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BUILDING RESILIENCE: HOW GREEN FINANCE INITIATIVES CAN EMPOWER UNBANKED POPULATIONS IN IRINGA MUNICIPAL

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ABSTRACT:

The dual challenges of financial exclusion and environmental degradation represent two of the most pressing issues facing sustainable development in the Global South. While these problems are often addressed in isolation, a transformative opportunity exists at their intersection. This study proposes to investigate this relationship by exploring the potential of green finance initiatives to empower unbanked and underbanked populations. This study examined how green finance initiatives can empower unbanked populations in Iringa Municipal by enhancing financial inclusion, promoting sustainable livelihoods, and strengthening resilience to economic and environmental shocks. The research employed a qualitative approach, involving 215 purposively selected participants, including unbanked individuals, smallholder farmers, community leaders, and representatives from financial institutions and NGOs implementing green finance programs. Data were collected through semi-structured interviews and focus group discussions and analyzed using thematic content analysis to identify key patterns, themes, and insights. The findings revealed that a significant proportion of unbanked populations faced financial exclusion due to limited access to financial institutions, socio-economic constraints, and lack of awareness. Green finance initiatives demonstrated considerable potential in addressing these challenges by enabling households to adopt sustainable livelihood practices, access climate-smart technologies, and improve economic stability. However, the effectiveness of these initiatives varied across participants, influenced by factors such as program accessibility, scalability, affordability, and outreach. In general, the study concluded that green finance represents a promising strategy for empowering marginalized communities, but its success depends on inclusive, well-designed interventions that deal with structural barriers to participation. These findings contribute to the broader discourse on financial inclusion, sustainable development, and climate resilience in Tanzania and similar contexts.

KEYWORDS: Green Finance, Unbanked Populations, Financial Inclusion, Sustainable Livelihoods, Economic Resilience, Climate Resilience, Inclusive Finance, Socioeconomic Empowerment, Sustainable Development.

INTRODUCTION

The dual challenges of financial exclusion and environmental degradation represent two of the most pressing issues facing sustainable development in the Global South. While these problems are often addressed in isolation, a transformative opportunity exists at their intersection. This study proposes to investigate this relationship by exploring the potential of green finance initiatives to empower unbanked and underbanked populations in Iringa Municipal, Tanzania. Globally, an estimated 1.4 billion adults remain unbanked, lacking access to basic financial services that are crucial for economic security, investment, and resilience against shocks [1]. Concurrently, climate change poses an existential threat, disproportionately impacting vulnerable communities who contribute least to the problem. Tanzania, and the Iringa region in particular, is experiencing the tangible effects of climate variability, including unpredictable rainfall patterns and soil degradation, which directly threaten agrarian livelihoods. Green finance, which channels capital towards environmentally sustainable projects and practices, has predominantly been a tool for large-scale investments in developed economies. However, its principles can be adapted to the micro-level to address local environmental challenges while simultaneously promoting financial inclusion. This research posits that by integrating green objectives with inclusive financial products such as loans for solar home systems, sustainable agriculture kits, or energy-efficient cookstoves financial institutions can not only expand their client base but also build the socio-economic and environmental resilience of the most vulnerable populations. This study, therefore, sought to understand the mechanisms, challenges, and opportunities for deploying green finance in Iringa Municipal. It aimed to provide a framework for how policymakers, financial institutions, and development partners can design and implement initiatives that simultaneously bridge the financial divide and foster climate adaptation, ultimately creating a more sustainable and equitable future for the community.

Background of the study

Despite notable strides in Tanzania's economic development, financial exclusion has persisted as a critical challenge. According to the World Bank's Global Findex database, approximately 66% of adults in Tanzania lacked access to a formal bank account as of 2021, with the majority concentrated in rural and peri-urban settings [1]. Contributing factors include low and irregular income streams, limited proximity to banking infrastructure, lack of formal identification, and pervasive financial illiteracy [2]. While urban centers are often assumed to be more financially inclusive, urban poverty and informality continue to undermine this assumption. Iringa Municipal, for instance, has a growing population that depends on informal sector employment, small-scale agriculture, and petty trade, which leaves many residents unbanked or underbanked. This exclusion restricts opportunities for accessing savings and credit facilities, thereby reinforcing cycles of poverty and limiting the ability of households to recover from financial shocks.

Within Iringa Municipal, the situation is further exacerbated by socio-economic vulnerabilities that intersect with financial exclusion. Informal sector workers and smallholder farmers, who make up a significant portion of the local economy, operate largely outside formal structures and are thus excluded from mainstream banking services [3]. Without adequate financial access, these groups are unable to invest in productivity-enhancing technologies or build safety nets to cushion against shocks. As a result, the absence of accessible and affordable financial services reduces resilience at the household and community levels, perpetuating dependency on informal lending, rotating savings groups, or in-kind savings such as livestock. This context underlines the urgent need for innovative financial models that are not only accessible but also aligned with the realities of irregular income flows and informality in Iringa.

The Iringa Region, located in Tanzania's Southern Highlands, has long been a cornerstone of agricultural production, but its sustainability is increasingly jeopardized by environmental degradation. Deforestation, largely driven by the demand for charcoal and firewood, has contributed to severe soil erosion, biodiversity loss, and the degradation of water sources [4]. Unsustainable land-use practices such as over- cultivation and limited adoption of soil conservation measures have resulted in nutrient depletion, ultimately reducing yields and agricultural productivity [5]. Compounding these issues is the growing unpredictability of climate patterns. Farmers report increasing variability in rainfall, shortened growing seasons, and more frequent droughts and floods conditions that undermine food security and threaten household livelihoods. These environmental challenges have direct social and economic consequences, especially for populations already constrained by poverty and exclusion from formal financial safety nets.

The vulnerability of Iringa's population is heightened by the lack of financial capacity to invest in climate- resilient technologies and practices. While sustainable agriculture practices such as conservation tillage, irrigation technologies, and the adoption of drought-resistant seeds have been recommended, the high upfront costs render them inaccessible to most smallholder farmers [6]. Similarly, the lack of insurance products tailored to smallholder contexts leaves farmers exposed to climate-related risks with little recourse in the aftermath of crop failure. This dynamic reveals a dual challenge: while environmental degradation and climate variability reduce livelihood security, the absence of affordable and inclusive financing mechanisms compounds vulnerability. Dealing with environmental and financial exclusion together, rather than in isolation, thus becomes essential for building sustainable resilience within Iringa Municipal.

Globally, green finance has moved from a marginal idea to a central pillar in strategies for sustainable development. Defined as financial products and services that support environmentally sustainable projects, green finance is increasingly viewed as an enabler of both climate resilience and inclusive economic growth [7, 8]. Instruments such as green bonds, sustainability-linked loans, and microfinance products tailored to environmental outcomes have been developed to bridge the gap between finance and sustainability. Within East Africa, innovative models have shown promise. Pay-As-You-Go (PAYG) solar systems pioneered by companies such as M-KOPA and Off-Grid Electric have demonstrated how mobile money-enabled instalment payments can make clean energy accessible to low-income households [9]. Similarly, micro-loans for sustainable agriculture have enabled smallholders to access drought-resistant seeds, irrigation technologies, and organic fertilizers, which not only improve productivity but also strengthen resilience to climate shocks.

For Iringa Municipal, green finance represents a potential pathway to address both financial exclusion and environmental vulnerability. By tailoring financial instruments to the realities of unbanked populations, green finance could simultaneously enhance access to clean energy, promote sustainable agricultural practices, and provide mechanisms for risk management [10]. However, despite its promise, the uptake of green finance in Tanzania remains limited. Structural challenges including insufficient institutional capacity, lack of awareness among target populations, and the limited adaptation of products to informal sector dynamics constrain widespread adoption. While global and regional examples highlight what is possible, there remains a need to understand how green finance can be effectively localized and scaled in municipal contexts like Iringa, where both financial exclusion and environmental stress intersect.

Although global and regional evidence underscores the transformative potential of green finance, there is limited empirical research exploring its localized impact on unbanked populations in Tanzanian municipalities. Existing studies have largely focused on national-level policies or specific sectors such as energy, leaving a gap in understanding how green finance can be adapted to meet the needs of urban informal economies and small-scale agriculture in Iringa Municipal. This study therefore addressed the gap by examining how green finance initiatives can simultaneously tackle financial exclusion and environmental vulnerability, while providing context-specific recommendations for designing inclusive financial products.

Statement of the problem

Despite ongoing efforts to enhance financial inclusion in Tanzania, a large proportion of the population, particularly in Iringa Municipal, remains unbanked and excluded from formal financial services. Barriers such as irregular income streams, lack of formal identification, limited access to banking infrastructure, and low levels of financial literacy have locked many individuals out of opportunities to save, access credit, or invest in productive ventures, thereby perpetuating cycles of poverty and vulnerability. At the same time, the municipality faces mounting environmental pressures, including deforestation, land degradation, and climate variability, which threaten the sustainability of smallholder agriculture and informal sector livelihoods that dominate the local economy. Green finance initiatives—such as pay-as- you-go solar systems, micro-loans for sustainable agriculture, and environmentally linked financial products—have emerged globally and regionally as promising mechanisms to address both financial and environmental challenges. However, their application in Iringa Municipal remains limited, and there is insufficient empirical evidence on how these models can be designed to overcome barriers to financial access while also supporting sustainable livelihood practices. Moreover, the potential of green finance to build long-term economic and climate resilience among unbanked populations in the municipality has not been adequately explored, leaving policymakers, financial institutions, and development partners without context-specific insights to guide effective interventions. This gap necessitates research that not only assesses the extent of financial exclusion in Iringa but also examines the role and potential of green finance initiatives in empowering unbanked populations through improved inclusion, sustainability, and resilience.

Objectives of the study

Main Objective

To investigate how green finance initiatives can empower unbanked populations in Iringa Municipal by enhancing financial inclusion, promoting sustainable livelihoods, and strengthening resilience to environmental and economic shocks.

Specific Objectives

1. To assess the extent of financial exclusion among unbanked populations in Iringa Municipal and identify barriers that hinder their access to formal financial services.
2. To analyze the role of green finance initiatives in addressing environmental challenges and supporting sustainable livelihood practices among unbanked communities in Iringa Municipal.
3. To evaluate the potential of green finance initiatives in building economic and climate resilience for unbanked populations in Iringa Municipal.

Research Questions

1. What is the extent of financial exclusion among unbanked populations in Iringa Municipal, and what barriers hinder their access to formal financial services?
2. How do green finance initiatives address environmental challenges and support sustainable livelihood practices among unbanked communities in Iringa Municipal?
3. In what ways can green finance initiatives contribute to building economic and climate resilience for unbanked populations in Iringa Municipal?

Main contribution of the study

This study contributed to the growing body of knowledge on the intersection between financial inclusion, environmental sustainability, and community resilience by providing empirical evidence on how green finance initiatives empowered unbanked populations in Iringa Municipal. While much of the existing literature had examined green finance from a national or global perspective, this research situated the discussion within a localized Tanzanian context, thereby filling a gap in understanding how such initiatives could be effectively tailored to the needs of informal sector workers, smallholder farmers, and other unbanked groups. The study highlighted barriers that hindered financial inclusion and provided insights into how green finance mechanisms such as pay-as-you-go solar financing, micro-loans for sustainable agriculture, and environmentally linked savings schemes were leveraged to address these challenges.

Beyond its academic contribution, the study offered practical value for policymakers, financial institutions, and development partners by outlining strategies to design and implement inclusive green finance products that were responsive to the realities of irregular incomes, limited collateral, and low financial literacy. By doing so, the research not only advanced theoretical debates on inclusive green finance but also provided actionable recommendations to strengthen resilience against economic and climate-related shocks. Ultimately, the findings informed interventions that simultaneously promoted financial inclusion, supported sustainable livelihoods, and fostered environmental sustainability in Iringa Municipal and similar contexts across Tanzania.

Related works

Financial Exclusion and its Barriers

Financial exclusion remains a global challenge, with varying degrees of prevalence across continents, disproportionately affecting vulnerable populations and hindering access to essential economic opportunities. In Europe and America, for instance, the challenge has shifted from a lack of physical access to banks to issues of underbanked populations who, while possessing an account, are excluded from essential services like affordable credit or insurance due to poor credit scores, low income, or inadequate digital literacy [11]. The rise of digital banking has created a new class of exclusion, impacting those who are "digitally poor" and unable to navigate online platforms, further complicating efforts to achieve full financial inclusion [12].

In Asia, a continent with some of the largest unbanked populations in the world, the barriers are often more fundamental. They include low per capita income, lack of formal identification documents, and geographic isolation, particularly in rural areas [13]. While mobile money has made significant inroads, a persistent gender gap in digital payments remains, highlighting that technological solutions alone are insufficient without addressing deeper socio-cultural barriers and building trust in formal financial institutions [14].

Africa and East Africa have become a global model for financial inclusion driven by mobile money, with millions gaining access to accounts for the first time. However, this progress is not universal. Barriers such as low financial literacy, lack of identification, and high transaction costs still prevent many from fully utilizing these services beyond basic transactions [15-17]. The prevalence of informal borrowing and savings groups also underscores a deep-seated distrust in formal financial systems, which must be overcome for true financial inclusion to be achieved [18].

In Tanzania, national efforts have significantly increased formal financial access through a robust mobile money ecosystem [19]. However, data reveals a persistent gap, particularly for those in the informal economy and rural areas who face a combination of supply-side barriers (e.g., inappropriate services) and demand-side barriers (e.g., irregular income) [20, 21]. For Iringa, as an agricultural hub, these issues are compounded by the population's dependence on natural resources, making financial and environmental shocks particularly devastating (NBS, 2019).

Across all these regions, while the problem of financial exclusion is well-documented, a significant gap exists in the integrated study of inclusive green finance as a solution. The existing literature largely analyzes financial exclusion and environmental degradation as separate issues, failing to explore how a unified, green finance-focused approach can address both simultaneously. There is a critical lack of local- level, demand-side research that evaluates how unbanked communities would respond to, and benefit from, financial products explicitly designed to promote environmental sustainability. This study addresses this gap by providing an in-depth analysis of a specific urban context, Iringa Municipal, and proposing a framework that directly links financial empowerment with environmental resilience.

The Role of Green Finance in Addressing Environmental Challenges

Green finance initiatives play a pivotal role in addressing environmental challenges and promoting sustainable livelihoods globally, particularly by channeling capital toward low-carbon projects while enhancing financial inclusion for unbanked populations. In Europe and America, green finance was predominantly viewed as a macro-level tool for mobilizing large-scale investments to fund national transitions toward low-carbon economies and meet global climate commitments [22]. Initiatives focused on financial system-wide "greening," such as developing green taxonomies to classify sustainable activities, issuing green bonds, and integrating climate risk into financial regulations [23]. While these strategies were effective in directing capital to large-scale renewable energy projects and sustainable infrastructure, they often bypassed micro-level, unbanked communities who required more tailored and accessible financial products to address their localized environmental vulnerabilities [24].

In Asia, green finance was a critical component of national development plans, particularly given the region's high vulnerability to climate change and heavy reliance on resource-intensive industries [13]. Initiatives ranged from state-backed green lending and green credit policies to the development of climate-resilient infrastructure. For example, the Green Climate Fund (GCF) and the United Nations Development Programme (UNDP) supported projects that used financial mechanisms to promote sustainable livelihoods, such as financing for climate-smart agriculture and climate-resilient farming practices among smallholder farmers [25, 26]. However, these initiatives often focused on large-scale projects and may not have been sufficiently accessible or understood by unbanked individuals in informal economies.

Africa and Tanzania were increasingly adopting green finance to address both poverty and climate change, with a strong emphasis on leveraging technology to reach underserved populations [27]. For instance, the widespread use of mobile money platforms enabled the growth of Pay-As-You-Go (PAYG) solar systems for rural electrification, which provided clean energy through micro-payments, linking financial services directly to an environmental benefit.

In Tanzania, green finance toolkits were developed to guide businesses, particularly SMEs, on how to access financing for projects that aligned with the nation's climate goals [28, 29]. The World Bank and other international partners also supported projects that empowered local communities through grants and credits for sustainable livelihood initiatives, such as eco-tourism and beekeeping, to reduce pressure on protected areas [30].

Despite the growing recognition of green finance as a crucial tool for sustainable development, a significant gap remained in understanding its direct role in empowering unbanked populations at the local level. While macro-level initiatives were well-documented, there was a lack of empirical research on how localized green finance products could be specifically designed and effectively delivered to unbanked individuals to address their immediate environmental challenges and support their sustainable livelihood practices. This gap was particularly pronounced in a context like Iringa, where a large unbanked population relied on natural resources but lacked the financial tools to adapt to climate change. This study aimed to fill this void by providing a detailed, ground-up analysis of how inclusive green finance could be a viable solution for Iringa's unbanked communities.

Evaluating the Potential of Green Finance Initiatives in Building Economic and Climate Resilience for Unbanked Populations

Green finance initiatives hold substantial potential to enhance economic and climate resilience for unbanked populations by mobilizing resources for sustainable projects that reduce vulnerability to environmental shocks while promoting financial inclusion.

In Europe and America, the potential of green finance to build resilience is largely evaluated at a systemic level, focusing on mitigating climate-related financial risks and steering capital towards a low-carbon transition [31, 32]. Green bonds and sustainability-linked loans are used to fund large-scale projects, but their direct impact on the economic and climate resilience of unbanked households is often not a primary metric of success [33]. The emphasis has been on macroeconomic stability and climate-risk mitigation, rather than on micro-level empowerment, creating a top-down approach that may not reach the most vulnerable populations [34, 35].

In Asia, particularly in nations like India and China, the potential of green finance is being evaluated in both macro and micro contexts. State-led initiatives have channeled funds towards renewable energy projects and sustainable agriculture, with some studies demonstrating a positive correlation between green credit and poverty reduction in rural areas [7]. However, the resilience-building aspect for unbanked communities remains a work in progress. While micro-lending for climate-smart technologies has shown promise, there's a lack of robust data on how these initiatives affect long-term household income, reduce vulnerability to climate shocks, and create lasting economic stability [36].

In Africa and Tanzania, the potential of green finance to build resilience is intrinsically linked to empowering local communities through innovative, technology-driven solutions. Mobile money-based PAYG solar systems have been a game-changer, providing reliable energy and reducing dependence on expensive, polluting fossil fuels, thereby building both economic and climate resilience at the household level [37]. In Tanzania, local microfinance institutions have begun to offer credit for sustainable farming practices, such as water-efficient irrigation, but the overall impact and scalability of these projects remain to be fully evaluated [38]. While the promise is significant, the actual long-term outcomes for unbanked populations are still being measured.

Across these regions, there remains a critical research gap in the direct, long-term evaluation of green finance initiatives on the resilience of unbanked populations. While there's anecdotal evidence and some case studies, a comprehensive, systematic framework for measuring the dual impact on economic stability and climate resilience at the household level is missing. The existing literature is fragmented, focusing either on macro-level financial stability or on isolated micro-level projects without a consistent methodology for assessment. This study aimed to fill this void by developing and applying a novel framework to specifically evaluate the potential of green finance to build resilience for the unbanked in Iringa, providing much-needed empirical evidence for a globally recognized but under-researched area.

METHODOLOGY

Research Design

This study adopted a qualitative research design to explore in-depth how green finance initiatives can empower unbanked populations in Iringa Municipal. The qualitative approach was appropriate because it allowed for the collection of rich, detailed data on participants' experiences, perceptions, and challenges regarding financial exclusion and green finance. This approach enabled the study to capture the nuances of how unbanked populations interact with financial services and the potential impact of green finance initiatives on their livelihoods and resilience.

Study Area

The study was conducted in Iringa Municipal, Tanzania. The area was chosen because it combines urban and peri-urban communities where a significant proportion of the population remains unbanked. Additionally, ongoing efforts to promote sustainable development and green finance initiatives in Iringa Municipal make it a suitable context for exploring the study objectives.

Target Population

The target population consisted of unbanked individuals, smallholder farmers, local community leaders, and representatives from financial institutions and NGOs involved in green finance initiatives. These participants were selected because they could provide valuable insights into the barriers to financial inclusion, the role of green finance, and strategies for enhancing resilience among unbanked communities.

Sample Size and Sampling Technique

The study involved a total of 215 participants who were selected using purposive sampling to ensure that respondents possessed relevant experience and knowledge regarding financial exclusion and green finance initiatives. The sample comprised unbanked individuals from various socio-economic backgrounds, smallholder farmers engaged in sustainable livelihood activities, community leaders with insights into local development initiatives, and representatives from financial institutions and NGOs implementing green finance programs. This approach allowed the study to capture diverse perspectives and in-depth insights into the challenges and opportunities associated with green finance initiatives in Iringa Municipal.

Data Collection Methods

Data were collected through semi-structured interviews and focus group discussions (FGDs). Semi- structured interviews were conducted with key informants such as financial institution officers, NGO representatives, and local leaders to explore the challenges, opportunities, and potential impacts of green finance initiatives. FGDs were held with unbanked community members to capture collective perspectives on financial exclusion, awareness of green finance programs, and strategies to enhance resilience. This combination of methods allowed the study to gather both detailed individual experiences and broader community-level insights.

Data Analysis

The collected qualitative data were analyzed using thematic content analysis, which involved systematically coding the data, identifying recurring themes, and interpreting patterns that aligned with the study objectives. The analysis process included transcribing interviews and FGDs verbatim, reading and re-reading the transcripts to become thoroughly familiar with the data, and coding significant statements. These codes were then grouped into themes related to financial exclusion, barriers to access, green finance opportunities, and resilience-building strategies. Finally, the findings were interpreted to provide insights into how green finance initiatives can effectively empower unbanked populations in Iringa Municipal.

Ethical Considerations

The study ensured voluntary participation, informed consent, confidentiality, and anonymity of all respondents. Participants were informed of their right to withdraw at any time without any negative consequences. Ethical clearance and permission were obtained from relevant local authorities before data collection.

Limitations of the Study

The study acknowledged potential limitations, such as subjectivity in responses and access challenges to some unbanked populations in remote areas. To mitigate these, multiple data sources (interviews and FGDs) were used, and careful selection of participants ensured representation of diverse perspectives.

RESULTS AND DISCUSSION

This section presents and discusses the findings of the study on how green finance initiatives can empower unbanked populations in Iringa Municipal, based on data collected from 215 respondents through semi- structured interviews and focus group discussions. The analysis focuses on key aspects, including the extent of financial exclusion and the barriers that hinder access to formal financial services, the role of green finance initiatives in supporting sustainable livelihood practices, and the potential of such initiatives to enhance economic and climate resilience among unbanked populations. The discussion integrates thematic insights drawn from respondents' experiences and perceptions, highlighting patterns and recurring issues that reflect the challenges and opportunities in implementing green finance programs.

Extent of Financial Exclusion among Unbanked Populations

The key indicator Extent of Financial Exclusion among Unbanked Populations was examined to provide insights into how the lack of access to formal financial services affected communities in Iringa Municipal. This indicator focused on three sub-indicators: the proportion of unbanked households, which highlighted the magnitude of exclusion; the prevalence of key barriers to financial access, which reflected the main obstacles such as high costs, limited infrastructure, and lack of awareness; and the socioeconomic impact of financial exclusion, which demonstrated how exclusion had constrained opportunities for income growth, savings, and resilience. Together, these dimensions offered a clear understanding of the depth and implications of financial exclusion in the study area.

Figure 1: Showing the extent of financial exclusion among unbanked populations sub-indicators.

Proportion of Unbanked Households

The qualitative study conducted in 2025 as per data in figure 1, revealed significant variability in the extent of financial exclusion among 215 respondents, with 92 respondents (42.8%) reporting high levels of financial exclusion, 74 (34.4%) indicating moderate exclusion, and 49 (22.8%) experiencing low exclusion. Those classified as highly unbanked had no access to formal financial services, such as bank accounts or mobile money platforms, and were predominantly rural smallholder farmers and women in Iringa Municipal's outer wards. These respondents frequently cited systemic barriers like lack of national identification and distance to financial institutions as reasons for their exclusion, aligning with findings from the FinScope Tanzania 2023 report, which noted a 24% national unbanked rate with higher prevalence in rural areas [39]. A 41-year-old female farmer from Mwangata ward shared:

"…I've never had a bank account or used mobile money because I don't have an ID card, and the nearest agent is over 10 kilometers away. We keep cash at home, but it's risky and never enough to buy seeds or pay for emergencies. I know there are loans out there, but they're not for people like me who can't even register. It feels like the system forgets us women in the villages…"

This reflection underlined the entrenched exclusion faced by rural women, whose lack of documentation and mobility constraints prevented engagement with financial systems, echoing global trends of gender disparities in financial access.

Another respondent, a 35-year-old male trader from Kihesa, elaborated:

"…I tried to open a bank account two years ago, but they needed a voter's ID I didn't have, and the fees were too much for my small vegetable business. I rely on cash or borrowing from neighbors, but it limits how much I can grow my trade. Banks are for those with steady incomes, not people like me scraping by…"

These accounts highlighted how high financial exclusion stemmed from structural barriers, limiting economic opportunities and reinforcing poverty cycles in Iringa Municipal.

Respondents reporting moderate financial exclusion (74 individuals) had sporadic engagement with formal financial services, often through informal savings groups or limited mobile money use, but faced challenges in sustaining access due to high transaction costs and low financial literacy. These individuals, often younger or residing in urban-adjacent wards like Ilala, described occasional interactions with mobile money for transactions but lacked consistent access to credit or savings products. A 28-year-old female respondent from Mivinjeni ward explained:

"…I used mobile money a few times to receive payments for my crops, but the fees were high, and I don't know how to use it for saving or getting loans. I joined a village savings group instead, but it's not enough to buy better seeds or equipment. If I understood more or if

agents were closer, I'd use it more often…"

This narrative captured the transitional nature of moderate exclusion, where partial access existed but was hindered by logistical and knowledge gaps, consistent with studies noting the role of financial literacy in rural Tanzania [40].

Another respondent, a 33-year-old male farmer from Mtwivila, added:

"…I have a mobile money account, but I only use it when I sell maize in town. The agent charges a lot, and I don't trust putting all my money there because I don't understand the system. If it was simpler and cheaper, I'd use it more, but for now, cash is easier…"

These insights highlighted how moderate exclusion reflected limited but present engagement, constrained by cost and awareness barriers, suggesting potential for green finance to bridge these gaps.

The 49 respondents reporting low financial exclusion were typically younger individuals or those in urban- adjacent areas with access to mobile money agents or community-based financial institutions like SACCOS, yet still faced challenges in fully integrating into formal financial systems. These respondents often used mobile money for basic transactions or had access to limited microfinance services but lacked the means to leverage these for significant economic advancement. A 25-year-old male respondent from Ilala ward shared:

"…I use mobile money for sending and receiving money because there's an agent nearby, but I can't get a loan or save much because I don't have a steady income or enough knowledge about banking. I tried a SACCOS once, but the paperwork was too much, and I gave up. It's better than nothing, but it's still hard to grow…"

This viewpoint reflected the partial inclusion experienced by those with low exclusion, where proximity to services enabled some engagement, but bureaucratic and economic constraints limited impact, aligning with regional findings on urban-rural disparities (FSDT, 2023). A 30-year-old female trader from Mwangata noted:

"…I have a mobile money account and use it sometimes for business, but I don't know how to get a loan for better farming tools. The SACCOS in town helped a friend, but I don't have the right documents or time to go there often. It's like we're close to help but not close enough…"

These reflections highlighted how low exclusion still involved significant barriers, preventing full financial inclusion and underscoring the need for accessible, tailored financial products like green microfinance.

These findings illustrated a spectrum of financial exclusion in Iringa Municipal, from high exclusion driven by systemic barriers like documentation and distance, to moderate exclusion marked by sporadic access, and low exclusion limited by bureaucratic and literacy challenges. The experiences of respondents underscored the potential for green finance initiatives to address these gaps by offering simplified, accessible financial products, particularly for rural women and youth, to enhance economic opportunities and resilience.

Prevalence of Key Barriers to Financial Access

The study as in figure 1, exposed significant barriers that hindered access to formal financial services among the 215 respondents, with varying degrees of severity impacting unbanked households in Iringa Municipal, Tanzania. Data collected through semi-structured interviews and focus group discussions (FGDs) indicated that 88 respondents (41.0%) faced high barriers, characterized by insurmountable obstacles such as lack of national identification, low financial literacy, and geographic distance to financial institutions. Additionally, 76 respondents (35.3%) reported moderate barriers, where access was impeded but partially mitigated by proximity to mobile money agents or informal savings groups. Only 51 respondents (23.7%) experienced low barriers, typically those in urban-adjacent wards with some exposure to financial services but still constrained by bureaucratic or economic challenges. A 43-year-old female farmer from Mivinjeni ward articulated the severity of high barriers:

"…I've never been able to open a bank account because I don't have a national ID, and the nearest bank is two hours away by foot. Nobody in my village explains how these things work, and I don't read well, so I feel lost even thinking about it. We just keep money in a box at home, but it's risky, and we can't save enough to improve our farm. It's like the system isn't made for us rural women…"

This likeness accentuated how documentation and literacy barriers, compounded by geographic isolation, created significant obstacles, particularly for women, echoing global patterns of exclusion [2].

Another respondent, a 39-year-old male trader from Kihesa, added:

"…I tried to get a loan from a SACCOS once, but they asked for so many papers ID, proof of income, even land documents. I don't have those, and the bank in town is too far. I don't understand their rules, and the fees scare me. It's easier to borrow from friends, but that's not enough to grow my business…"

These accounts highlighted how high barriers entrenched financial exclusion, limiting access to capital for economic advancement.

Respondents reporting moderate barriers (76 individuals) described partial access to financial services, often through mobile money or community-based savings groups, but faced challenges like high transaction costs, intermittent connectivity, and limited understanding of financial products. These individuals, often younger or residing closer to urban centers like Ilala ward, noted that while they could occasionally engage with financial systems, consistent access remained elusive. A 27-year-old female respondent from Mtwivila ward shared:

"…I use mobile money sometimes to receive payments for my vegetables, but the fees are high, and I don't know how to use it for loans or saving. The agent is in the next village, and the network is bad sometimes, so I can't rely on it. I joined a savings group, but it's small, and we can't afford big things like irrigation pumps…"

This narrative captured the partial mitigation of barriers through mobile money, yet highlighted persistent challenges, consistent with studies noting the role of digital divides in rural Tanzania [41]. Another respondent, a 34-year-old male farmer from Mwangata, elaborated:

"…I've used mobile money for small transactions, but I don't understand how to get a loan or save properly. The agent charges a lot, and I need to travel to town for anything bigger. I want to learn, but nobody teaches us how these things work, and I'm afraid of losing money if I try…"

These insights revealed that moderate barriers, while less severe, still constrained meaningful financial inclusion, pointing to the potential for green finance to address cost and awareness gaps.

The 51 respondents reporting low barriers were typically those with better access to mobile money agents or SACCOS, often in urban-adjacent wards, but still faced hurdles like complex eligibility criteria and limited financial literacy. These individuals described occasional success in accessing financial services but struggled to leverage them for significant economic benefits. A 29-year-old male respondent from Ilala ward explained:

"…I use mobile money because there's an agent nearby, and I even tried a SACCOS for a small loan once. But the forms were confusing, and I didn't know what they meant by 'collateral.' I can send and receive money, but anything more like getting a loan for farming is hard because I don't understand the process well…"

This perspective reflected the relative advantage of proximity but highlighted persistent bureaucratic barriers, aligning with findings on urban-rural disparities in Tanzania [39].

A 31-year-old female trader from Mwangata noted:

"…I have a mobile money account and use it for my business, but I can't get a loan because I don't have enough savings or the right documents. The SACCOS is nearby, but they ask for things I can't provide, and I don't know enough to argue. It's better than nothing, but it's not enough to really change things…"

These echoes stressed how low barriers still limited full financial inclusion, emphasizing the need for simplified, accessible financial products like green microfinance to empower unbanked populations.

These findings illustrated a spectrum of barriers to financial access in Iringa Municipal, from high barriers driven by documentation, literacy, and geographic challenges, to moderate barriers mitigated by partial mobile money access, and low barriers constrained by bureaucratic difficulties. The respondents' experiences highlighted the urgent need for tailored green finance initiatives to overcome these barriers, particularly for rural women and youth, to foster economic resilience and sustainable development.

Socioeconomic Impact of Financial Exclusion

In the study on financial exclusion in Iringa Municipal, the findings revealed a significant socioeconomic impact on the unbanked population. The data as demonstrated in figure 1, collected from a survey of 215 respondents, showed that the lack of access to formal financial services was not just a banking issue but a major driver of poverty and vulnerability. The impact was categorized into three levels: high, moderate, and low. A total of 84 respondents (39.1%) reported a high socioeconomic impact, indicating severe financial instability, while 71 (33.0%) experienced a moderate impact and 60 (27.9%) a low impact. The results highlighted that for a substantial portion of the population, financial exclusion was a daily challenge with serious consequences for their ability to manage money, cope with shocks, and plan for the future.

For the 84 respondents who reported a high socioeconomic impact, the lack of financial services created a constant state of precarity. They were unable to save for emergencies, invest in their livelihoods, or secure loans at reasonable rates. This meant that any unforeseen event, such as a family illness or a failed harvest, could push them into a deeper cycle of debt. A young farmer from one of the municipal's agricultural zones spoke of the daily struggle:

"…when the rains failed last year, I had no money to buy new seeds. The bank would not give me a loan without collateral, and I had no savings. I had to sell my goat just to buy food for my children. Then, I borrowed money from a local lender at a very high interest rate just to get through the season. I am still paying that debt now. If I had a bank account, maybe I could have saved a little each month and not had to lose my goat…"

This powerful reaction illustrated how the absence of a simple savings mechanism could escalate a common climate shock into a catastrophic economic event.

The 71 respondents who experienced a moderate socioeconomic impact faced similar challenges, but their situations were not as dire. They might have had a limited ability to save, often through informal means, or had some access to mobile money. However, this access was insufficient to provide true financial security. A female street vendor shared her struggles with managing her income:

"…I try to save a little each day, but it is hard when the money is in my pocket. I use some of it to buy more goods for the next day, and the rest is for my family. But if my child gets sick, I have to use that money, and then I am back to zero. I know I should save in a bank, but the bank is far away and it is difficult for someone like me to get a loan for my business. I can't grow my business because I can't get the money to buy more stock. So, I am stuck at the same level..."

Her experience demonstrated how a lack of access to both safe savings and affordable credit acted as a constraint on business growth and economic advancement, perpetuating a state of moderate vulnerability.

Finally, the 60 respondents who reported a low socioeconomic impact were relatively more stable, but still faced a number of disadvantages. This group was more likely to have a mobile money account and some ability to save, but they still lacked access to the full range of services that would build true resilience. A small-scale construction worker explained his situation:

"…I use my mobile money to save some money for big projects, and it helps. But when I wanted to get a loan to buy a machine to mix cement, the loan was very small, and the interest was high. My friend who works in a big company was able to get a much bigger loan from a bank. It is not fair that we cannot access the same opportunities. We can save, but we cannot get the big boost we need to really improve our lives…"

This comment highlighted how even for those with a low socioeconomic impact, financial exclusion created unequal opportunities, limiting their ability to achieve their full economic potential.

These findings illustrated a range of socioeconomic impacts from financial exclusion in Iringa Municipal, ranging from severe limitations that entrenched poverty, to moderate constraints mitigated by informal networks, and low impacts tempered by partial access to financial services. The respondents' experiences underscored the urgent need for green finance initiatives to address these impacts by providing accessible, affordable financial products to empower unbanked populations, particularly rural women and youth, toward sustainable economic development.

Role of Green Finance in Addressing Environmental Challenges and Supporting Sustainable Livelihoods

The study examined the Role of Green Finance in Addressing Environmental Challenges and Supporting Sustainable Livelihoods, focusing on three sub-indicators: the adoption rate of green finance products, the impact of such initiatives on mitigating environmental challenges, and the enhancement of sustainable livelihood practices among unbanked populations. Findings revealed that respondents generally perceived green finance as a promising tool that not only encouraged the uptake of eco-friendly financial products but also contributed to reducing environmental degradation while simultaneously promoting alternative livelihood strategies that were more sustainable and resilient.

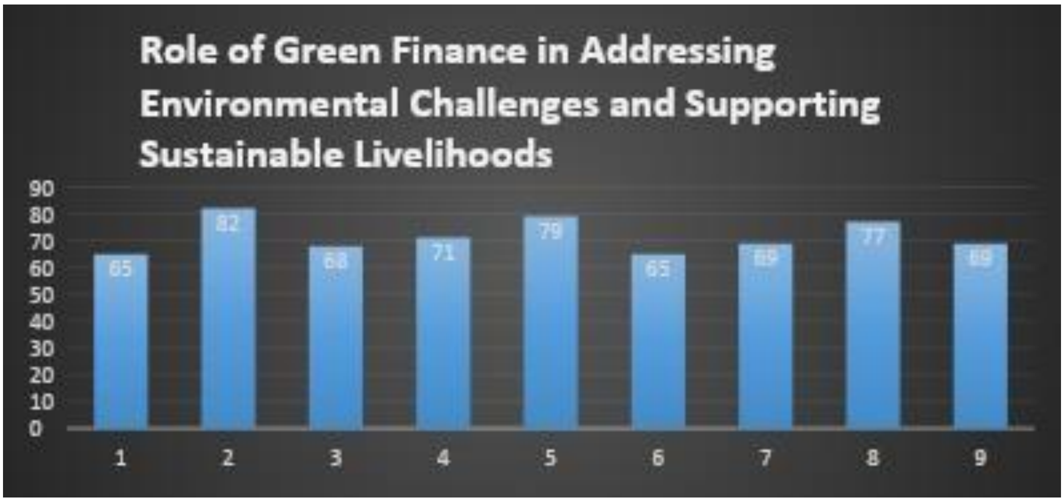

Figure 2: Showing the role of green finance in addressing environmental challenges and supporting sustainable livelihoods.

Adoption Rate of Green Finance Products

The findings on the adoption rate of green finance products as per data in figure 2, revealed important variations in the extent to which unbanked populations in Iringa Municipal embraced these initiatives. Out of the 215 respondents, 65 (30.2%) reported significant adoption, 82 (38.2%) indicated moderate adoption, and 68 (31.6%) stated they had not adopted any green finance products at all. Those who significantly adopted green finance products emphasized how access to eco-loans, renewable energy financing, and green savings schemes directly impacted their households and communities. A smallholder farmer who had benefited from a solar-powered irrigation loan explained:

"…when I accessed a green loan to buy solar irrigation equipment, everything changed. Before, I was limited to rainy seasons and had to depend on expensive fuel pumps that

drained my income. But with solar, I now farm all year, produce surplus crops, and even send my children to school without struggling as much. This program was not just financial support; it gave me hope and stability, something I never had before…"

Another respondent from a women's cooperative added:

"…through our green savings group, we managed to get small loans to buy improved stoves and solar lamps. It reduced our firewood expenses and improved our health since smoke reduced in our homes. Honestly, without this product, many of us would still be stuck in the old ways, spending more on fuel and suffering the consequences. Green finance has opened a new chapter for us…"

Respondents with moderate adoption, who made up the largest proportion (82 individuals, or 38.2%), described partial engagement with green finance programs. They acknowledged benefits but also pointed out constraints such as complicated procedures, insufficient product availability, or eligibility challenges. A kiosk owner reflected:

"…I joined a savings group linked to a green finance project, and from it I managed to buy an energy- efficient stove. That was a real change, but when I wanted to apply for a loan to expand my business with solar equipment, the requirements were too strict. They wanted documents and guarantors I couldn't

provide. So, I benefited somehow, but it was limited, and I could not move beyond the first step…"

Similarly, a youth entrepreneur remarked:

"…we were trained on how green finance could help us start businesses like solar charging stations. I tried to apply, but the loan amount offered was very small compared to what I needed, and repayment terms were tough. I still see it as useful, but at the moment it is more like an idea I can only partially take advantage of. It has potential, but for now it is not enough to transform my livelihood…"

Those who reported no adoption (68 respondents, or 31.6%) often highlighted issues of exclusion, lack of awareness, and mistrust in formal systems. Many felt that green finance products were either inaccessible to them or not designed with their realities in mind. A respondent from a rural village explained:

"…I have never used any green finance product because no one has ever come to our area to explain them. We only hear from others that there are loans for solar panels or clean energy, but we don't know where to start. Most of us don't even have bank accounts, so we believe such programs are for people in town, not for villagers like us…"

Another echoed similar frustrations:

"...green finance sounds like something good, but for us it is like a story we hear but never see. No officer or NGO ever came here to show us how it works. Even if they came, I don't think I would qualify because they always ask for IDs, bank slips, or collateral. So, I just continue with kerosene lamps and charcoal stoves, because at least those are available and don't require paperwork…"

The findings demonstrated that while green finance initiatives had significantly empowered some households, a substantial portion of the population remained only moderately engaged or entirely excluded. The narratives made it clear that adoption depended heavily on awareness, accessibility, and inclusivity of the products offered. While the stories of those who had significantly adopted highlighted transformational impacts, the frustrations expressed by moderate and non-adopters accentuated the urgent need to simplify processes, expand outreach, and design products suited for the realities of unbanked and marginalized communities.

Impact on Environmental Challenges

The study as in figure 2, findings on the impact of green finance on environmental challenges revealed a mixed picture of how these initiatives shaped ecological outcomes in Iringa Municipal. Among the 215 respondents, 71 (33.1%) reported significant impact, 79 (36.7%) perceived moderate impact, while 65 (30.2%) stated that green finance initiatives had no impact at all on environmental challenges in their communities. Those who reported significant impact often described how programs that supported renewable energy, sustainable farming, and eco-friendly technologies had directly reduced environmental degradation. A farmer who had shifted to solar-powered irrigation shared:

"...when I started using solar pumps, the need for diesel went away completely. Before, I used to buy fuel every week, which not only cost me a lot but also polluted the air with smoke. Now, the land feels more productive, the air around our fields is cleaner, and I no longer cut down trees for firewood. This program truly helped us protect our environment while earning a living…"

Another respondent from a women's cooperative explained:

"...green finance enabled our group to access loans for improved cookstoves, and this changed many

households. We used to depend heavily on firewood, and deforestation in our area was getting worse. But *now, the stoves use less wood, and smoke inside our kitchens has reduced. It is not just about convenience it is about protecting the environment for our children and grandchildren. Without this support, we would still be destroying our forests at the same pace…"*

Respondents who reported moderate impact, the largest group at 79 (36.7%), acknowledged improvements but also highlighted persistent challenges. For many, the adoption of green finance had begun to address environmental issues, but the scale was not sufficient to make widespread change. A smallholder farmer explained:

"…I managed to get a green loan to buy drought-resistant seeds, and it really helped reduce the pressure on water resources. But beyond my farm, many people are still using old methods and cutting trees for charcoal. So, yes, it has helped me personally, but when I look around the village, the impact is only moderate. We need more people involved for it to make a real difference…"

Similarly, a young entrepreneur running a solar phone-charging station said:

"…I see a change in my own business because I now rely on solar energy instead of a petrol generator. But when I walk through town, I still see a lot of waste mismanagement and heavy use of charcoal. The impact is there, but it is small compared to the scale of the problem. Green finance has started something good, but it has not yet reached the level where we can say the environment is truly safe…"

For the 65 respondents (30.2%) who perceived no impact, green finance initiatives were seen as either absent or ineffective in addressing environmental challenges. These respondents often lived in areas where such programs had not been implemented, or where they felt excluded from participation. A respondent from a rural settlement lamented:

"…in our area, I have not seen any green finance project that has reduced environmental problems. People still cut trees for charcoal, still burn waste in open fields, and still use kerosene lamps. Maybe these programs exist somewhere else, but here there is no change. It feels like the environment is just getting worse…"

Another participant echoed this comment:

"…to me, green finance has no impact because it is not visible in our community. The river near our home is still polluted, and people still farm along its banks using chemicals. I have heard others talk about loans for solar and eco-products, but in our village, nothing has changed. It looks like the environment is being left behind while others move forward…"

Findings showed that while green finance had achieved significant environmental impact for some groups, many respondents experienced only partial or no benefits, reflecting uneven implementation and accessibility. The testimonies demonstrated that the transformative potential of green finance was real, but its effectiveness depended on scale, inclusivity, and the extent to which programs were adapted to local environmental challenges. The accounts of significant adopters illustrated hopeful change, while moderate and non-adopters emphasized that without broader outreach and sustained investment, environmental challenges in Iringa Municipal would persist.

Enhancement of Sustainable Livelihood Practices

The assessment of how green finance initiatives enhanced sustainable livelihood practices revealed a compelling, though not universal, story of economic empowerment and resilience building, directly linking financial inclusion to improved well-being for a substantial portion of adopters. The data as presented in figure 2, showed that 69 out of 215 respondents (32.1%) experienced a 'Significant Improvement' in their livelihoods, attributing transformative changes in their economic activities and security directly to green financial products. A nearly equal number, 77 individuals (35.8%), reported a 'Moderate Improvement,' noting tangible benefits that had not yet fundamentally altered their economic trajectory, while another 69 respondents (32.1%) saw 'No Improvement,' often due to non-adoption, the failure of a funded venture, or products that were mismatched to their actual needs. For those who reported significant improvement, green finance acted as a catalyst, enabling them to break away from subsistence living and build more secure, productive, and sustainable enterprises. A woman who used a loan to transition from charcoal production to a beekeeping enterprise described a profound transformation:

"*…the improvement was not small; it was everything. Before, I was cutting trees every day, knowing I was destroying the forest but seeing no other way to feed my children. The green loan was not just money; it came with training on how to set up apiaries. Now, I sell honey and beeswax at the market. My income is more stable, and I am proud of my work. I am not harming the environment; I am protecting it because the bees need a healthy forest to thrive. This loan didn't just give me money; it gave me a completely new and sustainable life...*"

This reply of a fundamental livelihood shift was echoed by a young farmer who invested in a solar- powered irrigation pump:

"*…for me, the improvement was significant because it changed my status from a struggling farmer to a reliable supplier. With the pump, I can now grow crops year-round, not just during the rains. I have contracts with two small supermarkets in town because I can guarantee supply. My income has more than doubled. This is what 'sustainable' truly means it means I can now plan for the future, for my children's education, because my livelihood is no* *longer at the mercy of the weather…*"

These accounts highlighted that significant improvement occurred when green finance provided not just capital, but also the means to transition into more productive, less vulnerable, and environmentally harmonious livelihood models.

Respondents who reported a 'Moderate Improvement' typically cited clear benefits that enhanced their existing practices without revolutionizing them, often expressing hope for more substantial change in the future. A tailor from Uhindini near Vunja Bei who purchased a single solar panel to power his sewing machine illustrated this common experience:

"*…there was an improvement, yes. I can now work for two more hours in the evening, so I earn a little more money. I would call it moderate because it is not a huge change. I still have the same customers and the same machine. It hasn't allowed me to expand; it just makes my current work a bit easier and more profitable. It is a step in the right direction, but I need a larger loan for a better machine to truly move forward…*"

This view of incremental gain was shared by a farmer who used drought-resistant seeds:

"*…the improvement was moderate. The seeds helped; I got a harvest when my neighbour who used traditional seeds got nothing. So I had food to eat and a little to sell. But it was not a bumper harvest. It saved me from hunger, but it did not make me wealthy. It made a bad year into an okay year, which is important, but it is not yet a transformation...*"

These considerations highlighted that moderate improvement was characterized by increased stability and efficiency within existing livelihood frameworks, providing a crucial buffer against shocks but falling short of enabling significant economic mobility or sectoral change.

For the 69 individuals who perceived 'No Improvement,' the reasons were often deeply frustrating, ranging from complete exclusion from these financial products to failed investments that left them in a worse position. A man who had taken a loan for a solar dryer for his tomatoes, which broke after three months with no available technical support, expressed his disillusionment: "*…there was no improvement, only loss. The idea was good, but the machine was poor quality, and there was no one to repair it. Now I have a broken dryer and a debt to repay. My livelihood is exactly the same as before, but now I am poorer because of the loan payments. For me, green finance was a trap, not an improvement…*"

This experience of product failure and lack of support was a critical barrier. Another respondent, a fisherman, cited a fundamental mismatch between the offered products and his reality:

"*…how does a solar loan improve my fishing? They offered me a lantern for my boat, but my problem is not light; my problem is the declining fish stocks and the expensive permits. The* *'green' product did not address the real threat to my livelihood. So, there was zero improvement. It felt like the bank was offering a solution to a problem I didn't have, while ignoring the ones I do…*"

These accounts revealed that the perception of no improvement stemmed from a combination of product irrelevance, quality issues, and a lack of post-disbursement support, highlighting that the mere provision of green credit is insufficient without ensuring the products are appropriate, reliable, and integrated with broader support systems to truly enhance livelihoods.

The findings demonstrated a mixed impact of green finance on sustainable livelihood practices. While a third of respondents experienced significant positive changes, another third saw only moderate improvements, and the remaining third experienced no impact at all. The narratives suggested that for green finance to fully realize its role in enhancing sustainable livelihoods, issues of accessibility, affordability, and awareness needed to be addressed. This implied that future interventions had to focus not only on providing funds but also on creating inclusive systems that ensured marginalized groups could also benefit from the shift toward sustainability.

Potential of Green Finance in Building Economic and Climate Resilience

The study examined the Potential of Green Finance in Building Economic and Climate Resilience, focusing on three sub-indicators: Economic Resilience Outcomes, Climate Resilience Outcomes, and Scalability and Accessibility of Green Finance Models. This key indicator assessed how green financial mechanisms had supported communities in strengthening their economic stability, adapting to climate-related risks, and accessing sustainable financial solutions at scale. It reflected the extent to which green finance had been integrated as a practical tool for resilience-building, while also uncovering the challenges that limited its broader impact across different sectors and populations.

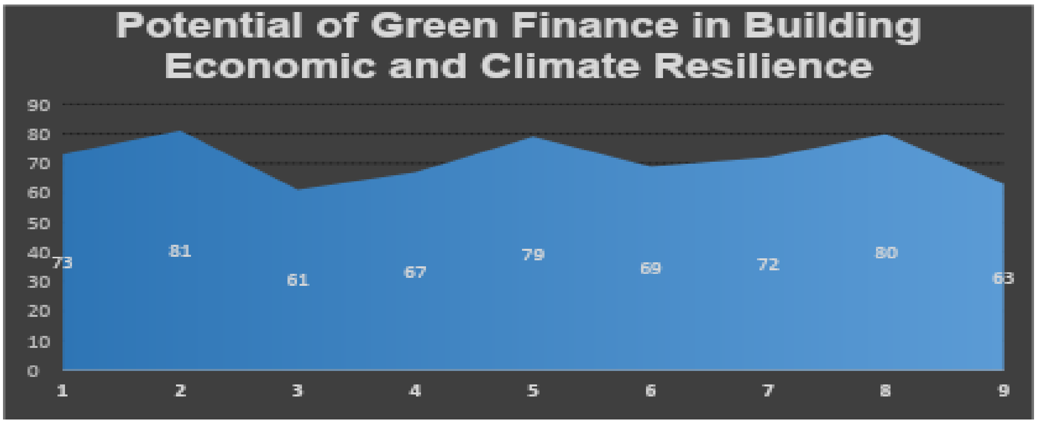

Figure 3: Showing the potential of green finance in building economic and climate resilience.

Economic Resilience Outcomes

The study also highlighted notable variation in the economic resilience outcomes of green finance, with 73 respondents (34.0%) reporting high potential, 81 respondents (37.6%) indicating moderate potential, and 61 respondents (28.4%) perceiving low potential. As shown in figure 3, those who perceived high potential often described how green finance interventions supported businesses and households to withstand shocks, particularly by promoting sustainable investment models and cushioning against climate-related risks. For instance, one respondent emphasized:

"…green finance had changed the way we planned our projects. By accessing small loans linked to sustainable farming, we had more stable incomes even when rains were delayed. Unlike before, when a single bad season destroyed everything, the financing allowed us to diversify into crops and activities that were more resilient. It gave us confidence that our livelihoods could survive unexpected shocks…"

This perspective illustrated how the introduction of green financial products had provided households with an enhanced ability to adapt to uncertainties, reinforcing findings from similar resilience-oriented programs in other contexts.

Another respondent added:

"…I saw green finance not just as money but as a tool for building security. The savings schemes attached to it meant we could plan better for the future and avoid falling back into poverty during crises. It was different from traditional loans because it emphasized sustainability, and that aspect gave us a stronger foundation economically…"

Such accounts highlighted how access to green financial instruments fostered tangible improvements in stability and resilience among households that were able to adopt them.

Respondents who reported moderate potential (81; 37.6%) described more mixed experiences, acknowledging that while green finance offered new opportunities, the benefits had not been evenly distributed or consistently accessible. Many participants explained that bureaucratic processes, limited awareness, and uneven outreach hindered the full realization of its potential. One respondent explained:

"…I believed green finance could help, but it had not reached everyone. In our area, only a few groups were able to access the loans, and the rest were left out. It felt like the program had promise, but until it covered more people, its ability to build resilience had been moderate at best. It helped some, but not the majority…"

Another respondent reflected on the conditionality attached to the financing:

"…we were asked to follow certain sustainability practices before accessing green loans, which made sense, but many small businesses couldn't afford the initial changes. So while the potential was there, the real benefits were delayed or limited, leaving many of us feeling only moderately supported…"

These insights captured how uneven implementation and structural limitations restricted the broader economic impact of green finance, even when its long-term promise was recognized.

Meanwhile, 61 respondents (28.4%) perceived the potential of green finance for economic resilience as low, often citing affordability barriers, lack of trust in financial institutions, and unsustainable conditions for vulnerable groups. Respondents in this group were often the most skeptical about the immediate benefits of green finance. One participant remarked:

"…for us, green finance had been more of a burden than a help. The requirements were too strict, and we couldn't keep up with the costs of making our activities 'green.' Instead of making us resilient, it increased our stress. We didn't see how it was going to protect us when basic survival was still a daily struggle…"

Similarly, another respondent stated:

"…many of us wanted to join the programs, but the loans came with strings attached, and the benefits were unclear. We were told it would build resilience, but we didn't experience that. For us, the impact remained very low because the financing felt distant, designed for others but not for people in our situation…"

These reflections underlined the exclusionary experiences of groups unable to meet the criteria for green finance, leaving them outside the resilience gains observed by others.

Taken together, the findings illuminated the variety of experiences with green finance and economic resilience outcomes, ranging from high potential where households reported greater stability and preparedness, to moderate potential where benefits were constrained by limited access, and low potential where financial exclusion and implementation barriers prevented meaningful change. The contrasting accounts highlighted both the promise and the limitations of green finance in supporting economic resilience, pointing to the need for greater inclusivity, simplified processes, and targeted outreach to ensure that its potential was more evenly realized across different groups.

Climate Resilience Outcomes

The study also highlighted significant variability in the perceived potential of green finance to build climate resilience, with 67 respondents reporting high potential, 79 indicating moderate potential, and 69 noting low potential. As per the survey data shown in figure 3, among the 215 respondents, those who perceived high potential, primarily farmers and households using climate-adaptive technologies, described how these tools fundamentally enhanced their capacity to withstand environmental shocks such as droughts, floods, and erratic rainfall. These individuals often emphasized the transformative role of products like drought-resistant seeds, solar-powered irrigation systems, and weather-indexed insurance in providing stability against climate uncertainties. A maize farmer who transitioned to drought-tolerant crops through a green loan shared:

"…the potential was unquestionably high because it changed our relationship with the weather. Before, one dry spell meant total crop failure and hunger. Now, even in a bad season, I get a harvest. It may not be bumper, but it is enough. This technology, financed through that loan, didn't just give me food security; it gave me peace of mind. I no longer lie awake at night worrying about clouds. For the first time, I feel like I have a fighting chance against the changing climate…"

This reflection highlighted how targeted financial products could directly buffer households against climate-induced losses, aligning with studies linking adaptive financing to reduced agricultural vulnerability.

Another respondent, a village elder whose community invested in solar-powered water pumps, elaborated:

"…the potential was immense. Our shallow wells used to dry up for months, forcing our women to walk kilometers. The solar pumps allowed us to access deeper groundwater reliably. During the last prolonged drought, we were the only village in the ward that didn't need water trucked in. This wasn't just convenience; it was resilience. We could water our kitchen gardens, keep our livestock alive, and stay healthy. Green finance made us climate-proof in a way we never thought possible..."

These accounts emphasized that high potential was associated with technologies that provided essential resources like water and food independently of increasingly unreliable climate patterns.

Respondents who reported moderate potential (79 individuals) acknowledged that green finance offered valuable tools for adaptation but felt these were insufficient to address the scale or multiplicity of climate threats they faced. These users often relied on a single technology, such as a solar lantern or an improved cookstove, which addressed one aspect of their vulnerability but left others exposed. A cassava farmer who purchased a weather-resistant variety through a microloan explained:

"…the potential was moderate, not a miracle. The new cassava strains survived the drought where my old ones would have died, so that was a huge win. But the extreme heat still stunted their growth, and the irregular rains made planting times a gamble. It helped me cope better, but it didn't make me immune. I still lost yield, just not everything. It's a crucial tool in the toolbox, but you need more than one tool to build a resilient house."

This response captured the pragmatic view that green finance provided important, yet partial, solutions to complex climate challenges. Another respondent, a fisherman who acquired a solar-powered freezer to preserve his catch during power outages, reflected:

"…the freezer helped reduce losses when the grid was down, which happened often during storms. That was a moderate improvement. But it didn't help with the bigger problem: declining fish stocks due to warmer water temperatures. So, I was better prepared for one climate impact but still vulnerable to another. The potential is real, but it needs to be part of a much larger strategy."

These insights highlighted that moderate potential was characterized by a recognition of incremental progress in adaptation, tempered by an awareness of the pervasive and interconnected nature of climate risks.

The 69 respondents who perceived low potential often cited a fundamental mismatch between the scale of green finance interventions and the magnitude of the climate challenges they confronted. Many felt that individual actions, like adopting a single technology, were futile in the face of systemic environmental degradation or large-scale weather events. A pastoralist from a drought-prone area expressed deep skepticism:

"...how can a small loan for a water tank compare to three consecutive years of drought? It might help one family for a few weeks, but when the grazing lands are completely barren and the rivers are dust, no financial product can bring back the grass. The climate problem is too big for these small solutions. The potential is low because we are fighting a forest fire with a cup of water..."

This perception of inadequacy was common among those facing the most severe climate impacts. Another respondent, a homeowner in a floodplain, noted:

"...they talked about green loans for storm-resistant roofing. But when the entire riverbank erodes and your house is swept away, a stronger roof is irrelevant. The finance doesn't address the root cause the deforestation upstream that makes the floods worse every year. Until there are large-scale projects to restore the ecosystem, these small products will always have low potential for us..."

These reflections accentuated that low perceived potential stemmed from a view that micro-level financial products were incapable of addressing macro-level environmental crises, indicating a critical need for green finance to be integrated with broader policy and ecosystem-based adaptation strategies to be seen as truly effective.

These findings illustrated a range of climate resilience outcomes from green finance in Iringa Municipal, from high potential driven by robust adoption of adaptive practices, to moderate potential constrained by access limitations, and low potential due to systemic exclusion. The respondents' experiences highlighted green finance's capacity to build climate resilience and the urgent need for inclusive, tailored strategies to ensure equitable adaptation among unbanked populations.

Scalability and Accessibility of Green Finance Models

The study also highlighted significant variability in the perceived potential for the scalability and accessibility of green finance models, with 72 respondents reporting high potential, 80 indicating moderate potential, and 63 noting low potential. As per data demonstrated in figure 3, among the 215 respondents, those who perceived high potential, often younger, tech-savvy individuals and members of organized community groups, emphasized the transformative role of mobile technology and agent banking in democratizing access to financial products. These individuals pointed to the existing widespread use of mobile money platforms as a ready-made infrastructure that could be leveraged to distribute green loans, process micropayments, and deliver educational content directly to users' phones. A youth leader who organized a farmer cooperative shared:

"…the potential for scalability was incredibly high because the delivery system already exists in everyone's pocket. We don't need to wait for banks to build branches in every village. With mobile money, a farmer in the most remote area can receive a loan disbursement, make a payment on their solar home system, and get weather alerts through USSD codes. Our cooperative used a WhatsApp group to share information about a new drought-resistant seed loan, and within a week, over 50 members had registered using their phones. The model is scalable because it is digital-first and builds on habits people already have…"

This consideration highlighted how leveraging existing digital infrastructure could rapidly expand the reach of green finance, aligning with studies on fintech-driven financial inclusion in East Africa.

Another respondent, a mobile money agent in Ndiuka, elaborated:

"…the accessibility potential is massive. I am already here in the community, people trust me to handle their cash and mobile transactions. Adding green finance products like signing people up for PAYG solar or insurance was a natural extension. The model is scalable because it uses a network of existing agents instead of building new brick-and-mortar locations. With minimal training, I could become a one-stop shop for my community's financial and green energy needs…"

These accounts underlined that high potential was associated with models that prioritized low-cost, familiar, and ubiquitous channels to overcome traditional barriers to access.

Respondents who reported moderate potential (80 individuals) acknowledged the promise of scalable models but highlighted significant practical constraints that needed to be addressed before widespread adoption could become a reality. These constraints included digital literacy gaps, especially among older populations, the affordability of smartphones for advanced applications, and the reliability of network coverage in remote areas. A middle-aged farmer who was comfortable with basic mobile money but doubtful of more complex products explained:

"…the potential is moderate because the technology is only half the solution. I can use my simple phone to send and receive money, but applying for a loan requires understanding complex menus and terms. Many of us are not literate enough to navigate these systems confidently. The model might be scalable on paper, but if we cannot use it without fear of making a costly mistake, its reach will always be limited to the educated few. We need more human touchpoints and support…"

This response captured the critical importance of user-friendly design and support services in achieving true scalability. Another respondent, a community health worker, reflected on infrastructure limitations:

"…in my village, the network is weak and electricity to charge phones is unreliable. A model based entirely on mobile phones assumes that these things are always available, which they are not. During the rainy season, we often go days without a signal. So, while the mobile-based model has moderate potential, it must be hybrid combining digital tools with physical community meetings and paper records to be truly accessible to everyone, not just those in towns with good connectivity…"

These insights highlighted that moderate potential was characterized by a recognition of the enabling role of technology, tempered by a pragmatic understanding of the digital divide and infrastructural deficits that could exclude the most vulnerable.

The 63 respondents who perceived low potential often cited deep-seated structural and systemic barriers that they believed would prevent green finance models from ever reaching them at a meaningful scale. These included a fundamental lack of trust in formal financial institutions, perceived corruption in the distribution of resources, and a belief that these products were ultimately designed for profit rather than poverty alleviation. An elderly woman who had witnessed numerous development projects come and go expressed deep distrust:

"…they always talk about scaling up, but nothing ever reaches us here. The programs start in the towns, and the benefits are captured by the connected few. By the time it trickles down to our village, there is nothing left. How can you scale what you cannot trust? I do not believe that a bank in Dar es Salaam will ever truly care about whether I can afford a solar lamp. The model might work in other places, but here the potential is low because the system is not built for the poor…"

This perception of systemic exclusion and broken promises was a significant barrier to believing in scalability. Another respondent, a day laborer, pointed to the fundamental issue of affordability and risk:

"…these models talk about accessibility, but they are still built on debt. If I cannot repay because of a bad harvest or an illness, the system will still punish me. That is not accessible; that is a trap. True accessibility would mean grants, subsidies, or community-owned models where we share the risk. Until the model changes from lending to empowering, its potential to scale to the very poor will always be low. We need ownership, not just access…"

These thoughts emphasized that low perceived potential was rooted in a critique of the underlying philosophy of current green finance models, indicating that for true scalability and accessibility to be achieved, products must not only be distributed through efficient channels but must also be fundamentally redesigned to be more trustworthy, affordable, and aligned with the risk profiles of the most marginalized communities.

These findings showed that while green finance models had demonstrated potential for scalability and accessibility, perceptions were mixed. A portion of respondents saw clear evidence of inclusive models expanding across communities, while others described partial implementation constrained by barriers, and still others felt excluded altogether. The balance between high, moderate, and low perceptions pointed to a critical need for reforms in design and delivery particularly simplifying access requirements, expanding rural outreach, and ensuring affordability to unlock the full promise of scalable green finance.

CONCLUSION AND RECOMMENDATIONS

The study examined how green finance initiatives can empower unbanked populations in Iringa Municipal by enhancing financial inclusion, promoting sustainable livelihoods, and strengthening resilience to economic and environmental shocks. The findings revealed that unbanked populations faced significant financial exclusion, with barriers such as limited awareness, inadequate access to financial institutions, and socio-economic constraints restricting participation in formal financial systems. The prevalence of these challenges highlighted the critical role of targeted interventions like green finance in bridging the gap, enabling communities to access resources, adopt sustainable practices, and improve overall livelihood outcomes. Respondents' experiences demonstrated that when green finance programs were accessible and coupled with practical support, households reported greater economic stability and improved capacity to cope with climate-related risks. Moreover, the study stressed that the potential of green finance in building both economic and climate resilience was highly dependent on inclusivity, scalability, and accessibility. While some participants experienced substantial benefits, including stable incomes, adoption of climate-smart technologies, and improved preparedness for environmental shocks, others faced limitations due to restrictive eligibility, uneven program reach, and affordability challenges. These disparities highlighted that the effectiveness of green finance initiatives was not uniform across all unbanked populations. In general, the study concluded that green finance represents a promising avenue for empowering marginalized communities in Iringa Municipal, but its impact is contingent upon addressing structural, financial, and informational barriers to ensure equitable participation and sustainable outcomes.

Based on the findings of the study, it is recommended that policymakers, financial institutions, and development partners strengthen and expand green finance initiatives to ensure they are accessible, inclusive, and tailored to the needs of unbanked populations in Iringa Municipal. This includes simplifying application procedures, increasing awareness and outreach programs, and providing targeted support for marginalized and rural communities to adopt sustainable livelihood practices. Additionally, integrating capacity-building and climate-smart training alongside financial products can enhance both economic and environmental resilience. Efforts should also focus on scaling successful models while addressing affordability and infrastructural barriers, ensuring that green finance becomes a practical and equitable tool for promoting financial inclusion, sustainable livelihoods, and long-term resilience among unbanked households.

REFERENCES

1. W. B. Group, *Global Economic Prospects, January 2021*. World Bank Publications, 2021.
2. A. Demirgüç-Kunt, L. Klapper, D. Singer, and S. Ansar, *The Global Findex Database 2021: Financial inclusion, digital payments, and resilience in the age of COVID-19*. World Bank Publications, 2022.
3. E. Mgangaluma, M. Benedicto, M. J. Fimbo, N. Siriwa, V. Tesha, and H. Mpango, "Bank of Tanzania," ed: Retrieved March, 2024.
4. N. M. Pauline, "The status of strategic environmental assessment in Tanzania," *The African Review,* vol. 1, no. aop, pp. 1-27, 2024.
5. W. Critchley, S. Di Prima, and W. Tuyp, *Sustainable Land Management in Sub-Saharan Africa*. VU University Press, 2012.
6. F. A. Kitole and C. Komba, "Challenges and opportunities of climate change adaptation strategies among smallholder horticultural farmers in rural Tanzania," *Cogent Food & Agriculture,* vol. 11, no. 1, p. 2554247, 2025.
7. U. Volz, "Fostering green finance for sustainable development in Asia," in *Routledge handbook of banking and finance in Asia*: Routledge, 2018, pp. 488-504.
8. J. M. Chen, M. Umair, and J. Hu, "Green finance and renewable energy growth in developing nations: a GMM analysis," *Heliyon,* vol. 10, no. 13, 2024.
9. P. Rolffs, D. Ockwell, and R. Byrne, "Beyond technology and finance: pay-as-you-go sustainable energy access and theories of social change," *Environment and Planning a,* vol. 47, no. 12, pp. 2609-2627, 2015.
10. G. Desalegn and A. Tangl, "Enhancing green finance for inclusive green growth: A systematic approach,"
11. *Sustainability,* vol. 14, no. 12, p. 7416, 2022.

12. L. Gómez Urquijo, "Financial exclusion in the European Union: addressing difficulties in accessing finance within the current integration framework," *Journal of Contemporary European Studies,* vol. 23, no. 1, pp. 100-117, 2015.
13. P. S. Koku, "Financial exclusion of the poor: a literature review," *International Journal of Bank Marketing,* vol. 33, no. 5, pp. 654-668, 2015.
14. C.-Y. Park and R. Mercado Jr, "Financial inclusion, poverty, and income inequality," *The Singapore Economic Review,* vol. 63, no. 01, pp. 185-206, 2018.
15. P. J. Morgan, "Fintech and financial inclusion in Southeast Asia and India," *Asian Economic Policy Review,*
16. vol. 17, no. 2, pp. 183-208, 2022.
17. A. Demirgüç-Kunt and L. F. Klapper, "Measuring financial inclusion: The global findex database," *World bank policy research working paper,* no. 6025, 2012.
18. A. Demirgüç-Kunt and L. Klapper, "Measuring financial inclusion: Explaining variation in use of financial services across and within countries," *Brookings papers on economic activity,* vol. 2013, no. 1, pp. 279- 340, 2013.
19. A. Demirguc-Kunt, L. Klapper, D. Singer, S. Ansar, and J. Hess, *The Global Findex Database 2017: Measuring financial inclusion and the fintech revolution*. World Bank Publications, 2018.
20. S. Chikalipah, "What determines financial inclusion in Sub-Saharan Africa?," *African Journal of Economic and Management Studies,* vol. 8, no. 1, pp. 8-18, 2017.
21. M. S. Miano, M. R. Baha, and H. Mgonja, "Digital Financial Inclusion and Monetary Policy Effectiveness in Tanzania," *Available at SSRN 5244001*.
22. D. J. Mhella, "The development of mobile money and the politics of financial inclusion in Tanzania,"
23. *SOCIAL REVIEW. International Social Sciences Review/Revista Internacional de Ciencias Sociales,* vol. 1,
24. pp. 25-42, 2019.
25. P. J. Mmari, "Financial Literacy as a Determinant of Financial Inclusion in Tanzania," University of the Witwatersrand, Johannesburg (South Africa), 2022.
26. C. Fetting, "The European green deal," *ESDN report, December,* vol. 2, no. 9, p. 53, 2020.

27. M. Postuła and M. Lipski, *Green finance in the European Union*. Routledge, 2024.
28. S. Spinaci, "Green and sustainable finance," 2021.
29. U. ESCAP, *The future of Asian and Pacific cities: transformative pathways towards sustainable urban development*. United Nations, 2019.
30. U. ESCAP, "Growing Together: economic integration for an inclusive and sustainable Asia-Pacific century," 2012.
31. P. Shipalana, *Green finance mechanisms in developing countries: Emerging practice*. JSTOR, 2022.
32. E. G. Taera and Z. Lakner, "Sustainable Finance: Bridging Circular Economy Goals and Financial Inclusion in Developing Economies," *World,* vol. 6, no. 2, p. 44, 2025.
33. F. H. Khatibu and R. B. Lokina, "A review of Tanzania's fiscal regime for climate action," *REPOA, Dar es Salaam,* 2023.
34. M. Tandari, "The Tanzania development vision 2025," *Dear Partners, Friends & Interested Readers,* vol. 63, 2004.
35. R. M. Lastra and C. P. Skinner, "Sustainable central banking," *Va. J. Int'l L.,* vol. 63, p. 397, 2022.
36. E. Güler and H. Seyidoğlu, "Discussions on Green Central Banking and the 'Green'Performance of the Central Bank of Turkey: Comparison with G20 Countries," *Central Banking and Monetary Policy in the G20: Paradigms and Challenges,* p. 169, 2025.
37. A. K. Omeir and D. Vasiliauskaitė, "Eurosystem central banks' climate-related financial disclosures of non-monetary policy portfolios," *Agora International Journal of Economical Sciences (AIJES).* vol. 18, no. 2, pp. 155-169, 2024.
38. C. Towe, "The IMF and Its Mandate—Financial Sector Surveillance," *IEO Background Paper No. BP/24- 01/07 (Washington: International Monetary Fund),* 2024.
39. M. Committeri *et al.*, "The role of the IMF in addressing climate change risks," *ECB Occasional Paper,* no. 2022/309, 2022.
40. J. Zhang, Z. Song, and C. Nedopil, "China green finance status and trends 2023-2024," 2024.
41. T. Gizaw, Z. Getachew, and M. Mancha, "Financial development and economic growth: evidence from emerging African and Asian countries," *Cogent Economics & Finance,* vol. 12, no. 1, p. 2398213, 2024.
42. E. Lubinza, N. Mayala, and E. Kileo, "Effects of Microfinance Interest Rates on the Performance of Small- Scale Enterprises in Moshi Municipality, Tanzania," *Indian*

Journal of Economics and Finance, vol. 4, no. 2, p. 10.54105, 2024.

43. G. G. Lubawa and V. K. D. Litt, "Advancing Financial Inclusion through Digital Finance Innovations in Tanzania," *Fintech for ESG and the Circular Economy,* pp. 255-287, 2025.
44. E. S. Ugulumu, E. Nyankweli, and T. Lyanga, "Impact of Investment in Financial Services on Financial Inclusion in Iringa Hope Joint SACCOS in Southern Highland Zone of Tanzania," *International Journal of Finance and Banking Research,* vol. 11, no. 1, pp. 1-11, 2025.
45. E. S. Ugulumu, E. Nyankweli, and T. Lyanga, "Impact of Resources Policy for Enhancing Financial Inclusion in Iringa Hope Joint SACCOS in Southern Highland Zone," *Journal of World Economic Research,* vol. 14, no. 1, pp. 26-33, 2025.