



# Climate Change and Urban Migration in Sub-Saharan African Cities: Impacts and Governance Challenges

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an open access  journal



**Keywords:** urban climate challenges, migration, informal settlements, environmental degradation, climate governance

## ABSTRACT

Urban informal settlements are rapidly expanding in countries around the world. This is due partly to high birth rates, but also because of growing in-migration driven by climate change impacts affecting rural populations. Urban informal settlements struggle with degraded and sometimes nonexistent infrastructure (such as water, sewage, and drainage systems) and service provision (health, education), and these shortcomings are aggravated by urban climate-related hazards like flooding and heat spikes. As informal settlements expand, their already overburdened infrastructure can lead to urban disasters such as flooding and landfill collapse. These challenges increase the governance and financial problems already faced by cities and create significant problems for climate resilience planning processes. Policy responses at both the national and city levels promise much but deliver little. This article reviews what is known about the environmental problems of informal settlements, particularly those in African cities, and how city governments have responded to those problems. We focus on two inland cities: Addis Ababa, Ethiopia, and Kampala, Uganda. We find that city climate adaptation plans do not incorporate the perspective of migrants, who are both particularly vulnerable to climate change and play a role in exacerbating environmental challenges in cities.

## INTRODUCTION

In 2017, 115 people were killed in an informal settlement near Addis Ababa, Ethiopia, when the Koshe landfill collapsed and caused a landslide. Such environmental disasters are common in informal settlements across the world, putting residents at great risk. Over the past decade, a burgeoning literature has explored how in-migration combined with environmental challenges exacerbate the problems of African cities, especially in informal settlements. In primary and secondary cities alike, informal settlements are rapidly expanding, in part due to growing urban migration—much of which occurs because of climate change impacts affecting rural populations. Urban informal settlements are characterized by degraded and sometimes nonexistent infrastructure (such as water, sewage, and drainage systems) and service provision (health and education). These shortcomings are aggravated by climate-related hazards like flooding and heat spikes. As informal settlements expand, the already overburdened

**Citation:** Tietjen, B., Jacobsen, K., & Hollander, J. (2023). Climate Change and Urban Migration in Sub-Saharan African Cities: Impacts and Governance Challenges. *Journal of Climate Resilience & Climate Justice*, 1, 20–32. [https://doi.org/10.1162/crcj\\_a\\_00009](https://doi.org/10.1162/crcj_a_00009)

**DOI:**  
[https://doi.org/10.1162/crcj\\_a\\_00009](https://doi.org/10.1162/crcj_a_00009)

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infrastructure can lead to urban disasters such as the Koshe landfill collapse. Policy responses to these urban challenges at both the national and city levels promise much but deliver little. These challenges increase the governance and financial problems already faced by cities and create significant problems for climate resilience planning processes.

Much of the published research on climate impacts on cities in Africa focuses on coastal cities experiencing sea level rise and flooding. There is less research on the climate risks faced by inland and high-altitude cities in Africa, and the adaptation efforts currently underway (Douglas et al., 2008; Frayne et al., 2012; Ndebele-Murisa et al., 2020; Simon & Leck, 2015). Most research on African cities focuses on primary, “megalopolis” cities, but two-fifths of Africans live in towns of less than 250,000 people (Zimmer et al., 2020). These “secondary” urban areas also struggle with informal settlements and climate hazards, but there is much less research about them.

In this literature review, we examine the double burden of urban migration and climate change and the challenges for local governments in African cities, given their limited power and resources. We refer to migration resulting from both slow-onset climatic changes, such as drought and sea level rise, and sudden onset or extreme climatic changes, such as hurricanes, typhoons, and flash floods, which often lead to sudden forced movement, or displacement, of people. We focus on two (primary) inland African cities that have received substantial international assistance in climate resilience and adaptation planning—Addis Ababa, Ethiopia, and Kampala, Uganda. While these cities have been explored thoroughly in the academic literature on climate resilience in African cities, they face different climate challenges than coastal cities in Africa. Our article seeks to fill this inland gap by exploring the climate challenges facing two major inland African cities, particularly in their informal settlements, and the international-, national-, and city-level policy efforts to date that have sought to bolster each city’s climate resilience. We begin with a description of informal settlements and their vulnerability to climate and environmental hazards.

### INFORMAL SETTLEMENTS

Climate resilience in developing countries involves understanding the vulnerability of the urban poor. Typically, informal settlements and very low-income *slum* areas are located on the outskirts of cities or sometimes within formal city boundaries. Informal settlements are areas where housing units have been constructed on land to which the occupants have no legal claim. Additionally, this construction usually is not in compliance with regulations related to planning, land use, built structure, and health and safety (Satterthwaite et al., 2020). These settlements are often in areas deemed *undesirable* by the wider population because of their location or landscape characteristics. For example, they might be on steep hillsides (at risk for mudslides), near unsanitary landfills, or on floodplains. Informal settlements lack what the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) (2021) calls *climate resilient infrastructure* such as paved roads, drainage, piped water, or energy grids, and they have limited or no access to services such as health care or emergency services, or water and waste management. There is little or inadequate oversight of urban and land planning, and low accountability for the absence of infrastructure and services. As a result, climate and other environmental hazards like flooding and extreme heat enhance risks to these informal settlements areas. The combination of poverty and lack of services and infrastructure means residents of informal settlements are highly vulnerable and less able to cope with the direct occurrences of climate and environmental hazards, and to the indirect consequences, such as outbreaks of infectious disease (Pharoah, 2016).

Informal settlements are growing across the world, largely because of in-migration from rural areas of the country (rural to urban migration), but migrants from other countries also move into them. Both internal and international migrants come to cities in search of economic opportunities and because they are driven from their villages by climate challenges, poverty, and other livelihood threats, or because of risks such as armed conflict or persecution by militias. Thus, informal settlements often comprise a mix of migrants, refugees, and internally displaced people (Tacoli, 2009; Selod & Shilpi, 2021). Migrants tend to move into informal settlements because housing is cheaper, and migrants have kin or other networks already present who can help them. As urban settlements increase in size across Africa (and many other parts of the world), it will become increasingly important to incorporate climate migration into urban resilience planning in these areas (Rivero-Villar & Vieyra Medrano, 2021).

### **METHODOLOGY**

This article is based on a systematic review of the literature on urban climate challenges in Africa, with a particular focus on Addis Ababa and Kampala. Using Scopus and Google Scholar, we searched for scholarly literature using the below search string. We also incorporated suggestions from local contacts on grey literature and government planning documents. The search string was as follows: (urban AND climate AND challenge) OR (climate AND governance) OR (informal AND settlement) OR (migrant) AND (Addis) OR (Kampala). The search produced 140 results in Scopus and 30,800 results in Google Scholar.

We reviewed all the abstracts in the Scopus search and eliminated articles that did not mention climate change or environmental degradation. On Google Scholar, due to the large volume of search results, we focused on the first 100 articles sorted by relevance to our search terms. Beyond these first 100 articles, we reduced the sample using the following criteria for elimination: 1) articles that only tangentially related to our topic of interest, 2) articles that were published by journals with very low impact factors, or 3) articles that had been published at least 24 months ago and were cited less than five times. We excluded articles that did not focus on climate impacts or environmental degradation. Additionally, we reviewed the bibliographies of articles that were particularly relevant to our search and incorporated articles based on those citations. Our final review focused on 68 relevant articles, reports, and books—a summary of which can be found in Table 1.

### **CLIMATE CHANGE AND MIGRATION IN SUB-SAHARAN AFRICA**

Sub-Saharan Africa is still predominantly rural, but it has the highest rate of urbanization in the world and predictions are that half of Africa's population will be living in urban centers by 2030. Urban climate-related migration is driven by a range of factors including sea level rise, extreme weather events like hurricanes and flooding, and temperature and other weather-related changes like droughts that affect rural people's ability to make a living from the land (Gemenne, 2011; UN-Habitat, 2010). Quantifying the numbers of climate-related migrants is an inexact science; however, because it is difficult to determine the specific role of climate change impacts in a household's decision to migrate. It is also challenging because the same events can affect people's ability and willingness to migrate in different ways. Climate shocks can lead to sudden, forced displacement when a sudden-onset disaster like a hurricane or flood occurs, and the numbers of displaced people are relatively easy to count. But slow-onset climate change impacts affect people's ability to stay or move over the long term, becoming a threat multiplier that compounds the economic, political, social, and cultural factors that cause people to move. For example, the high level of rain-fed agriculture in Sub-Saharan Africa could mean that diminished rainfall over several seasons could eventually cause

**Table 1.** Summary of Included Literature

<b>Type of Literature</b>	<b>Number Included in Review</b>
All	68
Peer reviewed journal articles	50
Reports (mostly government planning or United Nations publications)	15
Other: books, statistical data	3
<b>Topic or Focus Area</b>	<b>Number Included in Review</b>
Addis Ababa	13
Kampala	9
African Cities	10
Urbanization	38
Climate change	35
Migration	14
Informal settlements	21

farmers to migrate to informal settlements in urban areas in search of more stable livelihoods (Serdeczny et al., 2017). Or urbanization can occur with the decline of livelihood opportunities for herders and pastoral communities as drought and desertification destroy their traditional grazing areas (Hein et al., 2009). But slow-onset changes can also render households immobile, by destroying assets and savings and thereby diminishing the resources needed to migrate. The very poor are less likely to be able to migrate. Thus, environmental degradation and climate-related weather changes place additional pressures on already precarious rural livelihoods, which can both increase migration to cities and render people unable to move.

In Sub-Saharan Africa, migration outcomes are highly context specific. For example, Mueller et al. (2020) show the varied relationship between climate shocks and migration in Botswana, Kenya, and Zambia. It is important to note that migration is just one adaptation strategy utilized by rural people. Indigenous groups and other rural people have developed a great variety of adaptation mechanisms, which strengthen their ability to cope with both slow climatic changes and extreme climatic events (Internal Displacement Monitoring Centre [IDMC], n.d.; Turi et al., 2019). These strategies include altering their land management strategies, pooling resources, and diversifying livelihoods, among many others (Agrawal & Perrin, 2001).

#### **URBANIZATION AND CLIMATE CHALLENGES IN AFRICAN CITIES**

High in-migration can increase the climate vulnerability of a city, as urban development and informal settlements expand into hazard-prone areas (Niva et al., 2019; Tacoli et al., 2015). Rapid urbanization puts pressure on urban landscapes, overwhelming the city's capacity to deliver services, and overburdening already rickety infrastructure (like drainage systems) that increase the risk of land degradation, flooding, and mudslides (Adamo, 2010; Douglas et al., 2008). These risks are greatly increased in informal settlements, whose residents, already poor, are more vulnerable to the outbreaks of disease and to variation in food prices resulting from

production shocks (Ahmed et al., 2009; Hertel et al., 2010; Serdeczny et al., 2017). Three urban hazards—flooding, extreme heat, and water scarcity—are particularly problematic in informal settlements in inland cities.

### **Flooding**

Flooding is exacerbated with the rapid, uncontrolled expansion of informal settlements in high- and low-elevation inland cities, especially with expansion onto floodplains, that is, land already at flood risk (Lwasa, 2010). These settlements usually lack adequate drainage infrastructure or the existing drainage systems have been neglected. The increasing intensity of climate change-related storms exacerbates this problem (Adelekan, 2010; Douglas et al., 2008). In high-altitude cities, informal settlements are often on steep hillsides, where they are at risk of mudslides and washed-out infrastructure. Flooding from extreme rain runoff leads to health risks from water contamination aggravated by poor sanitation and dense habitation (Douglas et al., 2008). Even though informal settlements often lack paving, densely built structures can channel floodwater and limit drainage, especially when there is little drainage infrastructure in the first place. Adding to this, as formal cities grow, they cover drainage areas with roofs, roads, and pavements that can obstruct natural channels. Newly built drainage systems move water to rivers more rapidly than under natural conditions and doing so can lead to flooding of the rivers—and the floodplains on which informal settlements are built. Even moderate storms now produce higher flows in rivers because of surface runoff from hard surfaces and drains (Douglas et al., 2008).

### **Extreme Heat**

Many African cities are susceptible to the urban heat island (UHI) effect (UN-Habitat, 2010). Low-income areas and informal settlements are particularly susceptible to heat because there is less shade (trees are the first casualties), and few people can afford air-conditioning. Even fans can be of little use if people have low or no access to electricity. One study found that in Nairobi, temperatures in informal settlement (slum) areas were consistently hotter than non-slum areas (Scott et al., 2017). Increased heat combined with a lack of health services creates health risks for populations unable to access cooling facilities. This vulnerability will worsen as heat extremes become more common. The UHI can also lead to increased frequency and intensity of thunderstorms, which, combined with increased heat, adversely impacts health. These health impacts particularly affect the urban poor and elderly in informal settlements.

### **Water Scarcity**

African cities struggle with access to safe water, and urban population growth further strains water availability (Showers, 2002). Water shortages regularly occur in inland cities, and droughts aggravate water crises—especially in the Horn of Africa (Filho et al., 2018). Migrants and the urban poor in informal settlements and slums rarely have adequate access to city services and infrastructure. Access to safe and clean water will become more difficult as cities face large-scale water shortages. For example, the Gauteng City-Region of South Africa, which includes Johannesburg and Pretoria, experiences the highest rate of in-migration in South Africa with projected population growth of 25% in the next decade. In Gauteng, 23% of households report water interruptions multiple times per month (Bischoff-Mattson et al., 2020).

### **Climate Change Response in African Cities**

The literature on civil society and environmental activism in African cities is limited, and largely focuses on South Africa and North African countries. Environmental activism in much of Africa is still at a low level, in part because of government restrictions on protest (Sowers et al., 2011). In recent years there has been an uptick in the number of environmental organizations in African cities, and localized protests have grown around environmental issues. However, these organizations are not effective at communicating with government officials, and their activities are fragmented and have not had significant political impact to date (Simane et al., 2016).

Climate change responses by African national and city governments are modest compared to other regions. Local governments have led climate mitigation and adaptation activities in many rich countries, but in African countries urban officials tend to have little political power or financial resources. Cities try to implement national-level policies but there is little local-level policy development (Filho et al., 2018). For example, the national environmental protection agency for Ethiopia does not maintain connections to regional offices in a way that might aid coordination and response at the local level (Simane et al., 2016). City government officials have little access to reliable climate data, which inhibits their ability to monitor or evaluate changes over time. These limitations exacerbate the challenges of African cities responding to climate change and reduce the potential for including affected communities in city resilience planning.

Below, we examine urban adaptation and governance responses in Addis Ababa and Kampala and suggest future directions for resilience planning in inland African cities. Both Addis Ababa and Kampala face similar issues of many cities in Africa, both inland and coastal: youth unemployment and poverty, lack of safe and affordable housing, water scarcity, environmental degradation and pollution, and lack of risk awareness and emergency preparedness (Resilient Cities Network, 2020).

#### **Addis Ababa, Ethiopia**

Addis Ababa is a large inland city with a population of 3.7 million people and a population projected to reach 5.1 million by 2037. Addis has a long history of in-migration. In 2008 some 37% of Addis inhabitants were born outside the city (Moller, 2012), and that number is likely higher today, although Ethiopia is still one of the least urbanized countries with only 21% of its population living in urban areas as of 2019 (Dorosh & Schmidt, 2010; World Bank, n.d.). Conflict, environmental degradation, and climate change continue to displace people in several regions of the country, contributing to increased urbanization in all cities and towns (ReliefWeb, 2020).

Rapid urbanization is the major cause of flooding in Addis, and continued urbanization will further exacerbate flooding in the city (Beshir & Song, 2021). One hazard assessment found that Addis is particularly vulnerable to flooding, drought, and heat waves noting that 67% of the population lives in flood-prone areas (De Risi et al., 2020). A more recent study (Arsiso et al., 2018) assessed changes in rainfall and temperature extremes in Addis Ababa using high-spatial resolution climate data. Under multiple scenarios, they project a general increase in rainfall and temperatures along with strong variabilities in rainfall, which could challenge water resource management as well as land use management. Another study conducted flood risk assessments and developed criteria for identifying suitable flood adaptation strategies and prioritizing between viable risk mitigation measures in Addis (De Risi et al., 2020). Alongside the challenges posed by climate change, Addis also faces environmental challenges related to

waste management and the pollution of rivers and waterways. An estimated 40% of vegetables supplied in the city are irrigated with wastewater drawn from polluted rivers (Yohannes & Elias, 2017). This pollution threatens local ecosystems and has serious health implications for the residents of Addis.

These risk analyses and climate change projections for Addis do not discuss how informal settlements fit into the picture. For example, it is not clear to what extent the flood-prone areas discussed by De Risi et al. (2020) refer to informal settlements versus the entire city. Climate estimates predict that Addis Ababa will experience increased heavy rainfall, flooding, and higher temperatures from the UHI effect, as more land is cleared for informal settlements or urban development (Tadege, 2007; Woldeamlak & Conway, 2007). Addis's mountainous landscape is rapidly being degraded from deforestation and the resulting soil erosion, and the proliferation of informal settlements. The city's vulnerability to flooding has been aggravated by the combination of poor drainage systems, expansion of poorly constructed informal housing in flood-prone areas, improper waste disposal, and loss of green spaces. This decline in green spaces is estimated to contribute to 40% of flooding and landslides in Addis. It also negatively affects pollution mitigation, carbon sequestration, runoff regulation, and water security—further exacerbating Addis's vulnerability to shocks and stresses (Resilient Cities Network, 2020).

Some 80% of houses in Addis's inner-city area, known as *Kebele* housing, are characterized as slums due to overcrowding and inadequate infrastructure. Many of the houses lack infrastructure for drinking water, sanitation, and cooking (Resilient Cities Network, 2020). While *Kebele* housing is not necessarily in informal settlements, these communities struggle with the same issues. Informal settlements are on the rise too, as the city's lack of affordable housing pushes households to buy land from farmers in outlying areas of the city. These informal housing situations, known locally as *Chereka Bet*, are built on unused land and are often at high risk of environmental hazards like flooding. Only 7% of the city population is connected to sewage systems (Resilient Cities Network, 2020).

Estimates vary regarding the exact number of people living in informal settlements in Addis, but a study by the Urban Development and Works Bureau found that in 2008, almost 400,000 people in the city were living in informal settlements (Bikis & Pandey, 2023). In 2008, Addis's population was 2.7 million people (De Risi et al., 2020), meaning that almost 15% of the population lived in informal settlements in 2008. With an increase of one million people since 2008, it is likely that population of informal settlements has increased significantly. Other estimates suggest that as much as 70% of city residents lived in informal settlements in 2020 (Bikis & Pandey, 2023). The range of estimates highlights the challenges of estimating the population numbers in informal settlements, which are often left out of censuses and are difficult to reach in survey research. Informal settlement populations can also be estimated by looking at *unplanned* areas of a city. Using satellite imagery, UN Habitat found that about 40% of the administrative area of Addis was considered unplanned or slum areas (Karadimitriou et al., 2021).

### **Government Response**

The Addis Ababa Resilience Strategy (Resilient Cities Network, 2020), developed by the city government and the Global Resilient Cities Network, states government action is needed to improve infrastructure and reduce the city's vulnerability to climate change shocks and stresses. Through a partnership with the 100 Resilient Cities network, the city appointed a chief resilience officer and established the Addis Ababa Resilience Project Office. The three pillars

of action outlined in the strategy are: 1) building a safe and thriving city, 2) taking a more participatory, human-centric approach to designing the city, and 3) creating a livable city that promotes the health and well-being of its residents (Resilient Cities Network, 2020). Each pillar has goals related to safe and affordable housing, water and sanitation, governance, and transportation, among other targets. The government's policy commitments around these themes include designing a joint program with Oromia National Regional State to conserve, restore, and sustainably manage Addis's surrounding mountain and urban forest ecosystems. The program commits to incorporating local communities in designing and implementing the program. Other commitments include a drainage master plan to address localized flooding, and an urban agriculture initiative aimed at addressing concerns about food insecurity in the city. Another goal is to launch a study on the informal economy to develop more effective responses tailored to vulnerable groups, including migrants. These commitments are all aspirational, and progress on them will need to be monitored.

The Addis Ababa Resilience Strategy does not address informal settlements, which are particularly vulnerable to climate hazards. It simply calls for more study of the informal economy to develop more effective policy interventions. In response to the proliferation of informal settlements, the Resilience Strategy says,

Government-owned *Kebele* housing remains the primary housing option for the city's urban poor. However, due to this housing's poor quality, its lack of safety, and the valuable land that it stands on, the City has been demolishing it and resettling residents who have legal claims to the homes either in condominium housing or on the outskirts of the city, where access to services and livelihood opportunities are often limited (Resilient Cities Network, 2020).

One critique of these practices concerns the lack of participation by the poor in decision-making processes regarding their relocation and a lack of public trust in the process. Charitonidou (2021) calls for urban planning solutions in Addis Ababa to be based on a "negotiated planning" approach, with close analysis of the connections between planning, infrastructure, and land. Such an approach would also benefit climate resilience planning for the city. More research is needed on how government relocation affects migrant and informal settlement communities in Addis.

Along with relocation policies, city government officials in Addis have targeted informal settlements with the goal of providing better ecosystem services to the city to improve the water supply, air quality, and sanitation, and increase plant life and trees. All these steps can help city residents adapt to the impacts of climate change, if implemented effectively (Dubbale et al., 2010). At the national level, the Environment Policy of Ethiopia, Ethiopian Programme of Adaptation to Climate Change, and the Climate-Resilient Green Economy Strategy together promote several climate resilience and planning programs throughout the country. These include a climate monitoring program, an attempt to integrate climate change planning into national-level policies, plans to improve drought control, build climate resilient infrastructure, develop early warning systems for agricultural threats, and improve energy efficiency for transport and buildings (Filho et al., 2018). However, the plans lack any strategy on how to manage the impact of migration on cities like Addis.

#### ***Kampala, Uganda***

Kampala is an inland city on Africa's largest lake, Lake Victoria, and like other African cities, is facing recurrent climate and migration challenges, including heavy flooding, particularly



during the rainy seasons, which have become more intense and less predictable (Lwasa, 2010). The increased occurrence of heavy rainfall events, widespread encroachment on wetlands, environmental degradation (including open dumping of solid wastes), and inadequate physical planning are all driving the severity of flooding (Lwasa, 2010). Kampala also struggles with the UHI effect, exacerbated by the expansion of informal settlements, and impervious city surfaces that magnify the UHI effect (Twinomuhangi et al., 2021). Wetlands have shrunk as new construction often occurs in drained wetland areas. The resulting flooding and waterlogging can lead to diseases and other health impacts (Isunju et al., 2016). Pollution and wastewater control place further stress on local ecosystems and increase risk of disease (Kampala Capital City Authority [KCCA], 2015). These stressors combined with high urbanization rates in Kampala increase the strain on resources and expand the population of people living in parts of the city that are most vulnerable to climate hazards.

Kampala is one of the fastest growing cities in the world and is projected to grow from around 3.5 million to between 8–10 million people over the next 3 decades. City growth-rate estimates vary from 2% to 5.5% annually (Uganda Bureau of Statistics, 2016; Vermeiren et al., 2012). According to the Kampala Climate Change Action Plan, the city sees a daily influx of around two million people entering the city for business, transit, and other activities (KCCA, 2015). Those who move permanently to Kampala usually move into existing low-income neighborhoods or informal settlement settlements that are often in or near risk-prone areas such as wetlands or floodplains (UN-Habitat, 2006). As with Addis, estimates of informal settlement populations in Kampala vary, though estimates suggest that over 60% of Kampala's population live in informal settlements (Renzaho et al., 2020; UN-Habitat, 2006). Later estimates by UN-Habitat (2010) found that 85% of urban residents in Ugandan cities live in slums or informal settlements. Based on Kampala's current population, this suggests an informal settlement population of at least two million people.

As a regional center of economic activity, Kampala is a major destination hub for migrants within Uganda, as well as refugees who have fled the Democratic Republic of Congo, Rwanda, and South Sudan, among other countries over the past several decades. As of 2019, the United Nations High Commissioner for Refugees (UNHCR) had registered more than 76,000 refugees in Kampala, but likely there are many more unregistered refugees (UNHCR, 2019).

### **Government Responses**

Uganda is one of the countries participating in UNHCR's Comprehensive Refugee Response Framework.<sup>1</sup> Accordingly, the KCCA collaborated with the United Nations (UN) on a 2018 report called the "Strategic Response to Displacement, Migration and Resettlement" (KCCA, 2018).

The 2015 Kampala Climate Change Action plan identifies climate responses that the government says it will carry out (KCCA, 2015). Alongside mitigation policies such as a 22% reduction of emissions below business-as-usual scenarios, the government's adaptation goals include reducing the number of people exposed to climate change threats and coordinating intentionally planned and integrated neighborhoods. The plan addresses three issues: 1) the short and long-term adaptation of the city to climate change impacts, 2) charting a low

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<sup>1</sup> The CRRF aims to link humanitarian programming to long-term development goals of the city, strengthen the coordination, sustainability, and impact of multistakeholder responses to urban displacement, understand the needs and preferences of urban displaced persons, and ensure that displaced and marginalized residents are included in public services.

emissions development path for the city, and 3) transforming the threat of climate change into an opportunity for residents. Goals include action items related to transportation, housing, energy, and land use. Kampala's 2015 climate plan does not mention projects that have already occurred, but identifies goals related to improving waste and sanitation systems, developing a more efficient transportation system, and integrating land use challenges into city planning (KCCA, 2015).

As with the Addis strategic plans, many of Kampala's climate commitments are aspirational and largely ineffective. Since 2015, few of its goals have been achieved. Kampala's climate challenges continue to be exacerbated by urbanization and expansion of informal settlements (Ismail, 2020). In 2019, residents of the Bwaise informal settlement in Kampala dug trenches around their houses to prevent floodwaters from entering their homes (Broto et al., 2022). Updates are needed on the progress made by the Kampala Climate Change Authority in recent years (Rivero-Villar & Vieyra Medrano, 2021). Although the action plan highlighted the challenges urban migrants and the poor face, it did not mention plans to include these groups into city resilience planning. Informal settlements remain a challenge for Kampala.

### **Comparing Resilience Strategies in Addis and Kampala—Lessons and Best Practices**

Like the victims of the Koshe landfill collapse in Addis Ababa, many low-income communities in African cities are at great risk for climate and environmental disasters. City governments like those in Addis and Kampala have developed high-level plans to increase resilience in their cities. Persistent climate challenges will continue to be exacerbated by increasing rural to urban migration and the growth of informal settlements. Although much of each city's growth is occurring in the form of informal settlements, neither Addis nor Kampala city and national authorities pay much attention to these areas. Despite several calls to incorporate representatives from informal settlements in planning, neither Addis nor Kampala have successfully done so. This is a significant gap that will become wider unless city authorities turn their sights to improving resilience and climate mitigation efforts in these areas.

In both Addis and Kampala there are ongoing efforts on the parts of nongovernmental and community-based organizations, like the Resilient Cities Network, to address the flooding and water-scarcity problems of their own communities. These efforts could be supported and expanded by city governments, but so far there is no sign that this is happening. To mitigate these challenges and build climate resilient cities, governments must incorporate migrants and the urban poor into their resilience plans. The ongoing exclusion of these vulnerable populations not only aggravates their condition but poses wider threats to the resilience of the entire city.

There are a few concrete areas where both cities could implement policy changes to respond to the broader extreme heat, drought, and flooding problems outlined earlier in this article. First, there is a dire need in both cities for improved public trust. With much of the current policy agenda focusing on high-end real estate development projects, citywide residents and especially those living in informal settlements have little reason to believe their priorities are being heard. Second, green infrastructure can be a valuable policy solution for Kampala and Addis—both cities can benefit from increased integration of dedicated green spaces with high-infiltration capacity for managing storm water and flood control, particularly informal settlements. Both cities can follow successful examples of such green infrastructure implementation in Indonesia, China, and the United Kingdom, where cities expanded green spaces and effectively managed flooding (Akbar et al., 2017; Li et al., 2020). These green-scapes can also introduce trees that provide shade and mitigate against the UHI effect. It

should be noted that informal settlements are not serviced by conventional infrastructure, something that ought to be addressed in concert with any green infrastructure improvements. Third, drinking water and sewerage management can be more professionalized and improved upon in both cities—whereby climate-impacted informal settlements can address chronic lacks of fresh drinking water and disease outbreaks related to exposed sewerage. Successful examples for these kinds of initiatives have been documented in Pakistan’s informal settlements where engineers introduce separate piping for fresh water and sewerage (Hasan, 2006). Such enhancements can go a long way in both Kampala and Addis to enhance public health for the residents of informal settlements.

Lastly, these three solutions for Kampala and Addis are not siloed, they are each connected to one another and ought to be addressed through the investment in local urban planning capacity in both cities. Public trust can be garnered through active local government engagement with residents around their challenges. Planting trees and piping in fresh water, for example, can be done in a comprehensive way that supports broader community needs in both Addis and Kampala. Stronger and more heavily resourced local governments in both cities can be more responsive to residents’ needs. Both cities can adopt and implement the kind of community plans, building off the efforts discussed here, that will be embraced by people and directly address the challenges raised in this research. Both Kampala and Addis are already implementing their climate action plans and it is feasible to integrate these solutions with increased financial support and interest from outside agencies or foundations.

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