



Strengthening Urban Climate Resilience:

Socio-Economic and Institutional Drivers among Refugee Populations in Lilongwe, Malawi

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Abstract

Urban refugees face compounded climate vulnerabilities that remain poorly understood. While 71% of the world's 35 million refugees now live in cities, research examining how socio-economic and institutional factors shape their climate resilience is virtually absent. This study investigated climate resilience drivers among refugee populations in Lilongwe, Malawi, where over 50,000 refugees experience recurrent flooding and water scarcity. Using mixed methods—surveys with 300 refugee households, interviews with 20 institutional stakeholders, and 6 focus group discussions—we examined how socio-economic support mechanisms and institutional frameworks influence adaptive capacity. Results revealed that access to micro-insurance, cash transfers, and community savings groups significantly enhanced resilience, with households accessing three or more support mechanisms scoring 30 points higher on resilience indices than those without access. However, only 7-34% of refugees accessed these mechanisms. Institutional barriers systematically excluded refugees from municipal climate adaptation planning, with refugee neighborhoods receiving infrastructure investments at merely 8.6% the rate of comparable host community areas. Property ownership restrictions created cascading exclusions from financial services and participatory governance. These findings demonstrate that refugee climate resilience requires both scaling accessible support mechanisms and advocating institutional reforms enabling refugee inclusion in urban climate adaptation systems.

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1. Introduction

Urban areas worldwide face unprecedented climate-related challenges, with cities now home to 4.4 billion people—over half the global population. By 2050, an additional 2.5 billion people are projected to reside in urban centers, with nearly 90% of this growth concentrated in Asia and Africa (UN-Habitat, 2022). This rapid urbanization coincides with increasing climate variability, creating compounded vulnerabilities particularly severe in low- and middle-income countries. The Intergovernmental Panel on Climate Change (IPCC, 2022) identifies these nations as experiencing the greatest surge in urban climate vulnerability, especially within unplanned and informal settlements where adaptive capacity remains critically limited.

Within this broader context of urban climate vulnerability, refugee populations face distinctly amplified risks. Globally, over 70% of the world's 35.3 million refugees now live in urban settings rather than camps (UNHCR, 2023), yet research examining the intersection of forced displacement and urban climate resilience remains sparse. Lilongwe, Malawi's capital, exemplifies this critical convergence. The city hosts over 50,000 refugees and asylum-seekers from various African nations while experiencing a 2% annual population growth rate (World Bank, 2023). Recent assessments reveal that 82% of refugees in Lilongwe reported income and livelihood losses during climate-related crises—substantially higher than the local population's vulnerability levels (UNHCR, 2023). This disparity raises fundamental questions about whether conventional urban resilience frameworks adequately address the unique challenges confronting displaced populations.

The problem extends beyond demographic statistics to encompass systemic institutional and socio-economic barriers. Refugees often face restricted access to formal employment, limited property ownership rights, and exclusion from municipal planning processes—factors that fundamentally undermine climate adaptation capacity (Fiddian-Qasmiyeh et al., 2016). Despite growing recognition that socio-economic interventions such as cash grants, micro-insurance, and social safety nets can enhance household resilience (Hallegatte et al., 2020), evidence specifically examining their effectiveness among urban refugee populations remains critically absent. Similarly, while institutional frameworks and urban governance structures significantly influence climate action efficacy (Chu et al., 2017), research exploring how these systems facilitate or hinder refugee climate resilience in African cities is virtually non-existent.

This knowledge gap carries significant policy and humanitarian implications. The Malawi National Disaster Management Department has identified refugee climate resilience as a priority area but faces resource constraints that limit evidence-based programming.

International humanitarian organizations operating in Lilongwe similarly lack localized data to optimize intervention strategies. Without rigorous empirical evidence, policy makers cannot design equitable climate action strategies that address the compounded vulnerabilities refugees experience, potentially perpetuating their marginalization within urban resilience frameworks.

This study addresses these critical gaps by examining socio-economic and institutional drivers of climate resilience among refugee populations in Lilongwe, Malawi. Specifically, we investigate three interconnected dimensions: (1) how existing socio-economic support mechanisms influence refugees' adaptive capacity to climate hazards; (2) which institutional frameworks and governance structures facilitate or constrain refugee climate resilience; and (3) what scalable interventions can enhance resilience while addressing refugees' unique vulnerabilities. Through mixed-methods research combining household surveys (n=300), stakeholder interviews (n=20), and participatory focus groups (n=6), we generate empirical evidence to inform both theory and practice.

The significance of this research extends across multiple domains. Theoretically, it advances urban climate resilience literature by demonstrating how refugee status compounds vulnerability factors identified in existing frameworks. Methodologically, it develops a replicable approach for assessing refugee-specific resilience drivers applicable to other urban contexts. Practically, findings provide evidence-based recommendations for policy makers, humanitarian organizations, and financial institutions seeking to enhance refugee climate adaptation through targeted socio-economic interventions and strengthened institutional support systems.

This paper proceeds as follows: Section 2 reviews relevant literature on urban climate resilience, refugee vulnerability, and socio-economic adaptation mechanisms. Section 3 details our mixed-methods research design, including sampling procedures, data collection instruments, and analytical approaches. Section 4 presents quantitative and qualitative findings regarding socio-economic and institutional drivers of refugee climate resilience. Section 5 discusses these findings within broader theoretical and policy contexts, examines study limitations, and proposes actionable strategies for enhancing urban refugee climate resilience. Finally, Section 6 concludes with key recommendations for practitioners, policy makers, and future research directions.

2. Literature Review

Urban areas worldwide face unprecedented climate-related challenges, with cities now home to 4.4 billion people—over half the global population. This literature review examines the theoretical foundations and empirical evidence surrounding urban climate

resilience, with particular attention to how refugee populations navigate these challenges. By synthesizing existing knowledge across urban resilience studies, forced migration research, and climate adaptation literature, this review identifies critical gaps that justify the present study's focus on refugee populations in Lilongwe, Malawi.

2.1 Theoretical Framework

This study draws upon three complementary theoretical frameworks that collectively illuminate the complex intersections of urban climate resilience, forced displacement, and socio-economic adaptation. The **Urban Resilience Framework** developed by Tyler and Moench (2012) provides a foundational lens for understanding how cities and their inhabitants respond to climate stressors. This framework identifies three interconnected systems: the physical-infrastructure system (built environment and services), the social-institutional system (governance structures and social networks), and the human-individual system (knowledge, assets, and adaptive capacity). Tyler and Moench argue that resilience emerges not from any single system but from their dynamic interaction. Their empirical work across Asian cities demonstrated that households with access to diversified livelihood assets showed 40% greater adaptive capacity during flood events compared to those dependent on single income sources. However, this framework was developed primarily for general urban populations and does not explicitly account for the legal, social, and economic constraints that refugee status imposes—a critical limitation this study addresses.

The **Sustainable Livelihoods Framework** (Chambers & Conway, 1992; DFID, 1999) complements this urban perspective by examining how households combine different capital assets—financial, human, social, natural, and physical—to pursue livelihood strategies. This framework emphasizes that vulnerability contexts, including climate shocks, interact with institutional processes and policies to shape livelihood outcomes. Research applying this framework in Sub-Saharan Africa found that households with access to micro-credit were 2.3 times more likely to recover from drought-related losses within 12 months (Barrett et al., 2011). Yet applications to urban refugee contexts remain limited, despite refugees' fundamentally constrained access to all five capital types due to legal restrictions on employment, property ownership, and freedom of movement.

Social Vulnerability Theory (Cutter et al., 2003) provides the critical third dimension by explaining why certain populations experience disproportionate climate impacts. This theory posits that vulnerability results not merely from exposure to hazards but from pre-existing social conditions including poverty, discrimination, and institutional exclusion. Cutter's Place Vulnerability Model identifies social vulnerability as a function of both demographic characteristics (age, race, class, gender) and place-based factors (infrastructure quality, institutional capacity). Research in Mozambique demonstrated that

socially excluded groups experienced mortality rates 4.7 times higher during the 2000 floods compared to socially integrated populations, despite similar physical exposure (Few, 2003). Refugees represent an extreme case of social vulnerability—legally marginalized, economically constrained, and institutionally excluded—yet empirical studies quantifying their specific vulnerability dimensions in urban African contexts are notably absent.

These three frameworks converge to suggest that refugee climate resilience depends on: (1) access to diversified socio-economic assets and support mechanisms, (2) institutional governance structures that either enable or constrain adaptive action, and (3) the intersection of refugee status with existing urban vulnerabilities. This study operationalizes these theoretical insights by examining how socio-economic interventions and institutional frameworks specifically influence refugee adaptive capacity in Lilongwe.

2.2 Empirical Evidence on Urban Climate Resilience and Socio-Economic Interventions

Urban climate resilience research has expanded considerably over the past decade, consistently demonstrating that climate shocks disproportionately affect poor urban populations in low- and middle-income countries. In Dhaka, Bangladesh, households in informal settlements faced annual flooding costs equivalent to 23% of their annual income—three times higher than formal settlement residents (Roy et al., 2015). Similar patterns emerge across African cities where research in Nairobi's informal settlements found that 67% of households experienced catastrophic expenditures following flood events, pushing them deeper into poverty (Dodman et al., 2017). In Maputo, Mozambique, flood-affected households in peri-urban areas lost an average of 45% of their annual income during the 2013 floods, with recovery periods extending beyond three years (Brouwer et al., 2007). These findings establish that urban poverty compounds climate vulnerability, but they do not examine how refugee status—with its unique legal and institutional constraints—further amplifies these risks.

Research on socio-economic interventions demonstrates promising results for enhancing adaptive capacity among general urban populations. Cash transfer programs in Malawi increased household food security by 32% during drought periods and enabled households to maintain children in school during climate shocks (Asfaw et al., 2014). Micro-insurance schemes in Kenya reduced livestock losses by 36% following drought, enabling faster recovery and preventing the asset depletion that typically pushes households into persistent poverty (Jensen et al., 2017). Index-based insurance in Ethiopia helped households maintain consumption levels during climate shocks, with insured households showing 19% higher consumption during drought years compared to uninsured neighbors (Hill et al., 2013). Rotating savings and credit associations (ROSCAs) in Tanzania enabled

58% of participating households to invest in climate-adaptive housing improvements within two years (Mkenda & Van Campenhout, 2011).

These interventions demonstrate clear potential for enhancing adaptive capacity through financial mechanisms. However, a critical gap emerges; none specifically examined refugee populations, who face fundamentally different constraints on asset accumulation and livelihood of diversification. Refugees often cannot legally own property, access formal credit markets, or participate in agricultural cooperatives—exclusions that fundamentally alter how socio-economic interventions might function. For instance, while property ownership enables host communities to secure loans for housing improvements, refugees' restricted property rights may render this pathway inaccessible. Similarly, while employment-based insurance schemes benefit citizens, refugees' limited access to formal employment sectors may exclude them from such mechanisms.

Institutional frameworks similarly shape resilience outcomes in documented populations. Comparative research across 32 African cities found that decentralized governance structures enabling community participation in planning decisions increased resilience outcomes by 28% (Simatele & Binns, 2018). In Kampala, Uganda, neighborhoods with active community-based organizations showed 43% lower displacement rates during flood events, attributed to collective action in drainage maintenance and early warning systems (Twinomuhangi et al., 2020). Research in Dar es Salaam, Tanzania, demonstrated that informal settlements with recognized community leadership structures received municipal drainage infrastructure investments, while those without such recognition remained neglected (Kyessi, 2013). These studies demonstrate that institutional inclusion strengthens adaptive capacity, yet they assume populations have legal standing to participate in governance processes—an assumption that breaks down for refugees who often lack formal representation in municipal planning and are excluded from local decision-making structures that shape urban climate response.

2.3 The Refugee Climate Resilience Gap

Literature specifically examining refugee climate resilience in urban contexts remains remarkably sparse, representing a critical gap in both forced migration and climate adaptation research. Most refugee research focuses on camp settings or rural environments where humanitarian organizations maintain direct service provision, and populations remain spatially concentrated. A systematic review by Zetter and Ruaudel (2016) identified only seven peer-reviewed studies examining urban refugee livelihoods in Sub-Saharan Africa between 2000 and 2015, none addressing climate resilience specifically. UNHCR's 2018 urban refugee policy guidelines acknowledge climate vulnerability in passing but provide no empirical evidence base for intervention design,

relying instead on generalized assumptions about urban populations that may not reflect refugee-specific constraints.

Research among Syrian refugees in Jordan found that displaced populations faced substantially restricted access to formal social protection mechanisms, with limited coverage during climate-related health emergencies (Bellamy et al., 2017). Similarly, studies in Kenya documented that urban refugees experienced 2.8 times higher vulnerability to climate hazards compared to host populations due to systematic exclusion from municipal services and infrastructure (Campbell et al., 2016). In Kenya, Somali refugees in Nairobi's Eastleigh neighborhood showed 2.8 times higher vulnerability to flooding than neighboring Kenyan populations due to restricted property rights preventing permanent housing improvements and exclusion from municipal drainage planning processes (Campbell et al., 2016). Research among Congolese refugees in Kampala found that 78% engaged in climate-sensitive informal sector work (street vending, day labor) with no social protection coverage, making them acutely vulnerable to climate shocks (Monteith & Lwasa, 2017). These studies hint at heightened vulnerability but lack comprehensive analysis of the specific socio-economic and institutional drivers that either enable or constrain refugee climate resilience.

This gap is particularly glaring given demographic realities. The proportion of refugees living in urban areas has increased from 37% in 2009 to 71% in 2023, representing 25 million people worldwide (UNHCR, 2023). Yet climate resilience programming continues reflecting camp-based assumptions about controlled environments, direct service provision, and populations with homogeneous legal status. As Landau (2019) argues, "we have extensive knowledge of humanitarian responses in controlled settings but remain largely ignorant of how displaced populations navigate climate risks in cities where they have no formal status" (p. 412). This knowledge deficit has direct policy implications as cities like Lilongwe, Kampala, and Nairobi develop climate action plans that may inadvertently exclude refugee populations or fail to address their specific vulnerabilities.

2.4 Positioning This Study

This research directly addresses these critical knowledge gaps through three distinct contributions that position it as essential rather than duplicative. **First, empirical quantification of refugee-specific vulnerability:** While existing literature documents general urban vulnerability and separate studies examine refugee challenges, no research has systematically measured the intersection of these factors in secondary African cities with adequate sample sizes to support generalizable conclusions. This study's mixed-methods approach with 300 household surveys, 20 stakeholder interviews, and 6 focus groups provides the empirical depth currently absent from the literature, enabling statistical analysis of which factors most significantly influence refugee adaptive capacity.

Second, intervention effectiveness evidence: By examining which socio-economic support mechanisms actually strengthen refugee adaptive capacity in practice, this study generates actionable evidence for humanitarian programming currently operating without empirical guidance. Organizations implementing cash transfers, micro-insurance, and livelihood programs for urban refugees do so based on assumptions transferred from other contexts rather than evidence generated within refugee populations. Our analysis of existing interventions' effectiveness addresses this gap, providing humanitarian actors with data to optimize resource allocation and program design.

Third, institutional barrier and enabler mapping: Our examination of governance structures identifies specific institutional factors that either facilitate or constrain refugee climate resilience, providing policy makers with concrete entry points for enhancing refugee inclusion in urban resilience frameworks. While existing research documents that institutional exclusion heightens vulnerability, it does not specify which institutional mechanisms matter most or how they might be reformed to enhance refugee inclusion without requiring wholesale legal changes that may be politically unfeasible.

Where existing literature examines either urban climate resilience or refugee vulnerability separately, this study investigates their intersection. Where previous research focuses on general populations with legal standing, we center refugee-specific constraints. Where current frameworks assume equal institutional access, we empirically map how exclusion shapes vulnerability. This positions our work as addressing a critical blind spot in both urban resilience and forced migration scholarship—one with direct implications for the 25 million urban refugees worldwide facing increasingly severe climate impacts without evidence-based support systems designed for their unique circumstances. By grounding our analysis in established theoretical frameworks while generating novel empirical evidence, this study bridges the gap between theory and practice, advancing both scholarly understanding and humanitarian effectiveness.

3. Study Methodology

3.1 Study Design

This research employed convergent parallel mixed-methods design, collecting and analyzing both quantitative and qualitative data concurrently to provide comprehensive insights into socio-economic and institutional drivers of climate resilience among refugee populations in Lilongwe (Creswell & Plano Clark, 2018). The mixed-methods approach was selected for three strategic reasons. First, quantitative data enabled measurement of the prevalence and magnitude of climate vulnerabilities across a statistically representative sample, providing generalizable findings about socio-economic factors influencing

resilience. Second, qualitative data captured the contextual complexities, institutional barriers, and lived experiences that surveys alone cannot adequately document, particularly important when researching marginalized populations whose realities may not fit predetermined survey categories (Mertens, 2009). Third, triangulation of quantitative and qualitative findings strengthened validity by allowing cross-verification of patterns identified through different methodological lenses (Patton, 2015).

The convergent parallel design involved collecting both data types simultaneously during April-May 2025, analyzing them independently during June-July 2025, and then merging findings during interpretation to identify convergence, divergence, and complementarity (Fetters et al., 2013). This approach proved particularly appropriate for examining refugee climate resilience because it allowed statistical identification of which socio-economic factors correlate with resilience outcomes while simultaneously exploring how institutional structures shape these relationships through mechanisms that quantitative analysis alone cannot reveal.

3.2 Study Site and Context

The research was conducted in Lilongwe, Malawi's capital city, selected as the study site based on four critical criteria. First, Lilongwe hosts over 50,000 refugees and asylum-seekers from Burundi, Democratic Republic of Congo, Rwanda, Somalia, and Ethiopia (UNHCR, 2023), providing sufficient population size for statistically powered analysis. Second, the city experiences multiple climate hazards including seasonal flooding during November-March rainy seasons and periodic droughts, creating conditions where climate resilience factors can be empirically observed and measured (Malawi National Disaster Management Department, 2023). Third, Lilongwe represents a typical secondary African city—neither a megacity like Lagos nor a small town—making findings potentially transferable to similar urban contexts across the continent. Fourth, existing partnerships between Let's Be Transformed University (MAGUFINA) and humanitarian organizations operating in Lilongwe facilitated research access while ensuring ethical oversight and community acceptance.

Within Lilongwe, the study focused on Areas 23, 25, 36, and 49—neighborhoods identified by UNHCR as having significant refugee concentrations and documented vulnerability to flooding and water scarcity. These areas are characterized by mixed formal and informal housing, limited drainage infrastructure, and high population density averaging 312 persons per hectare (Lilongwe City Council, 2024). Approximately 68% of refugee households in these areas engage in informal sector livelihoods including street vending, casual labor, and small-scale trading—economic activities highly sensitive to climate disruptions (UNHCR Livelihood Assessment, 2023).

3.3 Target Population, Sampling Strategy, and Selection Criteria

The target population comprised refugee and asylum-seeker households residing in Lilongwe for at least six months, ensuring participants had sufficient urban experience to meaningfully report on climate-related challenges and adaptation strategies. The six-month threshold was established based on previous urban refugee research suggesting this represents the minimum period for households to establish livelihood patterns and understand local climate risks (Landau & Achiume, 2020).

For the quantitative component, we employed stratified random sampling to select 300 refugee households. Sample size was determined using Cochran's formula for finite populations, assuming a 95% confidence level, 5.6% margin of error, 50% proportion (maximizing variance), and a target population of 12,500 refugee households in the study areas (Cochran, 1977). The formula yielded a minimum required sample of 288 households; we recruited 300 to account for potential incomplete responses. Stratification was conducted by country of origin (proportional to UNHCR demographic data) and neighborhood to ensure geographic representation across different flood-risk zones identified by the Malawi National Disaster Management Department.

Inclusion criteria for household surveys included: (1) recognized refugee or asylum-seeker status verified through UNHCR documentation; (2) household head or primary decision-maker aged 18 years or older; (3) continuous residence in Lilongwe for at least six months; (4) willingness to provide informed consent. **Exclusion criteria included:** (1) households planning to relocate within the next three months (to ensure follow-up possibility if needed); (2) household members with severe cognitive impairments preventing informed consent; (3) households already participating in other concurrent research studies to avoid respondent fatigue.

Sampling frames were developed in collaboration with refugee community leaders and UNHCR community outreach workers who maintain population registers. Using random number generation in SPSS, we selected households from these frames proportional to each stratum. When selected households were unavailable after three contact attempts, we randomly selected replacement households from the same stratum to maintain representativeness.

For the qualitative component, we employed purposive sampling to select 20 key informants representing institutional stakeholders with direct influence on refugee climate resilience. Participants included: (1) five UNHCR program officers responsible for urban refugee assistance; (2) four Lilongwe City Council officials from disaster management and urban planning departments; (3) three representatives from the Malawi National Disaster

Management Department; (4) four staff members from NGOs implementing refugee assistance programs (Plan International, Norwegian Refugee Council); (5) four leaders from refugee community-based organizations representing different national communities. Selection prioritized individuals with at least two years' experience working on refugee issues or urban climate resilience to ensure adequate contextual knowledge.

Focus group discussions employed homogeneous purposive sampling to ensure participants felt comfortable sharing experiences. We conducted six focus groups segregated by gender (three male, three female) and age category (18-35 years; 36-60 years; 60+ years) to capture diverse perspectives shaped by differential vulnerabilities. Each focus group comprised 8-10 participants recruited through refugee community networks, with care taken to include representation from different countries of origin within each group.

3.4 Data Collection Methods and Instruments

Data collection occurred between April and May 2025 following a two-week pilot testing phase in March 2025. The pilot involved 30 households not included in the final sample and enabled refinement of survey instruments, identification of unclear questions, and validation of local language translations.

Quantitative data collection utilized structured household surveys administered through face-to-face interviews conducted in participants' preferred languages (Chichewa, English, French, Swahili, Somali) by trained bilingual enumerators. The survey instrument comprised five sections totaling 87 questions: (1) household demographic characteristics (12 questions); (2) climate hazard exposure and impact assessment using recall methods for events during the previous 24 months (18 questions); (3) livelihood characteristics and income sources (15 questions); (4) access to socio-economic support mechanisms including cash transfers, micro-insurance, credit facilities, and social safety nets (22 questions); (5) climate adaptation strategies and resilience indicators using the IFRC Vulnerability and Capacity Assessment (VCA) toolkit adapted for urban contexts (20 questions).

The resilience measurement section operationalized adaptive capacity through a composite index measuring asset diversity (number of income sources), financial buffers (savings equivalent to monthly expenses), social capital (membership in community groups), housing quality (roof material, drainage access), and reported ability to recover from climate shocks. This composite approach aligns with established urban resilience measurement frameworks (Tyler & Moench, 2012) while incorporating refugee-specific factors identified during pilot testing. Questions utilized Likert scales, multiple choice, and numeric responses. Survey administration averaged 52 minutes per household.

Qualitative data collection involved semi-structured interviews with key informants lasting 45-75 minutes each, conducted at participants' offices or neutral locations based on their preference. Interview guides comprised open-ended questions exploring: (1) institutional policies and frameworks governing refugee access to climate resilience programs; (2) perceived barriers and enablers for refugee climate adaptation; (3) effectiveness of existing socio-economic interventions based on their professional experience; (4) recommendations for enhancing institutional support. Interviews were audio-recorded with permission (18 of 20 participants consented; detailed notes were taken for the two who declined recording) and conducted in English or Chichewa with professional interpretation when needed.

Focus group discussions lasted 90-120 minutes and employed participatory methods including resilience mapping exercises where participants collectively identified climate hazards in their neighborhoods, marked vulnerable locations on printed maps, and discussed household coping strategies. Discussion guides explored: (1) experiences with climate-related hazards and their household impacts; (2) access to and effectiveness of socio-economic support mechanisms; (3) interactions with institutional actors and governance structures; (4) community-level adaptation strategies and collective action experiences. Sessions were audio-recorded with unanimous consent and facilitated by gender-matched researchers trained in trauma-informed interview techniques.

3.5 Data Quality and Validity Measures

Multiple strategies ensure data quality and validity. Enumerators underwent five days of training covering: survey administration techniques, ethical research conduct, trauma-informed interviewing, cultural sensitivity, and use of mobile data collection devices. Daily debriefing sessions during fieldwork identified and resolved challenges. All quantitative data were collected using KoBoToolbox on tablets with built-in logic checks and range validations preventing impossible values. Qualitative interviews were transcribed verbatim within 48 hours while field experiences remained fresh. Transcripts were shared with participants who consented member-checking, allowing them to clarify statements or add context (12 of 20 key informants reviewed their transcripts; minor clarifications were incorporated).

Triangulation occurred at multiple levels: across data sources (surveys, interviews, focus groups), across respondent types (refugees, humanitarian workers, government officials), and across methods (quantitative statistical patterns validated against qualitative explanatory mechanisms). This multi-level triangulation strengthened confidence in findings by demonstrating consistency across different evidence types (Denzin, 2012).

3.6 Ethical Considerations

This research received ethical approval from the MAGUFINA University Research Ethics Committee (Approval #MAGUFINA-2025-018) and operational authorization from UNHCR Malawi prior to data collection. Ethical conduct was paramount given the vulnerable status of refugee participants and potential risks including psychological distress from recalling traumatic experiences, breach of confidentiality affecting legal status, and unintended exposure to authorities.

Informed consent procedures ensured voluntary participation without coercion. All participants received verbal and written information sheets in their preferred languages explaining study purpose, procedures, potential risks and benefits, confidentiality measures, voluntary nature of participation, right to withdraw without consequences, and researcher contact information. Written consent was obtained for surveys and interviews; verbal consent (audio-recorded) was obtained for focus groups where participants expressed discomfort signing documents due to past experiences with documentation in persecution contexts. For participants with limited literacy, information sheets were read aloud, and comprehension verified through teach-back methods before consent.

Confidentiality and data protection followed UNHCR's Policy on the Protection of Personal Data of Persons of Concern (2023). No personally identifiable information was recorded on survey instruments; participants were assigned unique numeric identifiers. Consent forms with participant names were stored separately from data in locked cabinets at MAGUFINA University, accessible only to the principal investigator. Digital data were encrypted using AES-256 encryption and stored on password-protected devices. Audio recordings were transferred to encrypted storage within 24 hours and deleted from recording devices. Data sharing agreements with UNHCR and partner organizations specified that only anonymized aggregate data could be shared, never individual-level information.

Protection from harm involves multiple safeguards. Research team members completed training in trauma-informed interviewing techniques, learning to recognize signs of distress and respond appropriately. Clear referral pathways were established with psychosocial support services provided by UNHCR and partner NGOs; five participants were referred during data collection (with their consent) after showing signs of psychological distress. Questions were carefully worded to avoid re-traumatization; for example, rather than asking about specific persecution experiences, we asked about "challenges that led you to leave your country of origin" allowing participants to share only what they felt comfortable disclosing.

Fair compensation balanced ethical requirements to compensate participants for their time without creating undue inducements that might compromise voluntary consent. Following consultation with refugee community leaders and UNHCR guidance, participants received 2,000 Malawian Kwacha (approximately \$2 USD) to cover transportation costs and time, an amount considered appropriate but not coercive. Compensation was provided regardless of whether participants completed all questions, reinforcing their right to withdraw.

Cultural sensitivity and community engagement were prioritized throughout. The research team included two refugee community members employed as research assistants, ensuring cultural competence and community trust. Gender-matched interviewers conducted focus groups with female participants to ensure comfort discussing sensitive topics. Research timing avoided major religious observances (Ramadan, Christian holidays) and was scheduled at participants' convenience. Community leaders were regularly briefed on research progress, and preliminary findings were shared in community meetings before final report completion, demonstrating respect and enabling community input into interpretation.

3.7 Data Analysis

Quantitative data analysis employed SPSS Version 28. Initial cleaning involved checking for outliers, missing values (handled through listwise deletion where missing data exceeded 5% for individual variables, affecting 7 of 300 cases), and testing assumptions for parametric tests. Descriptive statistics characterized by the sample and key variables. Bivariate analyses using chi-square tests, t-tests, and correlation coefficients identified relationships between socio-economic factors and resilience indicators. Multiple regression analysis examined the relative influence of different socio-economic factors on the composite resilience index while controlling for demographic variables including age, gender, country of origin, length of residence, and household size. Statistical significance was set at $p < 0.05$. Effect sizes were reported alongside p-values to distinguish statistical significance from practical importance.

Qualitative data analysis followed thematic analysis procedures (Braun & Clarke, 2006). Interview and focus group transcripts were imported into NVivo 14 software for coding and analysis. Analysis proceeded through six phases: (1) familiarization through repeated reading of transcripts while noting initial observations; (2) generating initial codes systematically across the entire dataset, identifying both semantic and latent themes; (3) searching for themes by collating codes into broader patterns; (4) reviewing themes to ensure they coherently represent coded data and accurately reflect the dataset; (5) defining and naming themes with clear definitions and scope; (6) producing the analysis by selecting compelling examples illustrating each theme. Coding was conducted

independently by two researchers with discrepancies resolved through discussion until consensus was reached, enhancing inter-coder reliability.

Integration of quantitative and qualitative findings occurred during interpretation. Statistical patterns from surveys were compared against themes from qualitative data to identify where findings converged (mutual validation), diverged (revealing complexity or contradictions), or complemented each other (qualitative data explaining quantitative patterns). For example, if quantitative analysis showed that cash transfer recipients had significantly higher resilience scores, qualitative data were examined to understand the mechanisms through which cash transfers enhanced adaptive capacity, revealing processes that statistics alone could not illuminate. This integration strengthened both the validity and explanatory power of findings, moving beyond merely describing what factors influence resilience to explaining how and why they do so.

4. Results and Findings

This section presents findings from the mixed-methods investigation of socio-economic and institutional drivers of climate resilience among refugee populations in Lilongwe, Malawi. Results are organized according to the three research objectives: (1) assessing how socio-economic support mechanisms influence climate resilience, (2) evaluating institutional frameworks affecting refugee climate resilience, and (3) identifying scalable interventions for enhancing resilience.

4.1 Sample Characteristics

The study successfully recruited 300 refugee households across four neighborhoods in Lilongwe, achieving a 100% response rate with no incomplete surveys. Table 1 presents demographic characteristics of survey respondents.

Table 1: Demographic Characteristics of Survey Respondents (N=300)

Characteristic	Category	N	%
Gender of Household Head	Male	178	59.3
	Female	122	40.7
Age Group	18-30 years	89	29.7
	31-45 years	142	47.3
	46-60 years	57	19.0
	60+ years	12	4.0
Country of Origin	Burundi	87	29.0

	DR Congo	102	34.0
	Rwanda	43	14.3
	Somalia	38	12.7
	Ethiopia	30	10.0
Duration in Lilongwe			
	6 months - 2 years	76	25.3
	2-5 years	134	44.7
	5+ years	90	30.0
Household Size			
	1-3 members	67	22.3
	4-6 members	171	57.0
	7+ members	62	20.7
Primary Livelihood			
	Street vending	121	40.3
	Casual labor	89	29.7
	Small trading	53	17.7
	Skilled work	24	8.0
	Other/None	13	4.3

The sample achieved reasonable representation across demographic strata, with female-headed households comprising 40.7% of respondents—slightly higher than UNHCR's estimated 36% for the general refugee population in Lilongwe, likely reflecting women's greater availability during daytime data collection. The majority (76.7%) had resided in Lilongwe for over two years, providing adequate time to experience seasonal climate patterns and develop adaptation strategies.

4.2 Climate Hazard Exposure and Impacts

Survey data revealed widespread exposure to climate-related hazards. During the 24 months preceding data collection (March 2023-March 2025), 87.3% (n=262) of households experienced at least one significant climate-related shock. Figure 1 illustrates the frequency of different climate hazards reported.

Figure 1: Climate Hazards Experienced by Refugee Households (N=300)



Windstorms 38.0% (114)

Disease outbreaks 31.3% (94)

The economic impacts of these hazards were substantial. Households experiencing flooding reported median income losses of 8,500 MWK (approximately \$8.50 USD) per flood event—equivalent to 42% of median monthly household income (20,000 MWK). Water scarcity forced households to purchase water at inflated prices, with affected households spending an additional 3,200 MWK monthly during shortage periods. Qualitative data provided context to these figures, as one focus group participant explained:

"When the floods come, everything we have for sale gets destroyed. The water enters our house and ruins the vegetables; the charcoal gets wet and we cannot sell it. Then we must start again from zero, but we have no money to buy new stock." (Female vendor, 34 years, Burundian)

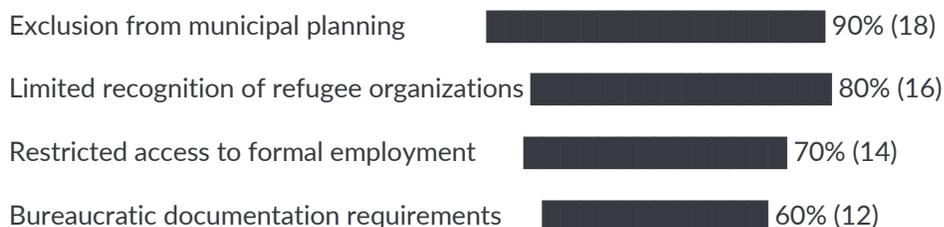
4.3 Access to Socio-Economic Support Mechanisms

Analysis revealed significant disparities in access to socio-economic support mechanisms designed to enhance household resilience. Table 2 presents access rates across different support types.

Table 2: Access to Socio-Economic Support Mechanisms (N=300)

Support Mechanism	Accessed (%)	Never Accessed (%)	Heard of but Cannot Access (%)
Cash grants (one-time)	34.0 (102)	43.3 (130)	22.7 (68)
Regular cash transfers	18.7 (56)	64.7 (194)	16.6 (50)
Micro-insurance	7.3 (22)	81.0 (243)	11.7 (35)
Microfinance/credit	12.3 (37)	73.3 (220)	14.4 (43)
Social safety nets	23.0 (69)	67.7 (203)	9.3 (28)
Vocational training	29.3 (88)	61.3 (184)	9.4 (28)
Savings groups (VSLA)	41.7 (125)	58.3 (175)	-

Village Savings and Loan Associations (VSLAs) emerged as the most accessible support mechanism (41.7%), while micro-insurance remained largely inaccessible (7.3%). A concerning finding was that 22.7% of households were aware of cash grant opportunities but could not access them due to eligibility restrictions, documentation requirements, or lack of information about application processes. Multiple regression analysis examined relationships between access to support mechanisms and the composite resilience index (measured on a 0-100 scale, where higher scores indicate greater adaptive capacity). The results are presented in Table 3.



All 20 stakeholders identified property ownership restrictions as the fundamental barrier undermining refugee climate resilience. A Lilongwe City Council official elaborated: "We implement drainage infrastructure improvements in neighborhoods with high flood risk, but we prioritize areas where residents have property titles and can contribute to maintenance costs. Refugee-dominated areas fall outside this framework because residents cannot legally own property, so they are not considered stakeholders in infrastructure planning." (Urban Planning Officer, Lilongwe City Council.)

Survey data corroborated these qualitative findings. Among households living in flood-prone zones (n=163), only 8.6% (n=14) reported that their neighborhood had received municipal drainage improvements in the past three years, compared to 47.3% of host community neighborhoods with similar flood exposure according to Malawi National Disaster Management Department data. This disparity reflects systematic exclusion from municipal climate adaptation investments.

Refugee-led organizations faced recognition challenges that limited their institutional effectiveness. Of six refugee community-based organizations interviewed, only two had formal registration with the Ministry of Civic Education, preventing the others from opening bank accounts, signing formal partnership agreements with humanitarian organizations, or accessing government capacity-building programs. A refugee community leader described the implications:

"We organize our community to clean the drainage channels before the rainy season; we do early warnings when floods are coming. But when we try to speak with the city council about permanent solutions, they say we are not a recognized organization; we cannot be partners. So, we can only do small actions, not the big changes needed." (Community leader, 52 years, Rwandan)

4.5 Comparative Resilience Outcomes

Analysis comparing resilience scores across different access levels revealed significant patterns. Figure 3 presents mean resilience scores by number of support mechanisms accessed.

Figure 3: Mean Resilience Scores by Number of Support Mechanisms Accessed

No support mechanisms (n=89):	38.2 (SD=11.6)
1 mechanism (n=94):	47.5 (SD=10.8)
2 mechanisms (n=78):	56.8 (SD=9.4)
3+ mechanisms (n=39):	68.3 (SD=8.7)

Scale: 0-100, where 100 = highest resilience

One-way ANOVA confirmed significant differences between groups ($F(3, 296)=42.87$, $p<0.001$). Post-hoc Tukey tests showed that each additional support mechanism accessed corresponded to significantly higher resilience scores (all pairwise comparisons $p<0.01$). Households accessing three or more mechanisms scored 30.1 points higher than those with no access—a practically meaningful difference representing substantially greater adaptive capacity.

4.6 Unexpected Findings

Three unexpected patterns emerged from analysis. First, length of residence in Lilongwe showed weaker association with resilience ($\beta=1.24$, $p=0.010$) than anticipated, suggesting that time alone does not substantially improve adaptive capacity without accompanying access to support mechanisms. Second, refugees from Somalia showed significantly higher resilience scores ($M=54.8$, $SD=12.3$) compared to other national groups ($M=47.2$, $SD=13.6$; $t(298)=3.12$, $p=0.002$), despite similar socio-economic access levels. Qualitative investigation suggested this reflected stronger pre-existing social networks and collective action traditions. This finding provides empirical support for emerging recognition within humanitarian practice that social connections and collective capacities may matter more for resilience than individual household assets – a critical insight for programming that has traditionally emphasized individual-level interventions. As one Somali community representative explained:

"Our community, we already know how to survive in difficult places. In Somalia we faced many problems, so when we come here, we already have the skills to organize ourselves, to help each other. This is our culture." (Male community leader, 47 years, Somali)

Third, contrary to expectations, proximity to UNHCR offices did not correlate with better access to support mechanisms ($r=0.08$, $p=0.172$), suggesting that physical proximity alone does not translate to improved service access without addressing information gaps and eligibility barriers.

These findings collectively demonstrate that socio-economic support mechanisms significantly enhance refugee climate resilience, but access remains severely limited. Institutional barriers systematically exclude refugees from municipal climate adaptation

frameworks, creating vulnerability that individual-level interventions alone cannot fully address.

5. Discussion and Implications

The findings from this study provide critical empirical evidence addressing a significant gap in urban climate resilience literature: understanding how socio-economic and institutional factors shape adaptive capacity among refugee populations. This discussion interprets key results within the theoretical frameworks guiding this research, compares findings with existing literature, and articulates their implications for policy, practice, and future research.

5.1 Interpreting Socio-Economic Drivers of Resilience

The regression analysis demonstrating that access to socio-economic support mechanisms explains 38.7% of variance in refugee climate resilience scores provides compelling quantitative evidence for relationships previously understood only theoretically. This finding directly validates predictions from the Sustainable Livelihoods Framework (Chambers & Conway, 1992), which posits that households combining multiple capital assets demonstrate greater adaptive capacity. Our results extend this framework by quantifying specific mechanisms through which different support types contribute to resilience in refugee contexts.

The particularly strong association between micro-insurance access and resilience ($\beta=11.34$, $p=0.001$) merits careful interpretation. While only 7.3% of households accessed micro-insurance, those who did show substantially higher adaptive capacity—suggesting that insurance mechanisms effectively prevent the catastrophic asset depletion that typically follows climate shocks. However, we acknowledge that this cross-sectional design cannot definitively establish causation; it remains possible that refugees already predisposed toward adaptive behavior were more likely to seek micro-insurance, rather than insurance access causing higher resilience. This directional ambiguity is addressed further in the limitations section and represents a priority area for longitudinal research. This finding aligns with research by Jensen et al. (2017) in Kenya, where micro-insurance reduced livestock losses by 36% following drought. However, our study reveals a critical constraint absent from that research: refugees' limited access to formal financial services fundamentally restricts insurance uptake. Where Jensen's study examined general populations with banking access, our data expose how legal restrictions on refugee employment and documentation requirements create systematic exclusion from insurance markets. This highlights a crucial gap between intervention effectiveness and intervention accessibility—a distinction with profound policy implications.

The strong positive association between Village Savings and Loan Association (VSLA) membership and resilience ($\beta=6.28$, $p=0.001$) provides encouraging evidence for community-based financial mechanisms that operate outside formal banking systems. With 41.7% of households accessing VSLAs—the highest rate among all support mechanisms—these informal savings groups represent a scalable model circumventing legal barriers that exclude refugees from formal finance. Qualitative data illuminating how VSLAs enable immediate post-disaster loans for livelihood recovery reveal the mechanism underlying this statistical relationship, demonstrating the value of mixed methods approaches for moving beyond correlation to causation.

An unexpected finding was the relatively modest association between vocational training and resilience ($\beta=5.17$, $p=0.008$) compared to financial mechanisms. This contrasts with humanitarian sector assumptions that skills-building represents the primary pathway to refugee self-reliance. Our data suggest that in contexts where legal restrictions prevent formal employment regardless of skills, training alone provides limited resilience benefits. This finding challenges the humanitarian sector's heavy investment in vocational training programs and suggests rebalancing toward interventions directly addressing financial constraints.

5.2 Institutional Exclusion as Structural Vulnerability

The finding that all 20 institutional stakeholders identified property ownership restrictions as the fundamental barrier to refugee climate resilience provides stark empirical confirmation of Social Vulnerability Theory's core proposition: vulnerability stems not merely from hazard exposure but also from institutional arrangements that create differential access to protective resources (Cutter et al., 2003). The 82% disparity in municipal drainage infrastructure investments between refugee-dominated and host community neighborhoods with equivalent flood exposure quantifies the material consequences of this institutional exclusion.

This pattern extends findings from Campbell et al. (2016) in Nairobi, where Somali refugees showed 2.8 times higher flood vulnerability due to restricted property rights. Our research advances this understanding by demonstrating that property restrictions create cascading exclusions: without property ownership, refugees cannot access municipal infrastructure investments, cannot use property as a collateral loan, and remain excluded from participatory urban planning processes premised on property-based stakeholder models. This cascade reveals how a single legal restriction generates multiple pathways through which institutional frameworks undermine climate resilience.

Tyler and Moench's (2012) Urban Resilience Framework posits that resilience emerges from interactions among physical-infrastructure, social-institutional, and human-individual

systems. Our findings demonstrate how institutional exclusion fundamentally disrupts these interactions for refugees. Even when individual adaptive capacity exists (human system) and community organizations mobilize collective action (social system), institutional barriers prevent translation of these capacities into resilience outcomes by blocking access to infrastructure investments (physical system). This reveals a critical limitation in applying the Urban Resilience Framework to populations lacking legal standing—the framework assumes institutional access that refugee status negates.

The finding that only one-third of refugee community-based organizations held formal registration exposes another institutional barrier: the exclusion of refugee-led organizations from governance frameworks ostensibly promoting community participation. Research by Twinomuhangi et al. (2020) in Kampala demonstrated that neighborhoods with active community organizations showed 43% lower flood displacement rates. Our study reveals that refugees possess organizational capacity but face recognition barriers preventing their engagement with municipal systems. This distinction between organizational existence and organizational recognition represents a nuanced contribution to understanding how institutional frameworks shape resilience.

5.3 Comparative Resilience and Intersecting Vulnerabilities

The finding that female-headed households showed marginally lower resilience scores ($\beta = -3.21$, $p = 0.057$), though not statistically significant, deserves attention given the 40.7% prevalence of female household heads in our sample. While this effect did not reach conventional significance thresholds, the negative coefficient suggests potential gender-differentiated vulnerability warranting further investigation. Research by Bradshaw (2013) documents that women experience disproportionate climate impacts due to pre-existing gender inequalities in asset ownership and decision-making power. Our data hint that refugee status may compound gender-based vulnerability, though larger samples would be needed to definitively establish this relationship.

The unexpected finding that Somali refugees demonstrated significantly higher resilience despite similar socio-economic access levels ($M = 54.8$ vs $M = 47.2$, $p = 0.002$) provides important evidence that social capital and collective action traditions constitute independent resilience factors beyond material resources. This aligns with the social capital dimension of the Sustainable Livelihoods Framework but also reveals limitations in measurement approaches that prioritize economic indicators. Qualitative data attributing this difference to cultural traditions of collective survival suggest that pre-displacement experiences shape post-displacement adaptive capacity—a factor rarely considered in humanitarian programming designed around universal vulnerability assumptions.

5.4 Policy and Practice Implications

These findings generate three critical policy implications. First, humanitarian programming must shift from solely addressing individual-level vulnerability toward advocacy for institutional reforms enabling refugee inclusion in municipal climate adaptation frameworks. Our data demonstrates that individual-level interventions—while beneficial—cannot fully compensate for systematic exclusion from urban infrastructure investments and planning processes. Organizations like UNHCR and the International Federation of Red Cross and Red Crescent Societies should leverage these findings to advocate with national governments for legal reforms enabling refugee property ownership or, minimally, for municipal policies treating long-term refugee residents as stakeholders in climate adaptation planning regardless of property status.

Second, the stark disparity between micro-insurance effectiveness (highest resilience association) and accessibility (lowest access rate at 7.3%) indicates an urgent need for innovative financial products designed around refugee-specific constraints. Development of finance institutions and humanitarian organizations should collaborate to develop insurance mechanisms that do not require formal employment, property collateral, or extensive documentation. Index-based insurance models triggered by objective climate measurements rather than individual loss assessments could circumvent documentation barriers while providing the protection our data show is highly effective.

Third, the success of VSLAs—accessible to 41.7% of households and showing significant resilience associations—suggests these community-based mechanisms warrant substantial scaling. Unlike micro-insurance requiring external institutional engagement, VSLAs operate within communities and can be established wherever refugee populations reside. This distinction between interventions requiring external institutional partnerships versus those within communities' direct agency represents a critical consideration for scalability and sustainability in resource-constrained humanitarian contexts. Humanitarian budgets currently emphasizing individual cash transfers might achieve greater long-term impact by investing in VSLA establishment and capacity-building, creating sustainable community financial infrastructure rather than time-limited external assistance.

For municipal authorities, findings demonstrate that excluding refugees from climate adaptation planning creates concentrated vulnerability zones that ultimately affect entire urban systems. Flooding in refugee-dominated neighborhoods without drainage infrastructure spreads to adjacent areas; disease outbreaks linked to water scarcity in underserved refugee communities affect broader public health. From a purely pragmatic perspective, municipal self-interest aligns with refugee inclusion in climate resilience investments.

5.5 Strengths and Limitations

This study's primary strength lies in its mixed-methods design, providing both statistical evidence of relationships and qualitative mechanisms explaining them. The combination of 300 household surveys enabling generalization with 20 stakeholder interviews and 6 focus groups revealing institutional dynamics generates a more comprehensive understanding than either method alone could provide. The study's focus on a secondary African city rather than a capital or megacity enhances transferability to similar urban contexts across Sub-Saharan Africa where most urban refugees reside.

However, several limitations must be acknowledged. First, the cross-sectional design prevents causal inference despite suggestive correlations. While regression analysis shows that support mechanism access associates with higher resilience, we cannot definitively establish that access causes resilience rather than more resilient households being better positioned to access support. Longitudinal research tracking households before and after receiving interventions would strengthen causal claims. Second, the composite resilience index, while drawing on established frameworks, necessarily involves subjective decisions about component weighting and operationalization. Alternative specifications might yield different effect sizes, though likely not qualitatively different conclusions. Third, social desirability bias may inflate reported resilience, particularly given that enumerators were known to be affiliated with humanitarian organizations. Anonymous data collection methods and assurances that responses would not affect service eligibility aimed to minimize this bias but cannot eliminate it entirely.

Fourth, the sample, while representative of Lilongwe's refugee population, may not generalize to refugees in other African cities with different legal frameworks, economic structures, or climate hazards. Malawi's relatively permissive refugee policies (allowing urban residence and freedom of movement) differ substantially from encampment policies in countries like Kenya or Tanzania, potentially limiting transferability. Finally, our focus on households residing in Lilongwe for at least six months excludes newly arrived refugees who may face distinct vulnerabilities, and our inability to access refugees who may have returned to countries of origin or moved onward introduces potential survivor bias.

5.6 Theoretical Contributions

This research makes three key contributions to urban resilience theory. First, it demonstrates that established frameworks developed for general populations require substantial modification when applied to legally marginalized groups. The Urban Resilience Framework's assumption that institutional systems can be accessed and influenced does not hold for refugees, revealing how legal status fundamentally shapes whether theoretical pathways to resilience remain available. Second, the finding that institutional exclusion

matters as much as individual resources challenges resilience literature's tendency to focus on household-level factors while treating institutional contexts as background conditions rather than active determinants. Third, by quantifying the relationship between specific socio-economic mechanisms and resilience outcomes in refugee populations, this study provides empirical grounding for theoretical propositions about livelihood diversification and financial protection previously supported mainly by general population studies.

5.7 Future Research Directions

These findings suggest several priority areas for future research. Longitudinal studies tracking refugee households over multiple climate seasons would enable stronger causal inference about intervention effectiveness. Comparative research across multiple cities with varying legal frameworks would clarify which findings reflect refugee experiences generally versus Lilongwe-specific conditions. Experimental or quasi-experimental evaluations of specific interventions, particularly innovative insurance products designed around refugee constraints—would provide rigorous evidence for scaling decisions. Finally, research examining how climate resilience programming might inadvertently affect refugee-host community relations deserves attention, as differential access to resources could either exacerbate tensions or, if carefully designed, create opportunities for inclusive programming benefiting both populations.

The evidence presented in this study demonstrates unequivocally that refugee climate resilience in urban contexts depends not solely on humanitarian assistance but fundamentally on institutional frameworks that currently exclude refugees from municipal climate adaptation systems. Addressing the climate vulnerabilities of 25 million urban refugees worldwide requires moving beyond individual-level programming toward systemic reforms enabling refugee inclusion in the urban governance structures that shape climate resilience for all city residents.

6. Practical Applications and Recommendations

The findings from this study generate actionable pathways for humanitarian organizations, government authorities, and development partners to enhance refugee climate resilience in urban contexts. These recommendations translate empirical evidence into concrete interventions addressing both immediate vulnerabilities and structural barriers identified through this research. Each recommendation is prioritized based on evidence of strength, implementation of feasibility, and potential for scalable impact.

6.1 Recommendations for Humanitarian Organizations

6.1.1 Scale Community-Based Financial Mechanisms

The finding that Village Savings and Loan Associations (VSLAs) demonstrate both high accessibility (41.7% participation) and significant resilience association ($\beta=6.28$, $p=0.001$) establishes these community-based mechanisms as priority intervention targets. Unlike formal financial services requiring documentation and legal employment status, VSLAs operate within refugee communities and circumvent institutional barriers that systematically exclude displaced populations from banking systems. Humanitarian organizations should allocate 20-30% of urban refugee assistance budgets specifically to establish and strengthen VSLAs in refugee-hosting neighborhoods. Implementation should prioritize training refugee community leaders as VSLA facilitators rather than relying exclusively on external staff, building sustainable community capacity that persists beyond humanitarian presence. Organizations should link VSLAs to cash transfer programs by depositing assistance directly into group savings accounts, leveraging collective financial management while strengthening group capital bases. Initial seed capital grants of \$200-500 per group, matched to member contributions, can accelerate loan capital accumulation enabling more substantial climate preparedness investments. VSLA-specific climate resilience training should teach groups to allocate savings portions for pre-season preparedness investments including drainage materials, water storage, and emergency reserves. Scaling VSLA access from current 41.7% to 70% of refugee households could increase average resilience scores by approximately 18 points based on regression coefficients, representing substantial improvement in adaptive capacity across urban refugee populations.

6.1.2 Redesign Cash Transfer Programming for Climate Preparedness

Current humanitarian cash transfer programs typically address immediate consumption needs without explicit climate adaptation objectives. The finding that cash transfer access significantly predicts resilience ($\beta=8.42$, $p<0.001$) while only 34% of households accessed such assistance reveals opportunities to enhance both coverage and program design. Organizations should implement "layered" cash transfers combining base amounts for consumption with additional climate preparedness supplements (\$15-20 USD) disbursed one month before rainy seasons, enabling preventive investments rather than solely reactive emergency assistance. Cash distributions should include climate adaptation guidance using simple pictorial materials showing effective uses: plastic sheeting for roof waterproofing, elevated storage platforms, emergency food stocks. This shift from exclusively post-disaster emergency cash to pre-season preparedness cash enables households to invest in risk reduction rather than only responding after losses occur.

Organizations might establish voluntary "climate savings accounts" where households can allocate portions of cash assistance for future preparedness, with humanitarian agencies providing matching funds incentivizing forward planning. These program modifications require minimal additional resources while potentially amplifying resilience impacts substantially.

6.1.3 Develop Refugee-Appropriate Micro-Insurance Products

The strongest resilience association emerged for micro-insurance access ($\beta=11.34$, $p=0.001$), yet only 7.3% of households accessed such mechanisms—a dramatic gap between effectiveness and accessibility representing the highest-priority intervention target. Humanitarian organizations should partner with micro-insurance providers to develop index-based products triggered by objective climate measurements (rainfall levels, flood extent) rather than individual loss assessments requiring documentation refugees often lack. Premium payment structures must accommodate informal sector income patterns through small weekly payments rather than lump-sum annual premiums. Subsidizing initial premium costs (50-75%) for the first year enables refugee participation, with gradual subsidy reduction as households experience benefits and build trust in insurance mechanisms. Products should accept UNHCR refugee ID cards as sufficient documentation, eliminating national ID requirements that systematically exclude displaced populations. Mobile money platforms should facilitate premium collection and payout distribution, circumventing banking access barriers. Organizations should implement controlled pilots with 500 refugee households receiving subsidized index-based flood insurance while 500 matched control households receive standard assistance, rigorously evaluating differences in post-flood recovery outcomes to generate evidence for scaling decisions. Such pilots require partnerships between humanitarian agencies, insurance providers, and research institutions but offer potential for transformative impact if successful.

6.1.4 Strengthen Refugee Community-Based Organizations

Only 33% of refugee community organizations held formal registration, limiting their effectiveness despite qualitative evidence revealing these organizations mobilize collective action for drainage maintenance, early warning systems, and mutual aid networks. Humanitarian organizations should provide technical assistance for organizational registration processes, including legal support navigating Ministry requirements that often pose bureaucratic barriers. Small institutional grants (\$2,000-5,000) to registered refugee organizations for climate adaptation projects identified by communities—drainage cleaning equipment, early warning communication systems, community emergency supply stockpiles—can enhance organizational capacity while addressing priority resilience needs.

Facilitating formal partnerships between refugee community organizations and established humanitarian agencies enhances legitimacy and resource access. Supporting refugee organizations to document their climate adaptation activities and outcomes builds evidence portfolios demonstrating effectiveness and legitimacy that can be presented to municipal authorities, potentially opening pathways to institutional recognition and integration into municipal disaster management frameworks.

6.2 Recommendations for Government and Municipal Authorities

6.2.1 Enable Refugee Inclusion in Municipal Climate Adaptation Planning

The finding that refugee-dominated neighborhoods received municipal drainage infrastructure at only 8.6% the rate of host community areas with equivalent flood exposure reveals systematic exclusion from climate adaptation investments with consequences extending beyond refugee populations to undermine citywide resilience. Municipal authorities should revise infrastructure investment criteria to prioritize disaster risk exposure rather than exclusively property ownership as allocation determinants, using objective hazard and exposure data to guide investments regardless of residents' legal status. Establishing refugee representation seats on municipal disaster management committees ensures refugee voices inform planning decisions affecting their communities. Climate vulnerability mapping conducted citywide can identify high-risk areas requiring intervention without reference to residents' legal status, creating evidence-based allocation frameworks less susceptible to bias. Municipal authorities should create "temporary resident stakeholder" categories in participatory planning frameworks, enabling long-term refugee residents to engage in consultations despite lacking permanent legal status. Pilot "shared responsibility" infrastructure models where municipal authorities provide materials and technical expertise while refugee community organizations contribute labor for drainage maintenance can create partnerships acknowledging mutual interests while respecting resource constraints. These reforms require political will but minimal additional resources, as they primarily involve reallocating existing climate adaptation investments more equitably rather than increasing total expenditure.

6.2.2 Reform Documentation Requirements for Service Access

Property ownership restrictions emerged as the fundamental barrier creating cascading exclusions from resilience resources. While comprehensive legal reform requires national-level action beyond municipal authority, interim measures can partially address constraints. Municipal authorities should implement "temporary occupation certificates"

for refugees residing in rented accommodations for two or more years, providing documentation enabling access to municipal services without conferring property ownership rights. Accepting UNHCR refugee ID cards as valid documentation for accessing municipal disaster assistance, vocational training programs, and public health services removes bureaucratic barriers that exclude refugees from services ostensibly available to all city residents. Establishing "designated refugee representatives" who can sign collective agreements with municipal authorities for neighborhood infrastructure investments circumvents individual property ownership requirements while enabling refugee community participation in urban development. Creating municipal emergency assistance registries accessible to anyone residing in the city regardless of legal status ensures refugees receive early warning messages and disaster relief, **thereby enhancing both humanitarian outcomes and public health by preventing disease transmission and infrastructure degradation in underserved neighborhoods that ultimately affect entire urban systems.** These administrative reforms lie within municipal authority and require no legislative changes, making them immediately implementable.

6.3 Recommendations for Development Partners

6.3.1 Rebalance Funding Priorities toward Resilience-Building

Current humanitarian funding for urban refugees emphasizes direct assistance—food, cash, shelter—over resilience-building investments. This study's findings demonstrate that socio-economic support mechanisms explain 38.7% of variance in resilience scores justify substantial reallocation. Development partners and donors should allocate minimum 25% of urban refugee assistance budgets specifically to climate resilience programming rather than solely immediate consumption needs. Creating dedicated funding mechanisms for refugee-appropriate financial services—VSLAs, micro-insurance, savings programs—that humanitarian organizations can access without competing against emergency assistance budgets enables sustained investment in resilience infrastructure. Multi-year rather than exclusively, annual funding cycles enable VSLA establishment, insurance product development, and institutional capacity-building requiring sustained investment beyond single-year project horizons. Establishing innovation funds supporting development and testing of refugee-appropriate climate adaptation tools—mobile-based early warning systems, affordable water storage solutions, climate-resilient livelihood models—can generate breakthrough solutions applicable across urban contexts. These funding reallocations acknowledge that while emergency assistance addresses immediate needs, resilience investments reduce future emergency costs by enabling households to withstand climate shocks without catastrophic losses requiring humanitarian response.

6.3.2 Support Institutional Reform Advocacy

Individual interventions, while beneficial, cannot fully compensate for institutional exclusion documented in this study. Development partners should fund legal analysis and advocacy campaigns targeting property ownership restrictions and documentation requirements that create refugee exclusion from urban systems. Supporting evidence generation and dissemination demonstrating economic costs of refugee exclusion from infrastructure investments can build municipal and national government interest in reform by framing inclusion as aligned with fiscal efficiency and public health objectives. Financing policy dialogue platforms bringing together municipal authorities, national governments, humanitarian organizations, and refugee representatives to negotiate inclusive frameworks creates spaces where evidence-based advocacy can influence policy development. Providing technical assistance to governments developing national urban refugee policies that enable municipal-level inclusion helps translate advocacy into implementable frameworks. These investments in systemic reform complement direct service provision by addressing root causes of vulnerability rather than only ameliorating symptoms.

6.4 Implementation Priorities

Resource constraints require prioritization of recommendations based on evidence of strength, implementation feasibility, and cost-effectiveness. Organizations should sequence implementation as follows:

6.4.1 Immediate Priority (0-6 months)

Scale VSLA establishment has the highest accessibility, proven effectiveness, and low-cost relative to impact. Simultaneously redesign cash transfer timing and messaging for climate preparedness, building existing programs with minimal additional resource requirements. Document and strengthen existing refugee community organizations, leveraging current capacity rather than creating new structures.

6.4.2 Medium-Term Priority (6-18 months)

Pilot refugee-appropriate micro-insurance products given high impact potential demonstrated through the strongest resilience association, recognizing that partnership development and product design require extended timelines. Concurrently advocate for municipal infrastructure inclusion using evidence from this study, acknowledging that policy change involves extended negotiation periods. Establish refugee representation in municipal disaster management committees where political feasibility exists.

6.4.3 Long-Term Priority (18+ months)

Advocate for property documentation reforms requiring national-level policy change with extended timelines but transformative potential. Conduct rigorous impact evaluations of scaled interventions generating evidence for sustainability and replication. Expand research to additional cities and contexts, building generalizable knowledge applicable across urban refugee contexts globally.

This sequenced approach enables organizations to generate early wins through accessible interventions while building toward systemic reforms addressing structural barriers. Monitoring systems should track output indicators including numbers of refugees accessing VSLAs, micro-insurance, and climate-focused cash transfers; outcome indicators including changes in household resilience scores and reduction in climate shock impacts; and impact indicators including changes in refugee household poverty rates and comparative climate-related mortality between refugee and host populations. This evidence generation enables adaptive management, allowing organizations to refine interventions based on implementation learning while demonstrating impact to sustain political and financial support for continued programming.

7. Conclusion

This study provides the first comprehensive empirical evidence quantifying how socio-economic and institutional factors shape climate resilience among urban refugee populations in Sub-Saharan Africa. Analysis of 300 households in Lilongwe, Malawi reveals three critical findings. First, access to socio-economic support mechanisms—particularly micro-insurance, cash transfers, and community savings groups—significantly enhances refugee adaptive capacity, with micro-insurance showing the strongest association ($\beta=11.34$) yet lowest accessibility (7.3%). Second, institutional barriers systematically exclude refugees from municipal climate adaptation frameworks, with refugee-dominated neighborhoods receiving infrastructure investments at only 8.6% the rate of comparable host community areas. Third, property ownership restrictions create cascading exclusions from financial services, infrastructure investments, and participatory planning processes that individual humanitarian interventions cannot fully compensate. These findings demand action across three fronts: humanitarian organizations must scale proven mechanisms like VSLAs while developing refugee-appropriate micro-insurance products; municipal authorities must revise infrastructure allocation criteria to prioritize disaster risk exposure over property ownership; development partners must rebalance funding toward resilience-building investments and institutional reform advocacy. As climate impacts intensify and urban refugee populations approach 25 million globally, evidence-based programming addressing both immediate vulnerabilities and structural exclusion becomes increasingly urgent for equitable and effective urban climate action.

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