

RESEARCH ARTICLE

Climate-Induced Rural–Urban Migration, Informal Settlement Expansion, and the Governance of Urban Resilience in Kumasi, Ghana.**Mabel Blay Nkegbe & Dr. Susan D. Albert-Makyur***PhD Candidate WASCAL Research Program-Federal University of Technology Minna, Niger State
Directorate of General Studies / Nile Online Digital Learning, Nile University of Nigeria, Abuja***ABSTRACT**

Ghana is witnessing a growing trend of people moving from rural areas to cities, often driven by the challenges caused by climate change to traditional farming livelihoods. Unfortunately, many urban areas are not equipped to handle this arrival of migrants. This paper explores how this climate-induced rural-urban migration affects urban resilience in Ghana, focusing on the Greater Kumasi Metropolitan Area. It examines the role of informal settlements in shaping the experiences of migrants, particularly in relation to flooding, heat stress, and inadequate infrastructure. Additionally, it looks at how current governance strategies may either alleviate or worsen these challenges. The research draws on a wide range of sources, including peer-reviewed studies, national policy documents, and other relevant literature published mainly between 2018 and 2026. This analysis is framed through theories like Social-Ecological Systems thinking, Urban Political Ecology, and climate mobility theory. The findings suggest that migration to Kumasi is not simply a direct reaction to climate shocks. Instead, factors such as agricultural decline, land commercialization, and limited rural services push people toward the city, where low land prices tempt them to settle in areas prone to flooding and lack vegetation, such as Aboabo, Asawase, and Ahensan. These neighbourhoods often have inadequate infrastructure and are more susceptible to issues like flooding and urban heat, yet they frequently go unrecognised in urban planning discussions. While initiatives such as the National Climate Change Policy, the National Adaptation Plan, and the new National Urban Policy aim to strengthen resilience, they face significant challenges. Problems like fragmented institutional responsibilities, insufficient funding for adaptation measures, weak enforcement of planning rules, and a reliance on eviction rather than improving existing communities hinder progress. Ultimately, this paper argues that enhancing urban resilience in Kumasi centers not just on the act of migration itself, but on the governance decisions regarding where and how migrants are allowed to settle. The paper concludes with suggestions for more localized and migration-sensitive urban governance, emphasising that residents of informal settlements should be viewed as crucial partners in adaptation efforts, rather than merely as individuals to be relocated.

Keywords: Climate-induced Migration; Urban resilience; Informal settlements; Urban Political Ecology; Kumasi-Ghana.

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1. Introduction

Climate change is reshaping the geography of human settlement in West Africa, and Ghana is a particularly great example of how that change is taking place. The prevalence of rainfall variability, lengthy dry spells, and the loss of rain-fed farm income in the northern savannahs of Ghana have for decades pushed families to migrate to seasonal and permanent life (Teye and Nikoi, 2022). But what's changed is the location and density of that migration: more and more of it ends up not in the secondary cities and agricultural frontiers, but in the country's two largest metropolitan clusters, Accra and Kumasi, whose population and built footprint have grown at a rate that has always been faster than any planning capacity (Cobbinah *et al.*, 2015; Cobbinah & Niminga-Beka, 2017). Ghana's urban population has grown from about four million in the 1980s to 20.4 million in 2026, with nearly two in three Ghanaians projected to live in urban areas by 2030 (Ghana Business News, 2026).

Kumasi, the second city and former capital of the Ashanti Kingdom, is a good example of how a population explosion and limited planning capacity is working against Ghana's development plan. Once a "Garden City of West Africa," Kumasi has lost large areas of land and farmland to development over the past twenty years, in addition to the huge growth of its urban area, and so did the city's urban heat and the natural drainage capacity that once absorbed the city's heavy seasonal rainfall (Abass *et al.*, 2020). A lot of this has been done informally: through the commercialization and subdivision of customary land, commercialization of residential areas and commercialization of the properties and also the building of floodplains and wetland margins and stream banks by people with little money and few options (Cobbinah and Niminga-Beka, 2017; Cobbinah *et al.*, 2022). Aboabo, Asawase, Suame Magazine and Ahensan, which are now among the largest informal settlements in the Greater Kumasi Metropolitan Area, are located on the Subin River and other watercourses and have been identified as among the most flood- and disaster-prone communities in the city (Opoku-Boateng *et al.*, 2024).

The governance challenges these poses is not only the management of migration, which is not possible and, at least according to the evidence, not the only method available to the government to control migration, but the urban environment in which migrants can settle in the city. Ghana has created a nation-wide climate and urban policy architecture that is more detailed in nature: the National Climate Change Policy (2013), the National Climate Change Adaptation Strategy (2012), the National Adaptation Plan Framework (2018), followed by further Nationally Determined Contributions and most recently the National Urban Policy and Implementation Plan (2026-2035) and the National Slum Upgrading and Prevention Strategy (2026-2035) which was launched in July 2026 (Ghana Business News, 2026; MyJoyOnline, 2026; United Nations in Ghana, 2026). But there is an existing body of evidence that policy ambition in Ghana has always surpassed implementation capacity, with adaptation finance disproportionately allocated to mitigation activities. Institutional mandates are dispersed between the ministries and Metropolitan, Municipal, and District Assemblies and land use regulation is not well-coordinated with informal growth (Africa Policy Research Institute, 2024; Africa Policy Research Institute, 2022).

This paper aims to fill that gap in governance by providing a well-supported evidence-based analysis of climate-induced rural–urban migration and its impact on urban resilience in Ghana, with Kumasi as the primary case in point. It builds an integrated conceptual framework on climate stress, migration, informality and governance response as well as in other secondary West African cities that are experiencing similar pressures. And it provides a critical, not descriptive, analysis of Ghana's newly launched National

Urban Policy and Slum Upgrading Strategy in 2026, to assess how these frameworks are structurally set up to reverse the implementation failure of their predecessor.

Kumasi is an appropriate case study for this purpose. It is Ghana's second-largest and fastest-growing city, located at the junction of ongoing rural-to-urban migration from the country's drier northern and middle-belt regions with a traditional land tenure system that has been a driver of unplanned expansion and a source of institutional friction with statutory planning authorities (Cobbinah & Darkwah, 2017). Unlike Accra, where the flood governance literature is much better developed, Kumasi's inland river flood situation, urban heat island elevation and its traditional land governance dynamics are relatively under-covered in the climate resilience literature, even as the city is repeatedly flagged in flood risk assessments as containing more high- and medium-risk zones than low-risk ones (Abass et al., 2020). Kumasi therefore has both empirical urgency and analytical relevance: a city where the migration–informality–vulnerability–governance relationship can be examined in unusually concrete terms.

2. Literature Review

2.1 Climate-induced rural–urban migration

The literature on environmental and climate migration has evolved from an early deterministic account of climate change and migration where climate shocks were assumed to be the cause of displacement. The influential foresight report on migration and global environmental change reframed migration as a consequence of political, demographic, social, economic and environmental drivers in which environmental change is largely a function of these drivers and not of migration itself (Black *et al.*, 2011). This multi-causal perspective is well known in a multitude of West African and Ghanaian contexts. Teye and Nikoi (2022) also show that while rainfall variability and drought disrupt rain-fed agriculture in dry regions of West Africa, migration is mediated by household capital, land access and market conditions (not a mechanical response to hazard exposure). Slow-onset stressors (e.g., decreasing rainfall) cause more voluntary, internal movement, whereas flood events are more likely to be involuntary migration.

In Ghana, this is in fact what is also recognised in the empirical literature. Drought and decreased rainfall are associated with higher migration rates in Ghanaian farming households, and flooding and soil fertility are much less associated with migration, suggesting that migration is not an outcome of climate change but rather of different climatic stressors. In Ghana's Upper East and Northern regions, mixed-method research also records climate-induced migration as a twofold effect of socio-ecological stress but suggests that migration may not be the only, or even the default, response to climate change; study of migration in the savannah zones shows that these processes have long-standing historical roots that go back to the days of historical and current climate information (Teye *et al.*, 2024). In this respect, the literature converges on the point that is very relevant to Kumai migrants arriving in the city are not a homogeneous group responding to climate change, but rather a differentiated group who move based on climate stress and land access, credit restrictions, age and gender and how they migrate into the city. Table 1 presents significant research on climate-related migration that pertains to the situation in Ghana.

Table 1. Summary of Major Literature on Climate-Induced Migration Relevant to Ghana

Study	Focus / Scope	Key Finding Relevant to This Paper
Black et al. (2011) – Foresight Report	Global conceptual framework for environmental change and migration	Migration is multi-causal; environmental change acts mainly by altering existing political, social, and economic drivers rather than causing movement directly.

Teye and Nikoi (2022)	Climate-induced migration in West Africa	Rainfall variability and drought erode rain-fed livelihoods; slow-onset stress drives voluntary internal migration, rapid-onset events drive involuntary displacement.
(Teye <i>et al.</i> , 2024)	Historical dynamics of climate-related migration, savannah zone, Ghana	Contemporary climate-migration patterns in northern Ghana have deep historical roots predating recent climate framings.
Kwanhi <i>et al.</i> (2024)	Systematic review, climate-induced migration in Africa	Rural–urban migration is a dominant African response to climate stress; indigenous coping mechanisms are increasingly overwhelmed by the severity of change.
De Sherbinin <i>et al.</i> (2015)	Socio-environmental vulnerability mapping, West Africa	Spatial data integration reveals differentiated climate vulnerability across West African sub-regions, informing migration risk assessment.

2.2 Informal settlements and urban vulnerability

Urban informality in Ghanaian cities is not a minor or distant phenomenon; it is a structural feature of urban growth. In Kumasi, around 85 percent of residential land use in the city centre has been converted to commercial or mixed use due to the increasing land value, and as a result, the lower-income population has been moved to other areas that are more likely to be affected by hazards (Cobbinah and Niminga-Beka, 2017). At the same time, the city has extended its urban settlement to floodplains, wetlands, and sensitive buffer zones with the use of customary land transactions, which are largely out of the scope of planning (Cobbinah *et al.*, 2022; Liwur *et al.*, 2023). The result in Aboabo, Asawase, Suame Magazine, and Ahensan is that housing quality, service provision, and hazard risk all come together within the context of informal settlement in these communities in such a way that they have limited access to safe water, drainage, and waste collection, which is associated with flooding (Opoku-Boateng *et al.*, 2024).

A common and important finding in the literature is that informal settlement is not a permanent place for people to leave. The majority of informal dwellers have neither thought of moving away from their homes nor made any concrete move towards formal housing (not because they don't understand the risk, but because the settlements are the most feasible option given the resources available), according to the survey data from Kumasi. This has a direct effect on governance: policies based on the belief that informal residents will voluntarily move away or can be evicted from the city fail to account for the economic reality of informal settlement in the city.

2.3 Urban resilience

Urban resilience has become the core lens through which climate adaptation in cities is reflected internationally, but the concept is not so well understood in relation to the related concepts of vulnerability and adaptive capacity. According to the Intergovernmental Panel on Climate Change, climate risk is generally treated as a product of hazard, exposure, and vulnerability, and vulnerability is then related to exposure, sensitivity, and adaptive capacity (Intergovernmental Panel on Climate Change, 2022). Resilience, in turn, has been discussed as the capacity of a system to absorb shocks and keep functioning, to regain a prior equilibrium, or to adapt to ongoing stress (or, more recently, to change the status quo to respond to some degree to it when it was already in place and could have been the source of vulnerability). Kumasi is at risk of this kind of thinking where in a purely absorptive or recovery-based framework

resilience is treated as a cycle to be dealt with, and a fundamentally new reading of resilience is to ask why settlement in these places is still the only option for migrant families and what structural changes are needed in this context.

Another point of tension is the notion of adaptive capacity as a static aspect of a population or a fluid, unevenly distributed resource that varies over the course of a hazard cycle and is shaped by certain institutional arrangements. The evidence from Kumasi's informal settlements on social capital development among Aboabo and Asawase residents gives a sense of the dynamism: dense mutual social networks create informal adaptive infrastructure such as shared early warning and mutual assistance in flood risk at the same time, and shared resources for temporary repairs. But this capacity is essentially outside formal leadership structures and is not equivalent to structural drainage or land-use management (Opoku-Boateng *et al.*, 2024).

2.4 Urban governance

The governance literature on Ghana's climate and urban policy frameworks is less about policy-free policy than about lack of implementation. Ghana's climate governance framework (National Climate Change Policy, National Climate Change Adaptation Strategy and National Adaptation Plan Framework) outlines a comprehensive set of adaptation targets but has been underfunded: of the total amount of climate finance in Ghana from 2011 to 2019, only 3.4 percent was dedicated to adaptation and 87.4 percent to mitigation, even though adaptation is the country's stated priority because of its low emissions history (Africa Policy Research Institute, 2024). There is also a lack of institutional coordination in the context of climate change, with climate change units sitting in various ministries and MMDAs and not in line with each other so as to produce governance that is not coherent (Africa Policy Research Institute, 2022; Africa Policy Research Institute, 2024).

On the urban level, there is also a long-standing disparity between customary land governance and statutory planning authority. Chiefs and other customary authorities still have a lot of power over land allocation in and around Kumasi and, given the development of stool land, they have a lot of money to push people into unplanned settlements, even if they have a policy to do so (Cobbinah and Darkwah, 2017). The Ghanaian city authorities have historically responded to informal settlement in flood-prone areas with eviction notices and threats of demolition, which has been seen to be practically ineffective, as displaced residents tend to return to safer and formal housing but not to move to safer and formal housing, as well as normatively rejected in the absence of addressing the lack of housing that caused informal settlement in the first place. Ghana's launch of the National Urban Policy and Implementation Plan and National Slum Upgrading and Prevention Strategy in July 2026 is an attempt to shift away from this eviction-based system and move to in-situ upgrading, participatory planning and digital land management (Ghana Business News, 2026; MyJoyOnline, 2026). How this can be a real change of mindset or a further example of an ambitious policy setting that runs out of capacity for implementation is not yet answered empirically, as the policy is new and has not been studied in the literature (most studies of evaluation) as it is in the literature, but this paper looks at it critically and provisionally rather than as a finalized achievement.

And, in general, these studies have focused mainly on migration drivers, informal settlement dynamics, hazards and governance failure as distinct disciplines and for Ghana the focus is largely on Accra, not Kumasi. In comparison, little work has been done to explicitly trace the causal chain of climatic stress in sending regions, migration processes, migration decision-making in a receiving city's sending areas, settlement patterns in a receiving city and governance decisions that contribute to vulnerability as well as the governance choices that lead to this vulnerability, especially for Kumasi's customary land and riverine flood context. This paper intends to develop and apply a unified framework that makes this chain explicit and more easily understandable.

3. Theoretical Framework

This paper applies three theories to the migration-informality-vulnerability-governance link in Kumasi: Social-Ecological Systems thinking, Urban Political Ecology and climate mobility theory. Each has its own dimension to fill the gap in the analysis left by the others and it is necessary to take them together in order to do so.

Social-Ecological Systems thinking (Berkes and Folke, 1998; Colding and Folke, 2003; Ostrom, 2009) is based on the idea that human and ecological systems are tightly connected and not independent, in the sense that resilience is a feature of the mixed system rather than a product of both. In Kumasi the idea is to take land-cover change and hydrological function into account in the context of settlement: the loss of vegetation and wetland buffer capacity in the Kumasi Metropolitan Area is not an external hurdle to urban life but is caused by settlement decisions which are then affected by the climate change (Abass *et al.*, 2020). SES thinking also helps to support the work of this paper and presents the adaptive capacity in a context-dependent manner as it is reflected in the social capital of Aboabo and Asawase.

Urban Political Ecology (UPE) can be used to answer the question that SES thinking does not cover in its own right, power. UPE treats the urban environment (drainage infrastructure, land classification, risk exposure) as the product of contested political and economic processes and not the result of a neutral background to migration and settlement (Lawhon *et al.*, 2014). In Kumasi, this process looks at whose land is buildable and not, which is informal and which is not; how customary land revenue incentives have to be accounted for by statutory planning and what is the reason why people end up in floodplains and wetland margins? SES thinking risks becoming a natural property of systems but UPE argues vulnerability is also and often purely a political factor in the process.

3.1 Contrasting the 2026 National Urban Policy with the UPE Analysis of the "Political Ecology of Land"

The launch of Ghana's **National Urban Policy and Implementation Plan (2026–2035)** and the **National Slum Upgrading and Prevention Strategy (2026–2035)** in July 2026, introduces a critical institutional vector that directly intersects with the political ecology of land identified in the UPE analysis.

- **The UPE Critique of Customary Land and Market Complicity:**

The UPE analysis reveals that Kumasi's land regime is governed by a contested political economy where traditional authorities commercialize stool land, and where rising land values in the urban core push lower-income populations toward hazard-prone peripheries and wetlands (Cobbinah & Darkwah, 2017; Cobbinah & Nimminga-Beka, 2017). Historically, statutory authorities have responded to this informal expansion through reactionary, punitive measures—primarily eviction threats and demolitions—that fail to address the root structural drivers of land access and housing deficits.

- **The 2026 National Urban Policy's Attempted Counter-Response:**

The 2026 National Urban Policy attempts to address this political ecology of land by shifting the governance paradigm away from punitive displacement toward **in-situ upgrading, participatory planning, and digital land administration**. By committing to digital land management frameworks, the 2026 policy explicitly seeks to reduce the informational opacity that has historically enabled unregulated customary land transactions on fragile ecological buffers. Moreover, by enshrining slum upgrading as a core pillar, the policy attempts to counter the market-driven exclusion highlighted by UPE, legally repositioning informal settlements as communities eligible for public infrastructure investment rather than zones slated for erasure.

- **Structural Limitations and Institutional Contradictions:**

However, viewed through a rigorous UPE lens, the 2026 policy's engagement with the political ecology of land remains fraught with contradictions. While the policy provides an ambitious textual framework, it does not structurally dismantle the underlying financial incentives of customary land commercialization or alter the decentralized power dynamics between traditional stool landowners and municipal authorities (Africa Policy Research Institute, 2024). Consequently, whether the 2026 policy can effectively override the entrenched political economy of urban land in Kumasi depends entirely on sub-national enforcement capacity, institutional coordination, and dedicated financing—elements that have historically undermined Ghanaian urban policy implementation.

Climate mobility theory based on the Foresight framework in which migration is multi-causal and mediated (Black *et al.*, 2011) and has been developed in subsequent West African cases (Teye and Nikoi, 2022) provides the paper an explanation of why and how migrants move, and it is not to say migration is bad or not bad, but that migration is not bad at all. Migration is in this way, one of several possible responses (such as immobility) and the consequences for urban resilience are not so much about the movement as about the situation awaiting migrants at their destination, and that is where SES and UPE perspectives become necessary.

3.2 Conceptual framework

With these three traditions combined, this paper proposes a conceptual pathway to link climate stress to urban resilience outcomes in six stages of interactions, shown in Figure 2. Climate change (rainfall variability, drought, and heat stress for example, in the form of rainfall variation, drought frequency, and heat stress in the country and how this has consequences for rural peoples' livelihoods dependent on rain-fed agriculture) and through household wealth, access to land, social networks, and community life, the migration of people that is driven by climate change is directed towards Kumasi and other urban areas. On arrival, migrants are restricted by land commercialisation, price, and access to land, which pushes many migrants into informal settlements in floodplains, wetland margins, and low-vegetation areas, leading to informal settlement expansion. This growth and interaction with the city's changed hydrology and thermal climate poses a challenge to the city's environment and infrastructure that is also under water and climate stress, leading to increased exposure to flooding, heat stress, and infrastructure deficits. These exposures, coupled with the socio-economic conditions of informal residents, constitute urban vulnerability. Governance response from national policy and MMDA planning practice to customary land administration, including upgrading, drainage, and inclusive planning, then takes place to address this vulnerability, and it is either reduced or increased by upgrading, drainage investment, and inclusive planning, or maintained and reinforced by eviction, neglect, or fragmented implementation. This is how urban resilience outcomes are constructed and how it feeds back through land prices and informal settlement consolidation and migration into the next step of the cycle. This feedback loop is the paper's central argument that resilience in Kumasi is not a linear outcome but a constant negotiation of governance decisions for a mobile population.

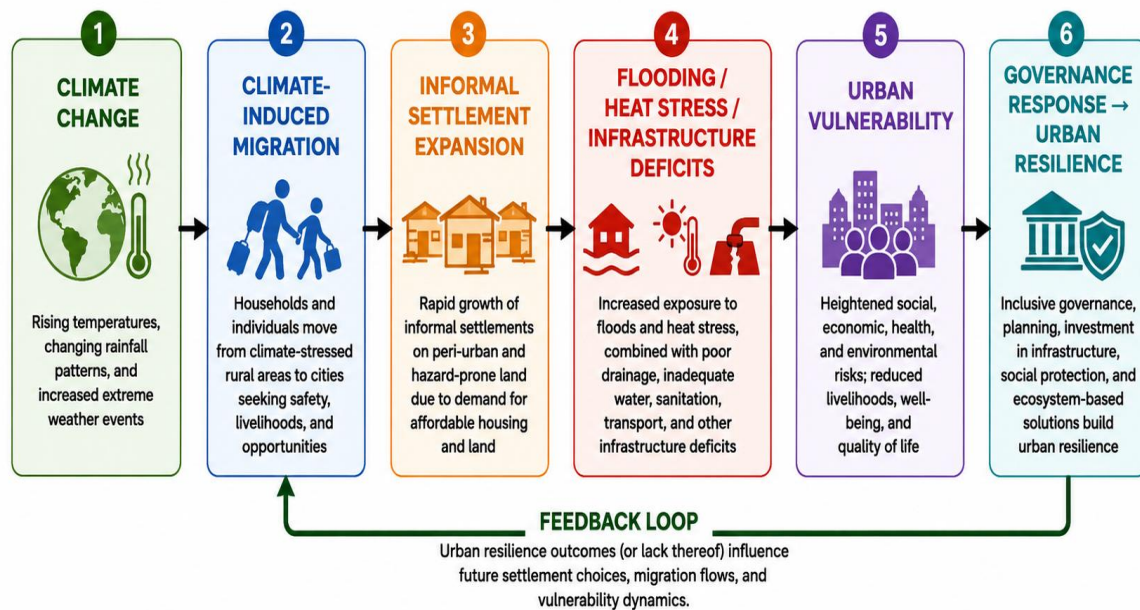


Figure 1: Conceptual Framework: the interactions between climate stress, migration, informal settlement and urban resilience outcomes

4. Methodology

This paper uses a desk-based, qualitative evidence synthesis design, which is appropriate for a critical policy-analytic question that demands mixing together a variety of evidence, coming from peer-reviewed empirical studies in the field of global policy research (e.g., national policy reports, and more recently data from the grey literature). This approach combines document analysis of Ghanaian national and sub-national policy instruments and thematic synthesis of the academic literature on climate migration, urban informality and resilience in Ghana.

Kumasi was selected as a case study by purposive, criterion-based case selection. As the second largest and amongst the fastest growing metropolitan regions in Ghana, it is situated on the intersection of the continuous rural-to-urban migration routes, customary land tenure practices and a well-known but still insufficiently understood riverine flood and urban heat profile, Kumasi (figure 2) is a city with the kind of empirical significance, data availability and theoretical interest needed for case selection in urban climate research. In contrast to the more studied Accra case study, this paper also has the opportunity to explore whether governance and vulnerability dynamics in Accra's flood literature could be generalised to the second, geographically and institutionally distinct, city in Ghana.

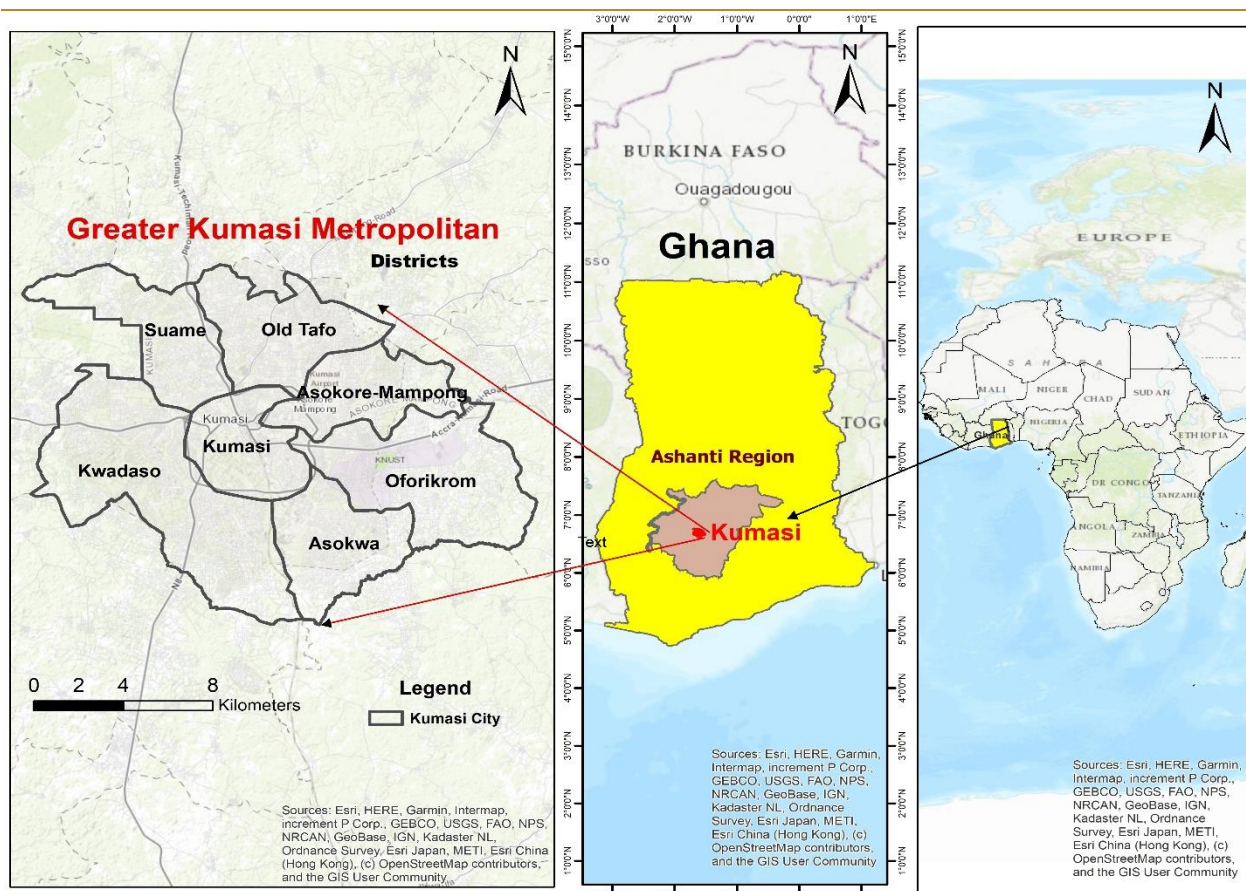


Figure 2: Map of study Location

The research was conducted on the basis of Scopus-indexed and cross-listed sources on ScienceDirect, Taylor & Francis Online, Springer Nature, Frontiers, MDPI, and Wiley Online Library, as well as on institutional and multilateral policy sites such as the United Nations Framework Convention on Climate Change document portal, the NAP Global Network, UN-Habitat and the Africa Policy Research Institute and recent Ghanaian reports on the launch of the National Urban Policy in July 2026. Search terms included “climate migration,” “rural–urban migration,” “informal settlement,” “urban resilience,” “urban vulnerability,” “flood,” “urban heat island,” and “governance” with “Ghana” and “Kumasi.” Papers in the literature were selected based on their peer-reviewed publications and official policy papers (published between 2018 and 2026), and few papers from the academic literature before that also exist so they contribute to the theoretical framework of the paper - such as the Social-Ecological Systems and Urban Political Ecology literature and this 2011 Foresight paper on migration and environmental change. Sources were only cited if their bibliographic information (authors, title, place of publication and year) could be independently checked against the source and cited record.

Thematic synthesis took place in three stages. The findings of each theme are then compared across studies to find some convergence, contradiction and evidentiary gap, especially about the extent to which the Accra-focused flood governance findings can be applied to Kumasi. Finally, the thematic results are integrated in the paper's SES-UPE–climate mobility analysis into the causal account presented in Section 5. The design is not without its limitations as it is based on secondary sources, where we do not have quantitative flood and heat data from Kumasi compared to Accra, and the very recent publication date of the 2026 National Urban Policy documents, so there cannot be any evaluation of the implementation.

5. Results and Discussion

5.1 Climate-induced migration and urban resilience in Kumasi

Kumasi's current growth cannot be understood without considering the climatic push factors in its rural hinterland and the wider northern and middle-belt savannahs from which many of its migrants come. Rainfall variability and drought have significantly eroded rain-fed agricultural livelihoods in these regions, and while climate stress and migration is not an exact linear process and not necessarily deterministic, evidence suggests that slow-onset stressors, and especially erratic rainfall, can be a major, and potentially only, driver of migration into urban centres such as Kumasi (Teye and Nikoi, 2022). This movement compresses internal urban growth pressures already significant: Kumasi's population and built-up area are growing rapidly in the last decades, with satellite land-cover analysis showing a built-up area increased by over 108 percent in recent decades of observation, while forest cover and farmland and shrub cover in the metropolitan area have declined significantly, at a rate of more than 90 percent.

This growth as a whole is incredibly challenging to cope with and, on the evidence to date, also negative in the global context. It is not only that urban growth is driven by migration inflow, but it is the register (unplanned, informal, and land-cover-degrading) that most directly impacts the city's ability to deal with climate shocks. Every hectare of forest or farmland converted to impervious built-up surface reduces the metropolitan area's ability to regulate rainfall and surface temperature; the very growth that is fueled by climate-induced migration, at the same time, is eroding the ecological buffering capacity that would have helped the city to tolerate the flooding and heat stress that climate change is making worse. This is the resilience inconsistency this paper identifies for Kumasi: migration based largely on rural climate stress is driving the urban growth that diminishes the city's climate resilience, an equation which is continuous and self-reinforcing unless government action is taken.

5.2 Informal settlement expansion and climate vulnerability

Informal settlement expansion in Kumasi creates a concentrated and spatially specific vulnerability in the form of three risk pathways: flooding, heat stress, and infrastructure. All three are identifiable but operate as a complementary system of exposure and thus the evidence base treats them as a single, mutually reinforcing system.

Flooding.

The vulnerability to flooding in Kumasi is geographically concentrated and related to informal settlement of floodplains and drainage channels. Spatial risk assessment using compound topographic and other indices across the Greater Kumasi Metropolitan Area finds that the combined number of communities classified as high- or medium-risk for flooding exceeds those classified as low-risk, with persistent flooding attributed to high rainfall, inadequate spatial planning, and unfavourable topographic conditions acting together rather than independently. Aboabo, which is traversed by the Subin River about two kilometres from Kumasi Central Market, and Asawase are the most flood- and disaster-vulnerable communities in the city (Opoku-Boateng *et al.*, 2024), and Ahensan has been identified as the most climate-disaster-vulnerable region of the city where people deal with flood risk through early warning and also by raising walls and staircases and temporarily moving out at the onset of heavy rainfall instead of structural or planning-based solutions, which are neither available (Table 3). These are household-level solutions in place of city-level drainage investment and show the extent to which individual adaptation cannot be leveraged as long as infrastructural intervention is not built. Lack of drainage maintenance, waste-clogged drains, and unregulated development of communities in the natural drainage corridors contribute to the underlying topography and rainfall risk, as is the case for other Ghanaian cities in which wetlands and flood retention zones have been gradually converted into residential and commercial development (Ghana Business News, 2026).

Table 2. Characteristics of Kumasi's Informal Settlements and Associated Vulnerabilities

Settlement	Key Characteristics	Primary Climate Vulnerability
Aboabo	Densely populated; traversed by the Subin River; approx. 2 km from Kumasi Central Market; rapid population growth	High flood exposure; contaminated flooding; unsafe water sources; dysfunctional drainage
Asawase	One of the two largest informal neighbourhoods in Asokore Mampong Municipal Assembly; high household density	Flood and disaster vulnerability; documented reliance on social-capital-based coping strategies
Ahensan	Among the most climate-disaster-vulnerable communities in Kumasi	Recurrent flooding; household coping limited to anticipatory measures (wall elevation, temporary relocation)
Suame Magazine	Dense informal commercial/residential mix; historically excluded from formal infrastructure planning	Water and sanitation deficits; self-organised communal water provision; flooding and waste-clogged drains

Heat stress.

Kumasi's transformation from a dense 'Garden City' to a rapidly growing city now has already resulted in a very well-known urban heat island effect as forest and farmland are replaced by hard and heat-retaining surfaces. Land surface temperature data from several decades of Landsat images show a strong inverse correlation between vegetative cover and surface temperature in the urban area and future land use scenarios, as well as the land-use scenario which will result in further loss of forest, waterbody, and farmland cover and the corresponding effect on urban temperature. Informal settlements, characterised by high building density, minimal green space, and limited tree cover, are structurally positioned to experience the most intense expression of this heat effect, even though household-level heat exposure data specific to Kumasi's informal neighbourhoods remains comparatively sparse relative to the flood literature, a gap this paper identifies as a priority for future empirical research rather than one it can resolve through synthesis alone.

Infrastructure deficits.

Water, sanitation, drainage, and waste management infrastructure in Kumasi's informal settlements are characterised by severe and interconnected deficits. In Aboabo and Suame Magazine, residents have developed self-organised responses, including communal wells, in the absence of reliable formal water supply, while contaminated flooding and dysfunctional drainage systems compound public health risk during and after rain events. These infrastructure gaps are not merely a service-delivery shortfall but a structural feature of how Kumasi's urban planning system has historically operated: inequitable planning has denied informal settlements access to technical interventions, piped water, engineered drainage, formal waste collection that would otherwise buffer residents against climatic hazard. The consequence is that flooding, heat stress, and infrastructure deficits do not operate as separate risks but as a single compounded exposure profile: a household in Aboabo without reliable drainage is simultaneously more exposed to floodwater contamination, more likely to face waterborne disease following a flood event, and less able to physically or financially recover before the next event. Table (3) shows the major climate hazards affecting the greater Kumasi metropolitan area.

Table 3. Major Climate Hazards Affecting the Greater Kumasi Metropolitan Area

Hazard	Principal Drivers	Documented Urban Effect
Flooding	High rainfall intensity; floodplain and drainage-corridor settlement; inadequate spatial planning; poor drainage maintenance	High- and medium-risk flood zones outnumber low-risk zones metropolitan-wide; Aboabo, Asawase, and Ahensan repeatedly identified as most flood-vulnerable
Urban heat/heat island effect	Loss of forest and farmland cover (built-up area growth exceeding 100% over recent decades); rising impervious surface share	Strong inverse relationship between vegetation cover and land surface temperature; projected further vegetation loss under future land-use scenarios
Infrastructure deficits (water, sanitation, drainage, waste)	Historic exclusion of informal areas from technical planning interventions; rapid, unregulated settlement growth	Self-organised communal water sources in Aboabo and Suame Magazine; waste-clogged drains compounding flood contamination risk
Land-cover / ecosystem degradation	Conversion of wetlands and buffer zones to residential and commercial development	Reduced natural drainage and flood-buffering capacity across watercourses including the Subin River corridor

5.3 Urban governance

Ghana's governance response to these compounding vulnerabilities operates across multiple, imperfectly coordinated instruments. The National Climate Change Policy (2013) and National Climate Change Adaptation Strategy (2012) establish adaptation as a formal national priority and provide the policy foundation for the subsequent National Adaptation Plan process, while Ghana's adaptation communication to the UNFCCC documents institutional strengthening at national and sub-national levels. On paper, this constitutes a reasonably comprehensive climate governance structure. Literature indicates that this structure has been chronically under-resourced for adaptation specifically, with the overwhelming majority of climate finance directed toward mitigation despite Ghana's stated adaptation priority, and that institutional coordination between the ministries and agencies responsible for climate policy and those responsible for urban planning and land administration has remained weak (Africa Policy Research Institute, 2022; Africa Policy Research Institute, 2024).

At the sub-national level, Kumasi Metropolitan Assembly's planning initiatives operate within, and are constrained by, this broader institutional fragmentation, compounded by the specific friction between customary land governance and statutory development control (Cobbinah and Darkwah, 2017). Land-use regulation intended to prevent development on floodplains, wetlands, and drainage corridors exists in Ghanaian planning law, but enforcement has historically been weak relative to the pace and profitability of informal land commercialisation, a dynamic evident in the conversion of the majority of Kumasi's central residential land to commercial use despite formal zoning designations (Cobbinah and Niminga-Beka, 2017). Where informal settlement upgrading has occurred, it has typically been progressively and externally supported, as in UN-Habitat's Participatory Slum Upgrading Programme, rather than embedded in routine MMDA planning practice.

The July 2026 launch of the National Urban Policy and Implementation Plan and the National Slum Upgrading and Prevention Strategy represents the most significant governance development in this space in over a decade and warrants critical rather than celebratory assessment. Positively, the policy explicitly

names climate resilience, land-use planning, and slum upgrading rather than prevention-through-eviction as core pillars, commits to digital land administration intended to reduce the informational opacity that has historically enabled unregulated customary land transactions, and directs Metropolitan, Municipal, and District Assemblies to integrate the new frameworks into their development plans and budgets (Ghana Business News, 2026; MyJoyOnline, 2026). These commitments, if implemented, would directly address several of the governance failures identified in this paper's literature review. However, the policy's own framing acknowledges that success depends on effective sub-national implementation, financing, and coordination, precisely the dimensions on which its predecessor policies have most consistently underperformed. The policy also arrives without a published implementation evaluation, having been launched only days before this paper's analysis was conducted, meaning its capacity to alter outcomes in specific settlements such as Aboabo or Ahensan cannot yet be empirically assessed and should not be assumed. Whether the 2026 frameworks mark a genuine institutional shift or a further iteration of ambitious formulation outrunning delivery is, on current evidence, an open and consequential question rather than one this paper can resolve.

Table 4. Assessment of Current Governance Strategies and Implementation Gaps

Policy / Strategy	Stated Objective	Documented Implementation Gap
National Climate Change Policy (2013)	Mainstream climate adaptation and mitigation into national planning and budgeting	Adaptation finance historically a small fraction of total climate finance inflows (approx. 3.4% of 2011–2019 inflows) relative to mitigation
National Climate Change Adaptation Strategy (2012) / National Adaptation Plan Framework (2018)	Build institutional and local adaptive capacity through a structured NAP process	Capacity-building initiatives (e.g., Africa Adaptation Programme) have been time-limited and not sustained post-project
Kumasi Metropolitan Assembly land-use planning / development control	Regulate settlement on floodplains, wetlands, and drainage corridors	Weak enforcement relative to pace of customary land commercialisation; historic reliance on eviction rather than upgrading
National Urban Policy and Implementation Plan (2026–2035)	Promote climate-resilient, inclusive, digitally governed urban development	Launched July 2026; implementation, financing, and MMDA integration not yet empirically evaluable
National Slum Upgrading and Prevention Strategy (2026–2035)	Shift from eviction toward in-situ upgrading and slum prevention	Success explicitly contingent on MMDA budget integration and inter-agency coordination, both historically weak

5.4 Implications for urban resilience

Building on the previous findings, urban resilience in Kumasi is not a permanent property of the city but a contingent reality based on a continuous interplay between climate-induced migration, informal settlement development and governance at the same time, as the conceptual framework of Section 3 suggests. The climate stress in Kumasi's rural hinterland leads to migration flows that are then channeled into the locations, floodplains, wetland margins and low-vegetation peripheral land where the population most directly undermines the city's ecological buffer. This settlement pattern then produces concentrated, compounding vulnerability to flooding, heat stress, and infrastructure deficits among the very households least equipped, financially and politically, to demand or finance mitigation. Governance response to this vulnerability has historically reproduced rather than interrupted the cycle. eviction-oriented flood

management displaces but does not resettle affected households, weak enforcement of land-use regulation permits continued informal expansion onto hazard-prone land, and adaptation financing has been directed disproportionately away from the urban adaptation measures, drainage, green infrastructure, upgraded housing, that would most directly reduce informal settlement vulnerability.

The fundamental insight of the paper which is based on the integrated SES–UPE–climate mobility model is that the interaction between migration, informality and governance cannot be seen as a coherent system where each element contributes directly to a response to the resilience outcome, but a feedback system in which the decision-making of governance to migration by migration is made which results in a weakening or growing resilience or to growth of the city. Where social capital among informal residents in Aboabo and Asawase is genuinely, and even in part, adaptive at the household and community levels (Opoku-Boateng et al., 2024), this capacity is structurally limited by the absence of complementary infrastructural and land-use interventions through formal governance. The 2026 policy shift towards in-situ upgrading and away from eviction is, in principle, exactly the type of governance shift we are suggesting is needed and will only be successful in the Kumasi Metropolitan Assembly if it can overcome the financing and coordination challenges that have inhibited similar objectives in the past. Figure 3 shows the dynamic relationships among urban resilience, climate-induced migration, informal settlement expansion and governance response

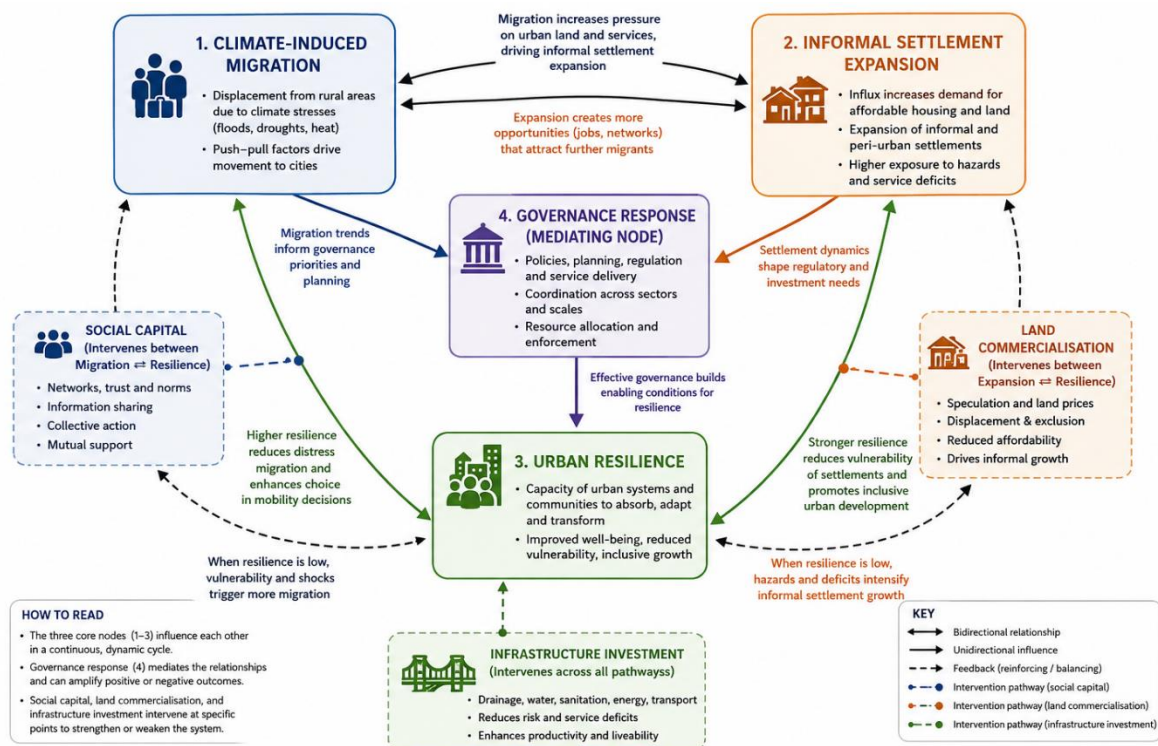


Figure 3: Dynamic relationships among urban resilience, climate-induced migration, informal settlement expansion and governance response

5.5 Bridging the Implementation Gap: A Framework for Institutional Transformation

The persistence of the migration-informality-vulnerability cycle in Kumasi demonstrates a persistent "implementation gap" that characterizes much of Ghana's climate governance architecture. Moving forward, structural transformation requires moving beyond the "siloed" approach where climate adaptation is treated as an environmental or disaster-response issue, separate from land-use and urban planning.

To break the cycle, local governance in the Kumasi Metropolitan Assembly (KMA) must adopt a tripartite.

To break the cycle, local governance in the Kumasi Metropolitan Assembly (KMA) must adopt a tripartite institutional strategy:

1.Risk-Informed Land Governance: Integrate spatial flood-risk data into the customary land allocation process. By creating a unified digital registry of hazard-prone zones (wetlands, buffers, floodplains), the KMA can provide customary authorities with actionable information to steer development away from high-risk corridors.

2.Financial Re-alignment: Current reliance on external project-based funding for adaptation remains unsustainable. The KMA must establish a dedicated, ring-fenced "Climate Resilience Fund" within its annual budget, prioritizing localized, small-scale infrastructure-such as de-silting drains and community-led green infrastructure-that directly buffers informal settlements.

3.Institutionalizing Community Adaptive Capacity: The social capital identified in settlements like Aboabo and Asawase is a significant, yet underutilized, resource. Future governance must formalize these networks as "Resilience Liaisons," ensuring that bottom-up knowledge of neighborhood-level climate stresses is incorporated into the planning cycle, moving communities from passive recipients of relief to active partners in urban governance.

To address these institutional failures requires acknowledging that urban resilience is a political act-it demands shifting budgetary, spatial, and administrative power toward the most marginalized residents, who

6. Policy Recommendations

The following recommendations are from the findings above and will be made for the institutional actors in the best way to implement them.

For national government, adaptation finance allocation should be rebalanced toward urban adaptation infrastructure, including drainage, green infrastructure, and settlement upgrading, given the documented historical skew toward mitigation; and the National Urban Policy and National Slum Upgrading and Prevention Strategy should be accompanied by separated, multi-year implementation financing tied to measurable sub-national delivery targets rather than framework adoption alone, addressing the implementation gap identified throughout Section 2.4 and Section 5.3.

For the Kumasi Metropolitan Assembly and planners, priority should be given to formally mapping flood-risk and heat-vulnerable zones, building on existing spatial flood-risk assessments of the Greater Kumasi Metropolitan Area, and integrating these maps directly into land-use permitting so that customary land allocation and statutory development control operate from a shared risk baseline rather than parallel and sometimes contradictory systems; in-situ upgrading, extending piped water, engineered drainage, and formal waste collection to settlements such as Aboabo, Asawase, and Ahensan, should be prioritised over eviction-based approaches, consistent with the residency patterns and stated intentions of informal residents documented in the literature.

For disaster management agencies, early-warning systems should be extended to and co-designed with informal settlement residents, building on and formalising the existing social capital and informal coping networks documented in Aboabo and Asawase, rather than treating these networks as substitutes for formal risk communication; post-flood response protocols should explicitly include informal settlements as a standing priority rather than an ad hoc consideration.

For NGOs and community organisations, continued support for participatory slum upgrading models, following the precedent of UN-Habitat's Participatory Slum Upgrading Programme, should be extended from its current pilot scale toward Kumasi's largest informal neighbourhoods, with community organisations resourced to participate directly in the planning processes that the 2026 National Urban Policy nominally opens to them.

For community organisations specifically, formalising and resourcing the existing social capital networks identified in Aboabo and Asawase, though, for example, community-based flood monitoring groups with a recognised liaison role to Kumasi Metropolitan Assembly, would convert an informally documented adaptive resource into a structurally integrated component of the city's resilience architecture.

7. Conclusion

In this paper we have investigated the impact of climate-induced rural-urban migration on urban resilience in Ghana, using Kumasi as a case study to examine the impact of informal settlement growth on vulnerability to flooding, heat stress and infrastructure deficiencies and how current governance practices are doing their part to address or exacerbate these problems. The main finding is that migration is not the only factor contributing to Kumasi's climate vulnerability; vulnerability is also a consequence of migration-induced urban growth at the hands of a governance system that has, until recently, turned this growth into hazard-prone informal settlements, through poor enforcement, evictions and flood management, and chronic under-financing of adaptation. The integrated Social-Ecological Systems, Urban Political Ecology and climate mobility model of this paper leads to the understanding of resilience in Kumasi as a continuous process of negotiation between climatic stress, migration, informality and governance decision-making.

Theoretically, this framework applies not just to Kumasi but other secondary West African cities with a similar migration-driven informal growth environment, and the study shows how the SES and UPE perspectives, whereas often not integrated as in Kumasi, can be applied to the assessment of vulnerability in both real world settings and in terms of power structures and how it is not only inherent to the state of the system in question but also the ecosystem in which that system of power operates. . Practically, the paper's assessment of Ghana's newly launched National Urban Policy and National Slum Upgrading and Prevention Strategy offers a provisional, critical baseline against which future implementation research can be measured.

The paper's main limitation is methodological: as a desk-based qualitative synthesis, it cannot independently verify the primary data underlying the studies it draws on, and this paper is constrained by the limited Kumasi-specific quantitative evidence regarding heat exposure and household-level infrastructure access compared to the more extensive Accra-focused literature. The 2026 National Urban Policy and Slum Upgrading Strategy is therefore provisional, as these instruments were only launched the day before this research and there is no evidence to date on the implementation of the plan. Future research should focus on primary settlement-level data collection on heat exposure and infrastructure access in the informal neighborhoods of Kumasi and be comparable to the flood-risk literature and follow up on implementation of the National Urban Policy and Slum Upgrading Strategy at the Kumasi Metropolitan Assembly level to test whether this change in governance and the level of access to infrastructure are in fact reducing vulnerability for the households of Aboabo, Asawase, Ahensan and Suame Magazine.

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