enterprises, and procedurally cumbersome access pathways. These constraints are not merely operational but are deeply rooted in theories of information asymmetry, which standard banking practices are ill-equipped to overcome for this specific client segment.

This review also integrates marine science and finance literature to argue that the missing middle in SME financing is not only a financial market failure but also symptom of unaccounted biophysical risk. By diagnosing how ecological degradation amplifies credit constraints, we propose solutions that align products with ecosystem health. The primary contribution of this review lies in its integrated diagnosis, which moves beyond siloed analysis of either SME finance or the Blue Economy.

By converging these literatures, it provides a coherent framework for understanding why conventional financial inclusion gains have yet to meaningfully penetrate key BE sectors. The review concludes that bridging this gap is both necessary and feasible. Necessity is driven by the BE's centrality to national sustainable development goals; feasibility is illuminated by the catalog of emerging solutions. These include scaling risk-sharing instruments like targeted credit guarantees, harnessing digital transaction data to create alternative credit histories, designing financial products with seasonal flexibility, and embedding climate risk mitigation through insurance bundling.

For policymakers, the imperative is to move from broad financial inclusion frameworks to targeted BE-SME action plans. This involves explicitly incorporating BE sectors into credit guarantee schemes, championing regulatory reforms that recognize movable collateral, and

incentivizing the development of alternative data markets. For financial institutions, the opportunity is to innovate in underwriting by adopting cash-flow-based lending technologies and building partnerships with digital platforms and value-chain anchors. Development partners can play a catalytic role by providing blended finance to de-risk pioneering lending portfolios and supporting capacity-building for both lenders and SMEs.

Bridging the finance gap requires transdisciplinary collaboration. Marine scientists must work with lenders to develop ecological risk scorecards that quantify habitat health, stock sustainability, and climate exposure in terms relevant to credit assessment. Tanzania's research institutions, notably the Institute of Marine Sciences at the University of Dar es Salaam and the Tanzania Fisheries Research Institute should partner with the Bank of Tanzania and commercial lenders to pilot science-informed loan criteria that reward sustainable practices such as mangrove restoration, coral-friendly tourism operations, and certified sustainable fishing. Without integrating marine data into financial decision-making, blue finance risks remaining more metaphor than mechanism. This review thus calls for a structured dialogue between the marine science and finance communities, convened by policymakers, to translate ecological understanding into credit infrastructure.

This review is not without limitations. It is based on available published and grey literature, which may underrepresent fully informal practices or nascent, unpublished innovations. Furthermore, the dynamic nature of both financial technology and climate impacts necessitates continuous research. Future empirical studies should quantitatively measure the causal impact of specific interventions, such as guarantee schemes or digital lending platforms, on BE-SME growth and resilience.

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