

Building Urban Resilience to Climate Shocks: An Analysis of Livelihood Diversification Programs as a Poverty Alleviation Strategy in Hwange District, Zimbabwe

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Abstract—Against the backdrop of intensifying climate crises, the pursuit of urban resilience constitutes a critical imperative for vulnerable populations across the Global South. This research presents a critical investigation into the efficacy of community-based resilience programs as a mechanism for poverty alleviation in Hwange District, Zimbabwe, a region characterized by acute vulnerability to climatic shocks. Employing a mixed-methods methodology, this study evaluates specific interventions namely hydroponic gardening, poultry production, and detergent manufacturing to elucidate their multifaceted outcomes. The analysis demonstrates that these programs serve an essential role as a social safety net, effectively improving household food security and fostering women's empowerment through enhanced financial autonomy and strengthened social capital. Notwithstanding these contributions, the study identifies considerable constraints: the economic returns remain modest, the initiatives are challenged by technical maintenance demands and land scarcity, and their engagement with youth and Persons with Disabilities (PWDs) is inadequate. This research concludes that while such programs are indispensable for building absorptive capacity to mitigate immediate shocks, their potential to catalyze a transformative pathway out of poverty is limited in the absence of deeper market linkages, inclusively designed frameworks, and substantive policy reinforcement. The empirical insights from Hwange provide a salient contribution to the global discourse on formulating equitable and sustainable urban climate adaptation strategies.

Keywords—urban resilience, poverty alleviation, climate change adaptation, livelihood diversification

I. INTRODUCTION

The concept of resilience has become a central tenet in contemporary development discourse, often employed alongside foundational notions of sustainability and inclusivity. Its conceptual origins are multidisciplinary; derived from physics and material sciences, it described a material's capacity to return to its original state after deformation. In ecology, seminal work defined it as the ability of an ecosystem to absorb disturbances and retain its fundamental structure and function [1]. This understanding has since been radically expanded and applied to social systems, where resilience describes the capacity of individuals, communities, and systems to anticipate, prepare for, respond to, and recover from shocks and stresses while preserving the potential for transformation [2, 3].

In an urban context, this concept has gained unprecedented

urgency. The world is now predominantly urban, and cities are on the front lines of converging global crises, including climate change, economic volatility, and public health emergencies [4]. Urban centres concentrate populations and assets, making them highly vulnerable to disruptions. Climate change acts as a threat multiplier, exacerbating existing social tensions and increasing the frequency and intensity of disasters such as floods, heatwaves, and droughts [5]. Consequently, urban resilience has evolved beyond a focus on robust physical infrastructure to encompass the dynamic ability of complex socio-ecological and socio-technical systems to maintain essential core functions, adapt to incremental change and sudden shocks, and transform underlying structures that limit current or future adaptive capacity [6, 7]. This perspective frames cities not as static entities to be defended, but as complex, learning systems that must continuously evolve.

In Zimbabwe, the compounding effects of climatic shocks and protracted economic instability have precipitated a severe and protracted humanitarian crisis. The country faces recurrent droughts and erratic rainfall patterns, which are increasingly linked to anthropogenic climate change [8]. Hwange District, located in a naturally arid region characterised by low and erratic rainfall, high temperatures, and shallow, rocky soils, is a climate change hotspot within the nation. These biophysical vulnerabilities, combined with socio-economic pressures such as high unemployment and limited livelihood diversification, have resulted in acute food insecurity and pervasive poverty [9]. The urban poor in areas like Hwange are particularly at risk, as they often depend on cash-based economies and market-purchased food, making them highly susceptible to price shocks and supply chain disruptions [10].

In direct response to these layered vulnerabilities, a suite of urban resilience-building programs was initiated in Hwange Urban in October 2021 by World Vision in partnership with various government stakeholders. These interventions are emblematic of a Community-Based Adaptation (CBA) approach, promoting livelihood diversification through targeted projects such as hydroponic greenhouse systems, poultry production, and small-scale detergent making. The core objective is to bolster the adaptive capacity of at-risk households by reducing their reliance on single, climate-sensitive income sources and enhancing their ability

to withstand and recover from multiple shocks [11].

This research seeks to critically examine the efficacy of these interventions. The study is guided by three specific objectives: first, to ascertain the variety and nature of urban resilience projects implemented by the communities; second, to identify the principal challenges and prospects of these programs as a tool for poverty alleviation; and third, to identify relevant policies and strategies that could ensure their long-term sustainability. By linking these hyper-local initiatives to the overarching global challenge of climate change, this paper argues that targeted urban resilience programs represent a vital, yet inherently complex, component of a broader, multi-scalar strategy to alleviate poverty in the world's most climate-vulnerable urban settings. Their success or failure offers critical lessons for sustainable development policy in an era of escalating environmental risk.

II. LITERATURE REVIEW

A. *The Evolution and Imperative of Urban Resilience in a Changing Climate*

The concept of resilience has undergone a significant evolution, transitioning from its origins in materials science and ecology to a central, albeit complex, paradigm in urban studies and development. In its ecological sense, resilience describes the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, and identity [2]. Applied to urban contexts, this definition expands beyond mere robustness to encompass a system's ability to adapt, learn, and transform in the face of both sudden shocks and slow-burn stresses [6]. Urban resilience operates in a state of non-equilibrium, recognizing multiple pathways of change, including persistence (maintaining the status quo), transition (incremental adaptation), and transformation (fundamental systemic change) [12].

This multifaceted understanding is critically important in an era of rapid global urbanisation and intensifying climate change. The Intergovernmental Panel on Climate Change has highlighted with high confidence that urban areas are hotspots of global climate risks, with billions of people exposed to heat stress, flooding, water scarcity, and sea-level rise [5]. For cities in the Global South, like those in Zimbabwe, these climatic shocks intersect with pre-existing vulnerabilities such as poverty, inadequate infrastructure, and high informality, creating complex risk landscapes [13]. The scale of the threat is monumental; the United Nations Office for Disaster Risk Reduction estimates average annual global losses from disasters at over \$300 billion, a figure projected to rise without concerted action [14].

Therefore, building urban resilience is no longer a secondary consideration but an imperative for sustainable development. It moves beyond the goal of simply "bouncing back" after a crisis towards "bouncing forward" fostering systems that are not only able to withstand disruptions but can also adapt and transform towards greater sustainability and equity [15]. This proactive approach is fundamental to achieving the Sustainable Development Goals (SDGs), particularly SDG 11, which aims to "make cities and human settlements inclusive, safe, resilient, and sustainable".

B. *Urban Resilience and Climate Change Adaptation: An Inextricable Link*

The intersection of urban resilience and climate change adaptation is where theory meets urgent practice. Climate change acts as a profound "threat multiplier," exacerbating existing socio-economic vulnerabilities and creating new ones within urban systems [5]. In Zimbabwe, the climate crisis manifests through increased frequency and intensity of droughts, erratic rainfall patterns, and mid-season dry spells, which severely undermine agricultural productivity and national food security [16]. This is acutely felt in regions like Hwange, which is naturally characterised by low rainfall, high temperatures, and shallow soils, making rain-fed agriculture a high-risk livelihood strategy.

Consequently, interventions like the hydroponic systems and climate-smart poultry projects examined in this study are not merely livelihood diversification activities; they are essential forms of planned adaptation to a changing climate. Hydroponics, for instance, represents a technological adaptation that decouples food production from unreliable rainfall, maximising extremely limited water resources a critical consideration in a drought-prone region [17]. Similarly, promoting drought-tolerant crop varieties and improved post-harvest management are direct responses to climate-induced stresses. These initiatives aim to enhance the adaptive capacity of urban households, defined as their ability to adjust to climate change, moderate potential damages, and cope with the consequences [5]. By doing so, they directly contribute to building urban resilience against the specific climate shocks that define the risk profile of Hwange.

C. *Policies and Strategies for Mainstreaming Sustainable Urban Resilience*

The sustainability and scalability of community-based resilience projects are contingent upon supportive and integrated policy frameworks. In Zimbabwe, the Zimbabwe Resilience Building Fund (ZRBF) has been a key actor in promoting resilience, though its initial focus was predominantly on rural communities [18]. There is now a compelling evidence-based rationale for developing dedicated urban resilience strategies that address the unique challenges of deindustrializing towns and high-density suburbs [19].

International frameworks provide valuable guidance. The UNDP's Urban Risk Management and Resilience Strategy outlines strategic priorities, including engaging diverse stakeholders to strengthen urban governance, amplifying marginalised voices in city decision-making, and harnessing innovation and digital technologies [20]. For the specific interventions in Hwange, this translates into:

Integrated Urban Planning: Municipal governments must enact urban land-use policies that formally allocate and protect space for urban and peri-urban agriculture, as recommended by the Food and Agriculture Organization [21]. This secures the natural and physical capital base for projects like the greenhouse.

Support for Climate-Smart Practices: National agricultural extension policies should be revised to support and fund Climate-Smart Agriculture (CSA) in urban contexts, promoting water-saving technologies like hydroponics, soil

moisture conservation, and sustainable nutrient management [22].

Strengthening Local Systems: Sustainability requires moving beyond project-based support to strengthening local institutions. This includes building the capacity of local government departments, supporting community-based savings groups to enhance financial capital, and ensuring reliable access to veterinary services for poultry producers to manage disease risks exacerbated by climate variability.

By mainstreaming resilience into urban planning, land-use policy, and local economic development strategies, these community-level initiatives can transition from isolated pilot projects to integral components of a city's long-term climate adaptation and poverty reduction portfolio.

D. The Sustainable Livelihoods Approach: A Framework for Analysing Community Resilience

To effectively analyse how households and communities build resilience, this study is grounded in the Sustainable Livelihoods Approach (SLA). The SLA offers a holistic, people-centred framework for understanding how individuals, particularly the poor, construct their livelihoods by combining and leveraging a portfolio of assets [23, 24]. The core of the SLA is the recognition that livelihoods are built upon five types of capital assets:

- **Human Capital:** The skills, knowledge, ability to labour, and good health that together enable people to pursue different livelihood strategies.
- **Social Capital:** The social resources, including networks, membership in groups, relationships of trust, and access to wider institutions, upon which people draw.
- **Natural Capital:** The natural resource stocks (e.g., land, water, biodiversity) and environmental services from which resources and services useful for livelihoods are derived.
- **Physical Capital:** The basic infrastructure, production equipment, and technologies that people need to pursue their livelihoods.
- **Financial Capital:** The financial resources, including savings, credit, and regular inflows of money, which are available to people.

The SLA is particularly potent in the context of climate change and resilience programming because it focuses on how vulnerabilities, such as climate shocks or economic stresses, impact these asset bundles [24]. It shifts the analytical focus from needs to strengths, identifying what assets people already possess and how development interventions can strengthen and diversify this portfolio [25]. In the context of Hwange, the urban resilience programs can be understood as direct investments in these capitals: providing physical capital (greenhouses, boreholes), enhancing human capital (trainings in hydroponics, detergent making), building social capital (savings groups, project committees), and generating financial capital (income from sales). The approach helps to evaluate not just the economic outcomes, but the holistic strengthening of a household's capacity to withstand shocks, aligning directly with the absorptive and adaptive dimensions of resilience [26].

III. MATERIALS AND METHODS

A. Research Approach and Design

This study employed a pragmatic mixed-methods approach, combining quantitative and qualitative inquiries. This design was chosen to facilitate triangulation, allowing for a more complete and synergistic understanding of the research problem than either approach could achieve alone [27]. The quantitative component provided measurable data on program participation and economic impacts, while the qualitative component enabled an in-depth exploration of participants' experiences, perceptions, and challenges.

The target population consisted of residents of Railways Township in Hwange Ward 14 who were directly involved in urban resilience programs. A non-probability purposive sampling technique was used to select 25 respondents: 17 project beneficiaries and 8 key stakeholders from government departments (Agritex, Social Welfare, etc.) and World Vision Zimbabwe. This sampling strategy ensured that selected participants held rich, relevant information about the phenomenon under study [28].

Primary data was collected using semi-structured interviews and questionnaires. The semi-structured interviews, guided by an interview schedule, allowed for flexibility and probing, enabling participants to elaborate on their experiences in their own words [29]. The questionnaires, featuring both closed and open-ended questions, facilitated the collection of standardised data from a larger subset of the sample.

B. Data Analysis and Ethical Considerations

Thematic analysis was used to analyse the qualitative data from interview transcripts. This involved familiarising oneself with the data, generating initial codes, searching for themes, and reviewing and defining them [30]. Quantitative data from questionnaires were analysed using descriptive statistics, such as frequencies and percentages, to summarise demographic and economic trends.

Ethical considerations were paramount. Informed consent was obtained from all participants, ensuring they understood the research purpose and their right to withdraw. Anonymity and confidentiality were maintained throughout the data collection and reporting process, with pseudonyms used for verbatim quotes to protect participants' identities.

IV. RESULT

A. Demographic Profile and Differential Vulnerabilities to Climate and Economic Shocks

The demographic data from the 25 participants paints a detailed picture of vulnerability and resilience in Hwange. The gender distribution (56% female and 44% male) is not coincidental; it reflects the gendered nature of both poverty and climate risk. Women, particularly in female-headed households, often bear the brunt of climate impacts due to their primary responsibility for household food and water security, which becomes exponentially more difficult during droughts [5]. The high number of female-headed households (10 out of 17 beneficiary households, as indicated by marital status data) signifies a group with typically limited access to capital and land, making them highly vulnerable to economic

and climatic shocks. A female participant from the poultry project articulated this empowerment, stating, *“This project has given us women a voice. The money from selling chickens and eggs is mine to decide how to use for my children’s needs and school fees. Before, during the dry years, we had nothing to fall back on”*. This underscores how the program builds not just economic but also social capital and agency for a critically vulnerable demographic.

Conversely, the data suggests a gap in engaging youth and Persons with Disabilities (PWDs). With only 16% of participants aged 21–30, the programs appear less attractive to the youth. This could be linked to the nature of the interventions, which may be perceived as low-profit or traditional, failing to align with youth aspirations for dynamic, high-growth livelihoods. Furthermore, the interview guide and findings did not explicitly capture data on PWDs, indicating a potential systemic oversight. In the context of climate change, this exclusion is critical; PWDs often face heightened risks due to mobility challenges in accessing relief services or information during climate-induced disasters like floods or heatwaves [31]. The concentration of participants in the 41–51 age bracket (28%) confirms the programs are a vital lifeline for those marginalized from the formal, male-dominated mining economy, but they risk leaving behind other equally vulnerable groups.

B. Gendered Economic Impacts and Differentiated Livelihood Perceptions in a Stressed Environment

The economic analysis, drawing from data on monthly earnings (mostly \$30–\$50) and meal frequency, reveals a story of modest gains that are deeply gendered and contextualized within a climate-stressed environment. For the women who dominate the programs, this supplementary income, however small, is a critical buffer. It provides a measure of financial autonomy and is often directly invested in children’s welfare, a trend well-documented in development literature [32]. The data from question 8a and 8b, which asked about empty stomachs before the program and meals per day after, provided powerful testimony. A common sentiment, particularly among women, was that dietary improvement was the primary achievement, a crucial form of absorptive resilience to food price shocks. A greenhouse project member shared, *“We are not getting much money, but we are no longer buying vegetables. The tomatoes and greens from the greenhouse mean our children have relish every day, even in the dry season when prices shoot up. That is a big change for us”*. This highlights the program’s success in directly combating seasonal, climate-related food insecurity.

However, for youth, this model may be insufficient. The low monetary return, as indicated by the income brackets, likely fails to meet their needs for capital accumulation or investment, making migration seem a more viable option. The programs, therefore, succeed as a vital safety net primarily utilized by women to stabilize household consumption but struggle to function as a springboard for economic mobility that would attract and retain younger participants.

C. Program-Specific Challenges through a Climate and Social Inclusion Lens

The challenges documented in the findings are deeply

intertwined with both climatic and social factors.

D. Hydroponic Greenhouse: Technological Resilience and Gendered Land Access

The maintenance and land scarcity issues are not merely technical but are linked to governance and gender equity. A stakeholder from the Agritex department explained, *“The technology is efficient but delicate. A single pump failure during a heatwave can wipe out a crop if not addressed immediately. And with only two greenhouses on limited urban land, the produce cannot meet the demand”*. This directly links a climate stressor (heatwaves) to technological vulnerability. The collective “maintenance bag” is a commendable example of community-based adaptive capacity. However, land scarcity is a political issue. The competition for urban land often sidelines agricultural uses, disproportionately affecting women, who rely most heavily on urban agriculture for food and income, yet often lack secure land tenure [33].

E. Poultry Production: Climate-Sensitive Diseases and Women’s Workload

The vulnerability of poultry to disease outbreaks is intensified by climate change, as warmer temperatures and altered rainfall patterns can expand the range of pathogens and vectors [34]. A female participant stated, *“We lost many chickens to disease before we received proper training, especially after the rainy season. Now we know about vaccinations, but accessing them reliably and affordably is still a problem”*. This highlights a critical gap in the local institutional capital for animal health. Since poultry is often managed by women, as confirmed by the project data, this lack of climate-resilient veterinary support directly undermines their livelihood security and increases their unpaid care work and stress.

F. Detergent Making: Market Saturation and the Limits of Homogeneous Livelihoods

The challenge of market saturation, as reported by a maker of pine gel detergent (*“Everyone in the area is now making soap...”*), reveals the limitations of promoting uniform small-scale enterprises. This is exacerbated by a constrained local economy, a common feature in deindustrializing towns. For youth, this lack of market diversification offers little appeal. For PWDs, who may face mobility challenges, accessing wider markets is even more difficult. This points to the need for programs to move beyond basic skills training to include market analysis, business development services, and support for innovative, diversified products that can create differentiated opportunities for various social groups, including youth and PWDs.

G. Prospects and Sustainability: Navigating Future Shocks

Despite the challenges, the prospects for sustainability are anchored in the community’s demonstrated adaptive capacity, such as the “maintenance fund”. However, long-term sustainability requires addressing the root causes of vulnerability. Stakeholder interviews emphasized the need for policies that secure land for urban agriculture and integrate these community-level initiatives into broader urban climate adaptation plans. Ensuring that future programming is explicitly designed to be inclusive of youth

through digital literacy and access to finance, and accessible to PWDs through targeted support and adaptive technologies, will be crucial for building a truly resilient urban community capable of withstanding the complex interplay of climate and economic shocks.

V. DISCUSSION

This study's findings on urban resilience programs in Hwange District offer a microcosm of the broader global challenges and opportunities in building climate-resilient livelihoods for the urban poor. The results reveal a complex interplay between gendered vulnerability, the limitations of homogenous livelihood interventions, and the critical role of supportive institutions. By situating these findings within the wider scholarly discourse, we can better understand their significance and extract transferable lessons.

A. *Gendered Engagement and the Invisible Vulnerable*

The predominance of women in Hwange's resilience programs is a finding consistent with studies of community-based adaptation across the Global South. Research from Bangladesh and Nepal similarly shows that women are more likely to participate in local adaptation projects, as these often align with their traditional roles in food production and natural resource management [35]. The empowerment expressed by female participants in Hwange, who gained control over income from poultry, echoes findings from FAO projects in sub-Saharan Africa, where access to small-scale livestock provided women with crucial financial autonomy [21]. This demonstrates that when resilience programs align with existing gendered responsibilities, they can effectively reach and empower a highly vulnerable demographic.

However, the low participation of youth and the apparent exclusion of Persons with Disabilities (PWDs) in Hwange highlights a critical shortcoming. This mirrors a global pattern where resilience and agricultural programs often fail to engage youth, who perceive such activities as unremunerated and lacking prestige [36]. In Latin America, for instance, youth out-migration from rural and peri-urban areas is a major challenge to agricultural sustainability, driven by a desire for more lucrative and stable urban employment [37]. The situation for PWDs is even more acute. The other findings confirm that people with disabilities are systemically left behind in disaster planning and response, a result of physically inaccessible infrastructure, exclusionary social and institutional attitudes, and a critical absence of disaggregated data on their specific needs and capacities [38] exemplified by their absence in the initial project design and data in Hwange.

B. *The Safety Net Versus the Springboard: Assessing Economic Impacts*

The modest financial returns from the Hwange programs, which primarily served to improve dietary diversity rather than lift households out of poverty, present a nuanced picture. This aligns with the concept of "persistent subsistence" observed in many small-scale urban agriculture initiatives [39]. A study of urban gardens in Kampala found similar results: while they were critical for household food security during economic downturns, they rarely provided a

pathway to significant wealth creation [40]. This underscores the role of such programs as a vital absorptive capacity mechanism, helping households cope with shocks, rather than an adaptive or transformative one that would fundamentally alter their socio-economic trajectory [26].

Contrastingly, successful poverty-alleviating programs often involve deeper market integration and higher-value chains. For example, horticulture projects in Kenya that linked women farmers to formal supermarket chains demonstrated a more substantial impact on income by creating stable, higher-value market opportunities [41]. The limited impact in Hwange suggests that without similar market linkages and a focus on higher-profit ventures, these programs may struggle to meet the economic aspirations of participants, particularly the youth, thereby limiting their long-term appeal and transformative potential.

C. *Systemic Barriers and the Limits of Community-Led Adaptation*

The program-specific challenges encountered in Hwange are not isolated incidents but reflect systemic barriers documented globally. The land scarcity for urban agriculture is a ubiquitous issue, particularly for women. As noted in Hwange, research from cities in Ghana and India confirms that women's access to urban land is often informal, insecure, and the first to be lost to commercial development, directly undermining their climate resilience [33, 42].

Furthermore, the vulnerability of poultry to climate-sensitive diseases in Hwange is a microcosm of a global challenge. The International Livestock Research Institute has repeatedly warned that climate change is accelerating the spread of livestock diseases, and that smallholder producers, especially women, are disproportionately affected due to poor access to veterinary services [34]. The community's initiative of a "maintenance bag" for the hydroponic system is a commendable example of building local adaptive capacity, a phenomenon also seen in community-managed disaster funds in the Philippines [43]. However, such community-based solutions can only go so far. They often lack the scale and resources to address systemic issues like land tenure or national veterinary service provision, highlighting the indispensable role of supportive local and national government policies.

Finally, the market saturation faced by the detergent-making group is a common pitfall of "one-size-fits-all" livelihood programs. Evaluations of post-disaster livelihood programs in Southeast Asia have critiqued this approach, noting that flooding local markets with identical products from multiple beneficiaries ultimately leads to failure for most [44]. This contrasts with more successful models that emphasize diversified skill training, value-chain development, and fostering entrepreneurship tailored to different segments of the population, including youth and PWDs [45].

The findings from Hwange are both unique and universal. They confirm that community-level resilience programs are essential for immediate shock absorption, particularly for women. However, they also starkly illustrate that without inclusive design, secure resource access, integrated market strategies, and robust policy support, such initiatives risk reinforcing existing vulnerabilities and failing to achieve

transformative, sustainable poverty reduction in the face of a changing climate.

VI. CONCLUSION

This research demonstrates that urban resilience-building programs in Hwange District represent a double-edged sword in the fight against climate-amplified poverty. On one hand, they have undeniably provided a vital lifeline, particularly for women. By investing in the capital assets outlined by the Sustainable Livelihoods Approach, these initiatives have bolstered absorptive capacity, enabling the most vulnerable to “weather the storm” of climatic and economic shocks. The tangible outcomes daily meals secured through greenhouse produce, small incomes from poultry empowering female-headed households are not trivial achievements. They represent a fundamental enhancement of human security and dignity in a context of extreme precarity, confirming that locally-tailored, community-based adaptation is an indispensable component of the urban resilience landscape.

On the other hand, the study unequivocally shows that these programs, in their current form, are a safety net, not a springboard. Their design and implementation encounter a “resilience ceiling,” where their ability to facilitate a transformative escape from poverty is limited. The modest financial returns, the exclusion of key demographics like youth and PWDs, and the systemic barriers of land tenure and market saturation prevent these initiatives from evolving beyond crisis management. They help households persist but offer limited pathways for transition or transformation. The findings from Hwange thus resonate with a global challenge: community-level coping is a necessary but insufficient response to systemic risks. Without confronting the underlying political economies that perpetuate vulnerability such as insecure land rights for women, inadequate public veterinary services, and a lack of diverse economic opportunities resilience programs risk merely helping the poor to survive their poverty rather than empowering them to overcome it. The future of urban resilience, therefore, lies not in abandoning community-based approaches, but in radically re-imagining them as part of an integrated, multi-scalar strategy that connects local action with national policy and market forces.

VII. RECOMMENDATIONS

To break through the “resilience ceiling” and translate coping mechanisms into genuine pathways out of poverty, the following actions are urgently recommended:

Future interventions must move beyond a one-size-fits-all model. This requires demographically intelligent programming that develops tailored value chains for youth, incorporating digital literacy and access to finance, and ensures the physical and economic accessibility of projects for Persons with Disabilities. Implementers should prioritize market-led diversification from the outset, conducting thorough value-chain analyses to identify high-demand, climate-resilient products and forging direct links between producer groups and stable markets, such as schools, hospitals, and private retailers, to avoid the pitfalls of local market saturation.

Policy support is the critical enabler that community

efforts cannot provide alone. Municipal authorities must formalize urban agriculture through land-use plans that legally designate and protect spaces for cultivation, with priority access for women’s collectives. Concurrently, national and local governments must invest in climate-smart public services, particularly by strengthening decentralized veterinary extension systems to provide affordable, reliable animal healthcare and by integrating urban agriculture and small-business development into local economic development plans and climate adaptation budgets.

The focus of external support should shift from short-term project funding to long-term system building. Donors should invest in building the adaptive capacity of local institutions, including municipal departments and community-based organizations, to manage and scale resilience initiatives. Funding should also be directed towards innovation grants that encourage youth-led agribusiness startups and the development of adaptive technologies for PWDs, fostering a more dynamic and inclusive ecosystem of urban resilience that can truly transform livelihoods in the face of a changing climate.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Q.N.: Conceptualization, Investigation, Methodology, Writing—Original Draft; K.K.: Formal Analysis, Data Curation, Writing—Review & Editing; P.M.: Validation, Writing—Review & Editing. All authors had approved the final version.

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