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Urban Poverty and Spatial Inequality: A Geospatial Analysis of Slum Dynamics in Rapidly Growing African Cities

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Abstract: The process of rapid urbanization, which has markedly transformed the lives of the people of Africa during the last twenty years, has witnessed the phenomenal growth of informal settlements, which has dramatically altered the very spatial patterns within the cities. African urban centers are still characterized by extreme spatial inequality as well as deep urban poverty although these cities are economically dynamic. This paper analyses urban deprivation in terms of space by conducting an integrative literature review (20102024) and comparative geospatial analysis of Lagos, Nairobi, Accra and Addis Ababa, since they are the fastest-growing cities in the world. The aim is to reveal the contribution of geospatial particularities, land-use distributions and exclusionary urban administration to the spread of the slums and systematic marginalization of their inhabitants. In a mixed-method design that incorporates peer-reviewed evidence with sciences developed on spatially grounded case studies, the research proposes similar patterns of spatial fragmentation such as unequal access to infrastructure, environmental injustice, the peripheralization of low-income population. It finds that although geospatial technologies (GIS and remote sensing) are becoming more accessible, their use in urban policy and planning is minimal. Such a dis-integration compromises the ability of governments to combat spatial injustice and to promote inclusive development outcomes. The argument of this study is the need to have spatially informed urban planning reforms, participatory models of slum upgrading, and collaborative governance models. Effective institutionalization of geospatial data has the potential to become a transformative intervention in terms of realizing spatial equity and sustainable urban futures in Africa.

Keywords: *Urban Poverty, Spatial Inequality, Slums, GIS, African Cities, Sustainable Development.*

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I. INTRODUCTION

➢ *Background to the Study*

In keeping with the global trend, urbanisation in Africa has advanced at an unprecedented pace during the past two decades, transforming the continents demographic and spatial structure. The urbanisation boom presents a global challenge, to which cities have been described as engines of economic growth as well as innovation, but also where the opposite is said — that many are sprawling more quickly with informal settlements that are unplanned and under-served and left behind to their own destinies. This is despite Africa being home to some of the fastest-growing cities on Earth, many of which are growing outside established planning jurisdictions. About 60% of the total urban dwellers in sub-Saharan Africa are expected to live in slums as stated around the year 2024, a number that skyrockets with few improvements in infrastructure or governance and service delivery (UN-Habitat, 2023; Satterthwaite et al.,_DEPENDENT * MERGEFORMAT_22). This has created a vicious circle of poverty, marginalization and environmental pollution, especially in the slums where urban poor people live within spatially marginalized geographies.

Slums formation and expansion are not only symptoms of poverty, but also underly spatial processes that strengthen inequality. The cheapest, least regulated land is in areas that are most environmentally precarious (floodplains, refuse sites, steeply sloped terrains) and informal settlements

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typically spring up there. As time goes by, these locales turn into structural neglect pockets with little access to clean water, sanitation, health care, transportation and education (Ajala 2021; Turok & Borel-Saladin 2019). This spatial fragmentation undercuts the development power and social cohesion cities can provide; inequality is vertical, between income classes as well as horizontal, among areas/ geographies or simply — at levels of access to urban opportunity. While poverty eradication has gained prominence in global and regional policy agendas, such as the Sustainable Development Goals (SDGs) and the African Union's Agenda 2063, there is still relatively little space for mapping out local aspects of poverty. Data that are available at the national and city level often mask intra-urban disparities, thus overlooking the micro-geographies of exclusion, which underpin everyday life in informal settlements (Fox & Goodfellow 2021).

In this scenario, the incorporation of geospatial technology becomes more significant. One very common set of tools for understanding the physical and socio-economic components of urban poverty is Geographic Information Systems (GIS), remote sensing, and spatial analytics. However, they remain underutilised in African urban research. Although these tools have been successfully used in various disciplines such as environmental science, disaster risk assessment and epidemiology (Karuri-Sebina 2020; Boamah et al. 2021), their application on analyzing slum dynamics with support for inclusive urban policy-making is not at its full potential. Yet a critical data blind spot persists in the lack of spatially disaggregated data that can be used to direct evidence-based planning and reveal the depth of urban inequality. Finally, many governments do not have the institutional capacity or political will to use spatial data in decision-making processes and their policies may exacerbate rather than mitigate spatial exclusion (de Sherbinin et al., 2023).

This research is poised to fill those essential gaps by investigating the spatial dynamics and determinants of slums expansion in fast-growing African cities while examining how geospatial approaches can facilitate urban poverty and spatial inequality analysis.

➢ *Research Questions*

Based on the problem identified, the study raises the following research questions:

- What are the spatial patterns and determinants of urban poverty and slum growth patterns in African cities?
- To what extent and in what ways do slum geographies represent, perpetuate or otherwise reflect wider spatial inequality?
- How have geospatial tools been used in the study and response to changes within slums in African cities?
- How have policy frameworks been attempted or developed to deal with spatial inequality and informality — how effective are they in targeting low-income needs?

➢ *Research Objectives*

The objectives included

- Analyzing the spatial distribution and structural drivers of slum formation in selected African cities;
- Examining the role of spatial inequality in perpetuating urban poverty;
- Evaluating applications of geospatial technologies for mapping and managing slum dynamics; and
- Identifying policy responses targeting reduced spatial inequality and enhanced urban equity.

This study provides an encompassing review of the relevant literature and is based on a number of case studies from Lagos (Nigeria), Nairobi (Kenya), Accra (Ghana) and Addis Ababa (Ethiopia).

This analysis of the period spanning from 2010 to 2024 embraces both pre- and post-virus urban dynamics on which spatial inequality in African cities is tethered. He said that is important for a few reasons. This paper firstly provides a new approach to analyse poverty in urban areas, which is an alternative to traditional socio-economic indicators and entail the spatial justice perspective. Secondly, it joins the trend of methodological innovation favoured by Urban Geography, supporting the urban geotechnologies and geographic information systems. Third, it helps to ground policy with geographically specific evidence that can inform fair infrastructure investment and planning. Finally, it adds to the developing academic conversation around sustainable urbanism in the Global South, where spatial exclusion and informal urbanization continued being serious difficulties (Sietchiping et al., 2020; Adelekan et al., 2022).

The rest of this paper is organized as follows. The following section discusses the theoretical and conceptual frameworks that underlie the analysis, including those of urban political ecology and spatial justice theory. In the 'Methods' section, details of the review strategy and case study design are presented, with a subsequent extensive literature and case analysis that reveals slum dynamics across the short-listed cities. The discussion synthesizes the findings with wider potential policy implications and theoretical contributions, whilst the final sections put forward new trajectories for research and suggest reforms to urban policy that may reduce spatial inequality in Africa's fast-growing urban tableau.

II. THEORETICAL AND CONCEPTUAL FRAMEWORK

A. Conceptual Review

➢ *Urban Poverty*

Urban poverty is a complex, multi-faceted problem that not only includes income insufficiency but also access to basic services, tenure security, adequate housing and risks related to environment and social deprivation. Urbanization in Africa is troubled by high rates of poverty, the unsustainable growth of informal settlements and poor institutional responses. While rural poverty, driven

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frequently by reliance on agriculture and isolation, greatly defines a life in poverty (UN-Habitat 2023; Davis & Henderson 2020), urban African poverty is exacerbated by expensive living costs, overcrowding, unemployment, as well as spatial segregation. The urban poor, whose numbers in slums or peri-urban settlements are on the rise as infrastructure investment lags behind population growth, end up experiencing systemic exclusion from quality education, healthcare, sanitation, and transportation networks (Ajala 2021).

Newer research highlights the fluid, social character of poverty in cities. Itself not just a state of deprivation, but one of maldistribution by the urban political-economy (Satterthwaite et al., 2022). This is why Fox & Goodfellow explain that studying urban poverty needs to be about more than quantitative measures of income, because the current institutional architectures, land markets and governance produce absolute spaces of disadvantage. This study, which attempts to provide a more nuanced understanding of where and how urban deprivation plays out within rapidly growing African cities, is based on a multidimensional approach to urban poverty that includes spatial dimensions.

- *Spatial Inequality*

Spatial inequality can be defined as that which is not evenly distributed in terms of resources, opportunities to receive services and services distributed in various geographic locations. This is evident in the urban context whereby there is physical isolation of people based on income, classes and social capital. The pattern of African urbanism has shown indications of the remnants of colonialism, market-oriented city growth, and ineffective governance that have focused on formal developments at the expense of informal spaces (Turok & Borel-Saladin, 2019; Sietchiping et al., 2020). This means that there are expansive slums which are in the same cities with neighborhoods of high incomes, hence high contrast in living areas.

Not only is spatial inequality a by-product of economic disparity, but also plays an important role in reproducing poverty. Inhabitants of the poor urban perimeters usually encounter systematic impediments to the public benefit, employment loci, and street infrastructural development, remaining in a condition of blockage and weakness (Boamah et al., 2021). Such differences are further complicated by poor institutional coordination, insecurity over land rights, and the informality of the economies in a majority of the cities. As maintained by Karuri-Sebina (2020), measures against spatial inequality should be spatially targeted by considering the geography of deprivation instead of applying one-size-fits solutions in narrowing down the gap. This paper contextualizes the spatial inequality as indicative of urban poverty and also a contributor of the same especially in relation to the nature of informal settlements and slum livelihoods.

- *Informal Settlements*

What informal settlements – popularly known as ‘slums’? These settlements are characterized by insecure land tenure, poor quality of housing and lack of infrastructure and services (including water supply, sanitation and drainage), as well as exposure to environmental hazards. Informal settlements are increasingly becoming the dominant form of urban housing across Sub-Saharan Africa as a result of rapid population growth, rural-urban migration and limited to no affordable formal housing options (UN-Habitat, 2021; Adelekan et al.,2022). LAGOS, NAIROBI & ACCRA: From Lagos to Nairobi and Accra, informal settlements not only house a surging urban labor force but are sites of struggle; battling simultaneously over survival under the most ruthless conditions, innovation in ephemeral cities-of-the-poor.

Informal settlement formation dynamics are both complex and spatially embedded. Slums are widely viewed as arising from land commodification, fragmented governance, and exclusionary zoning laws that force slum growth into the periphery or environmentally sensitive locales (de Sherbinin et al.…). Critically, however, informal settlements are not just inert areas of poverty but instead are consistently created and recreated through socio-political as well as economic practices intertwined with urban spatial design (Fox 2019). Acknowledging these settlements as integral parts of the urban landscape, instead of outliers to be wiped out, is necessary for environmentally sustainable and inclusive urban development. Cities are among the world's most powerful engines of inequality, and informal settlements offer a window onto those inequalities; how they are spatially distributed arguably tells you something about the architecture of urban exclusion.

- *Geospatial Analysis*

Geospatial Analysis is the use of spatial data (data that documents a geographic location) and Geographic Information Systems (GIS) to study and examine patterns, trends, relationships in geographies, understanding how they are organized. In urban studies, geospatial technologies have become necessary for land use mapping, monitoring of urban expansion and discrimination of service delivery gaps. Although a few exceptions exist (Boamah et al., 2021; Karuri-Sebina, 2020) this literature is underdeveloped with respect to application in slum research and African city spatial inequality.

Understanding urban poverty with geospatial analysis is useful because it unearths geographic dimensions of deprivation that are otherwise hidden within nonspatial datasets. Such as satellite imagery and spatial mapping can detect informal settlement, measure access to public services and analyse land cover change over time (de Sherbinin et al. 2007). Together with information on socio-economics, geo-spatial analysis offers a multi-dimensional view of poverty that acknowledges the importance of local-level impacts and context. It also helps evidence-based planning as policymakers can focus their investments and interventions where they are most needed. Contributions from totality of open-source mapping tools, participatory GIS and urban observatories such as Kibera Map for Development to available spatial data are increasingly democratizing the process of characterizing and targeting spatial inequalities

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by local authorities working in concert with communities (Satterthwaite et al., 2022). The study uses geospatial analysis not only as a methodology but also as a conceptual lens to understand how poverty and informality in African cities are mediated by space and place.

B. Theoretical Review

T Markedly complex patterns of urban poverty and spatial inequality in fast-growing African cities call for a profound analytical lens to make sense of the interplay among space, politics, environment, and human agency. Urban Political Ecology (UPE) is the first lens through which we can examine these contentions. This theory critiques the socio-ecological dynamics that produce urban environments and territorial organization. UPE is based on the concept that urban space is a socio-natural construct and that political and economic power are essential in determining access to urban resources, infrastructures, and spaces (Heynen et al., 2006; Lawhon et al., 2020). High-income, formal neighbourhoods and cities are unduly prioritised at the expense of informal settlements which are either evicted or pushed to ecologically risky peripheries. UPE understands this unevenness not as part of the natural urbanization, but to be politically meaningful and located in decisions entangled with elements of what we call governance, market dynamics, and exponents in urban planning ideologies (Swyngedouw & Ernstson 2019). It becomes clear that both the growth of slums and exposure to environmental risk in cities such as Lagos, Nairobi are merely symptoms of more entrenched structural inequalities grounded within political ecology.

In addition to this, Spatial Justice Theory explores the ethical and distributive areas of space in cities. Drawing on critical urban geography and social justice theories, spatial justice posits that the geographic dimension of resources such as how or where they are located, is a key determinant of exclusion or inclusion (Soja 2010; Sietchiping et al. 2020). By way of physical proximity to political, cultural and economic institutions, it argues for 'proximity based injustice' or the way that people are screwed not simply because we do not get something but also with respect to where they live and how planningsystems allocate opportunity through spatial arrangements. Further examples of spatial injustice in the African urban context are points at which zoning serves to marginalize poor populations (few opportunities for a mix of uses), policies including exclusion on land from security of tenure, and unequal transport networks where wealthier districts may be prioritized over slums. And the consequences of these spatial injustices are great: they make access to employment and education, exposure to climate-related hazards, etc. depend on where you live (Boamah et al., 2021). Spatial justice thus questions the way in which urban development is normally assumed and offers an incisive normative approach to understanding—and undoing—spatial disparities and poverty as experienced in the informal urban sector.

UPE and Spatial Justice proffer structural normative perspectives, while the Sustainable Livelihoods Framework (SLF) provides a sense 'in practice' actor centred/system oriented method for rethinking how we understand poverty as individual and household coping strategies. SLF defines five main capitals—human, social, financial, physical and natural—necessary to sustain livelihoods and empower for resilience (Chambers & Conway 1992; Scoones 2015). Within African informal settlements, these characteristic configurations are often taxed by modest adaptive livelihood strategies (informal labor, community networks, remittance flows) to negotiate the uncertainties of insecure tenure, fluctuating incomes and minimal service provision (e.g. water supply). The SLF is especially relevant for explaining why conditions within slums can vary so dramatically and why some residents are able to channel resources towards increasing their well-being. More recently, in urban SLF applications, key findings highlight the significance of spatial location and infrastructural access as factors that influence livelihood outcomes in cities (Adelekan et al., 2022; Satterthwaite et al., 2022), supporting the inherent overlap between space and socio-economic activity. In addition, the SLF shows how external shocks— such as climate change, evictions, or pandemics — are further exacerbating this situation by hitting these urban poor communities worst due to their super- fragile asset base and meager institutional support.

Together, this article highlights that these three theoretical lenses offer a multidimensional foundation for understanding the spatial dynamics of poverty in African cities. Urban Political Ecology shows the power imbalances and environmental marginalized forces from where the slums have emerged and are being excluded of infrastructural demands. Spatial Justice Theory brings a rights-based critique of the city-making and governance process, highlighting the normative requirements of democratic urban planning. In a meanwhile, the Sustainable Livelihoods Framework offers an enlightening approach to everyday life experiences and coping strategies of slum residents at a micro-level, which supports the both structural and normative analysis perspectives.

Based on this argument, the present study is theoretically situated within a hybrid theoretical framework that incorporates Urban Political Ecology and Spatial Justice Theory as its main grounding. This combination presents a critically reflective analysis of the political-economic forces that produce uneven urban development and also emphasizes the moral imperative for just and equitable urban processes. On the other hand, within wider spatial and ecological boundaries, it will offer a supportive analytical tool for framing the actual daily coping practices in the slums. This theoretical synthesis ensures that whilst the study is firmly rooted in both the structural underpinnings and human face of urban poverty, it also provides policy-orientated lessons for advancing spatial equity and sustainable urban futures throughout Africa.

C. Empirical Review

An expanding body of research evidence, particularly in the context of rapid urbanization and growth of slums, has indicated that poverty and spatial inequality is multi-dimensional. Developed countries focused largely on the

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redistribution of poverty in post-industrial cities, and spatial inequity and planning between urban planning. For example, according to Turok and Bailey (2020), the analysis of territorial differences within UK cities—showing how cutbacks in public services and neoliberal land-use planning worsened inner-city poverty on spatial grounds—is complementary. Hwang y Lin(2021) también señalan que debe tenerse en cuenta las implicaciones externarlos de los planes de renovación urbana, como la reorganización del lugar : un estudio siguiendo a dólar representaciones geoespaciales poblacionales estadounidenses explica cómo los programas se han utilizado cada vez que eps cuyo objetivo movilidad social. These two studies highlight how planning ideologies and exclusionary governance continue to perpetrate spatial injustice in developed economies with their superior fiscal capacity.

In Australia, Wiesel and Liu (2021) analyzed the spatial distribution of affordable housing, confirming systemic deprived-group clustering in low-access suburbs with continued recursive marginalization. For instance, Kühn (2020) mapped the provision of public healthcare, education and mobility in Berlin using GIS tools which also revealed that peripheral low-income districts faced a significant service gap. This research from the Global North demonstrates that infrastructure may exist, but where it is located and how we access it are determined by social-political landscapes as much as they result from technical planning efforts.

However, empirical work in developing countries switches the focus to informal urbanization and demographic shifts at high speeds. Bhan and Jana (2022:xxxx) analyzed slum redevelopment programs in Delhi and Mumbai; they found that the spatial relocation of slum dwellers often had contradictory impacts, as it led to greater socio-economic vulnerability by increasing travel time, causing job loss, damaging community networks. In the same way, Yuliani analyzed a numeral extracts from Indonesia. Another study conducted in Jakarta by Bonne et al.(2021)used geospatial approaches to mapped informal settlement and reported a high spatial concordance through the city concerning fragile locations like slums and exposure to environmental health hazard, namely flooding and pollution as aforementioned. This study has shown that although there is increasing availability of spatial data, there is little attestation to their integration in policy formulation which means they have a function with very limited transformation ability.

In Latin America, Pérez & Cardona (2020) compared slum upgrading programs in Colombia and Brazil which jointly indicated that the effectiveness of such interventions was directly related to how well investments in infrastructure were spatially coordinated with community demands for upgrades. They noted that improvements in infrastructure alone, without tenure regularization and participatory governance, are usually not sufficient to address the structural spatial injustice. On the other hand, Alvarado and González (2021) applied remote sensing data to delve into a problem that is rampant in the peripheries of Mexico City, showing an increasing mismatch between urban service delivery and housing expansion areas.

In African contexts, research points out the structural and spatial dimensions of urban poverty. Urban poverty in Africa is becoming spatialized as a result of poor land governance, political fragmentation and limited municipal financing (Fox & Goodfellow 2021). Similarly, Ajala (2021), in his study of spatial poverty mapping in Nigeria revealed that the state-sponsored infrastructural development did not favour Lagos informal settlements in terms of public investment patterns which by extension showed a spatial bias. In Nairobi for example, GIS-enabled community mapping has been used by residents in informal settlements — such as Mathare and Kibera (Otieno et al 2020) — to lobby for improved public services within their environment and obtain official recognition from the city agencies.

More evidence from Ghana by Boamah et al. [] This is in relation to a study by Djan, et al., [], concludes that the peri-urban areas are expanding disproportionately to infrastructure provision around Accra this creates spatial inequities due to interconnected tenure insecurity and informal housing markets. Mengistu and Gebeyehu (2022) studied the urban growth pattern of Addis Ababa, Ethiopia finding that land-use regulations along with state-led housing projects displaced slum residents to edge zones with limited services. This is in line with the kind of spatially unequal outcomes that arise from development-oriented planning practices severed from socio-spatial realities.

Geospatial approaches to urban poverty have been applied in cross-continental studies. For instance, de Sherbinin et al. Used high-resolution satellite imagery along with machine learning to generate poverty maps across 14 African and Asian nations (2023). Their findings confirmed that urban poverty is site specific, with informal settlements situated in areas of environmental risk and often spatially segregated from networks of essential services. In addition, a study conducted by Satterthwaite et al. This work, an integrated of participatory GIS with household survey data in Kenya, Uganda and Bangladesh shows how geospatially informed participatory planning is more responsive to the realities of the poor (2022).

Adelekan et al. 2022 showed the domination of climate vulnerability for African coastal cities as a spatialised urban problem. The work they carried out in Lagos and Dar es Salaam connected urban poverty with flood risk and infrastructural fragility, highlighting a spatially sensitive approach to adaptation. Mkhize and Ncube (2020) looked at the post-apartheid urban fabric in South Africa with spatial data demonstrating that market-driven urban development has not eradicated racial and economic segregation and informal housing delivery is inadequate. Similarly, Karuri-Sebina (2020) has demanded democratization of spatial data systems as a part of urban governance to make it more inclusive and resist the technocratic frameworks for planning that fail to incorporate local nuances.

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From a governance viewpoint, Sietchiping et al. In reviewing more than 30 African cities, Walubengo and Cybriwsky (2020) argue that planning regulations often negate the pace of informal urban expansion to further perpetuate spatial inequality. In their study, integration was proposed by incorporating spatial data platforms like cadastral mapping and urban observatories within local decision-making frameworks so as to track settlement growth in real-time and follow up on infrastructure requirements.

Together empirical studies from the Global North and South, urban poverty and spatial inequality are shown to be intimately connected: urban poverty is a spatial process that reflects larger political–economic institutional dynamics. First, that many developed countries continue to exhibit spatial injustices even amidst highly affluent societies, where exclusionary planning practices are the norm; and second, that in developing country and African contexts marked by high levels of informal urbanization, weak governance systems and limited availability of spatial data this can only serve to worsen conditions of poverty. In these contexts, and others, geospatial tools are increasingly important diagnostic and interventional instruments, but their promise to transform policy is compromised by stagnation in policies that govern how data may be used appropriately given imbalances in data availability from one place to another, or the inability of different branches of government to talk to each other with any facility. The urgency of collective action along these lines, this empirical grounding suggests, mandates spatially informed, socially inclusive and ecologically minded urban strategies in the face of slum dynamics and urban poverty as rapidly escalating stakes in Africa today.

Researchers have started investigating how airport infrastructure contributes to economic expansion. The study by Madaki et al. (2022) investigated non-aeronautical infrastructure elements including rental services and electricity supply and tollgates to establish positive economic correlations. Public-private partnerships (PPPs) represent a fundamental sector that demands attention. The authors Itu and Kenigua (2021) demonstrated how PPPs help Nigeria accomplish infrastructure projects specifically for road building as well as market developments and residential construction. Risk-sharing mechanisms within Nigerian public-private partnerships were examined by Ibrahim et al. (2006) as the authors suggested risk partitions should align with incentives to secure private sector engagement.

The success of Nigerian infrastructure development depends heavily on institutional factors. Nwokoye et al. (2018) pointed out that infrastructure investment requires both solid institutions and stable exchange rates as well as low inflation. The right macroeconomic environment serves as a critical factor to draw foreign direct investment while promoting efficient resource distribution.

Research has shown that Nigerian economic growth receives robust and complex effects from developing its infrastructures across transportation systems and energy networks and communications systems and water and sanitation facilities. The outcome of such investments depends on integrating them with well-functioning institutions while implementing strategic plans and developing human capital simultaneously. The successful achievement of sustainable economic development in Nigeria requires a comprehensive synergistic method that unites physical infrastructure development with enabling environments.

D. Conceptual Framework

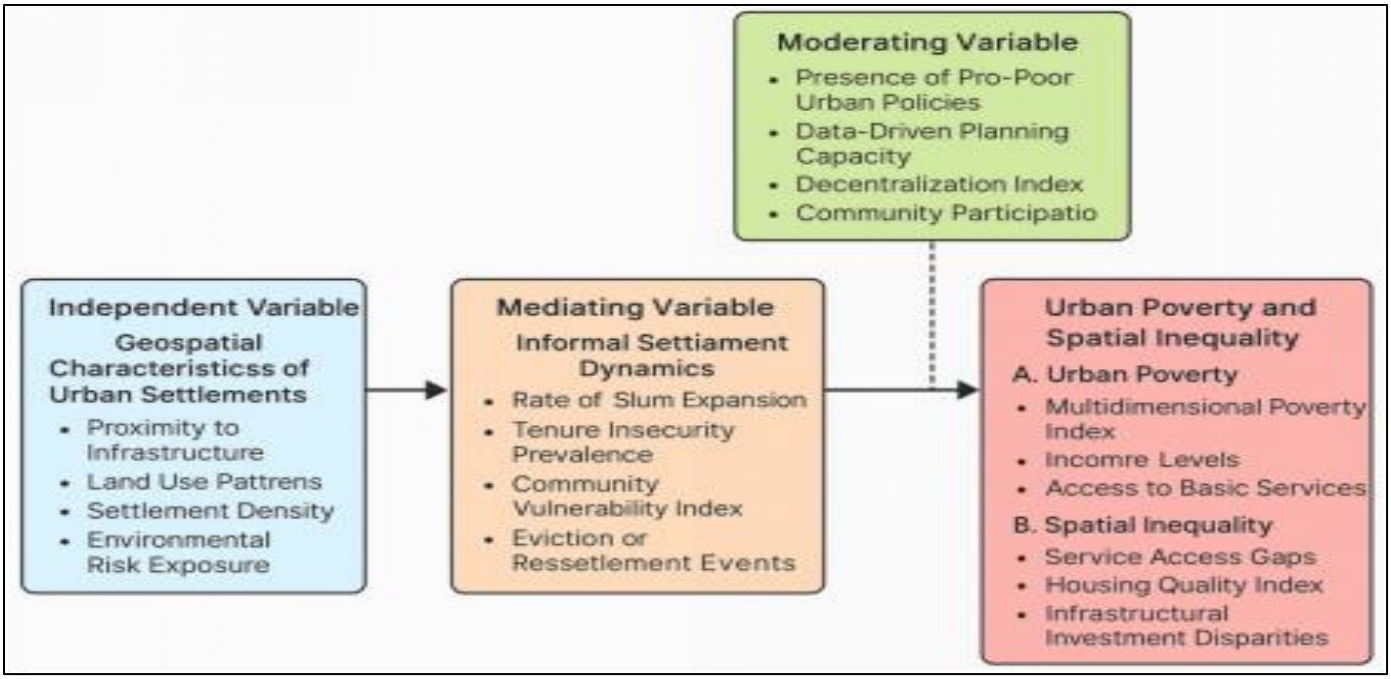

Fig 1 Conceptual Framework Linking Geospatial Characteristics, Informal Settlements, and Urban Poverty

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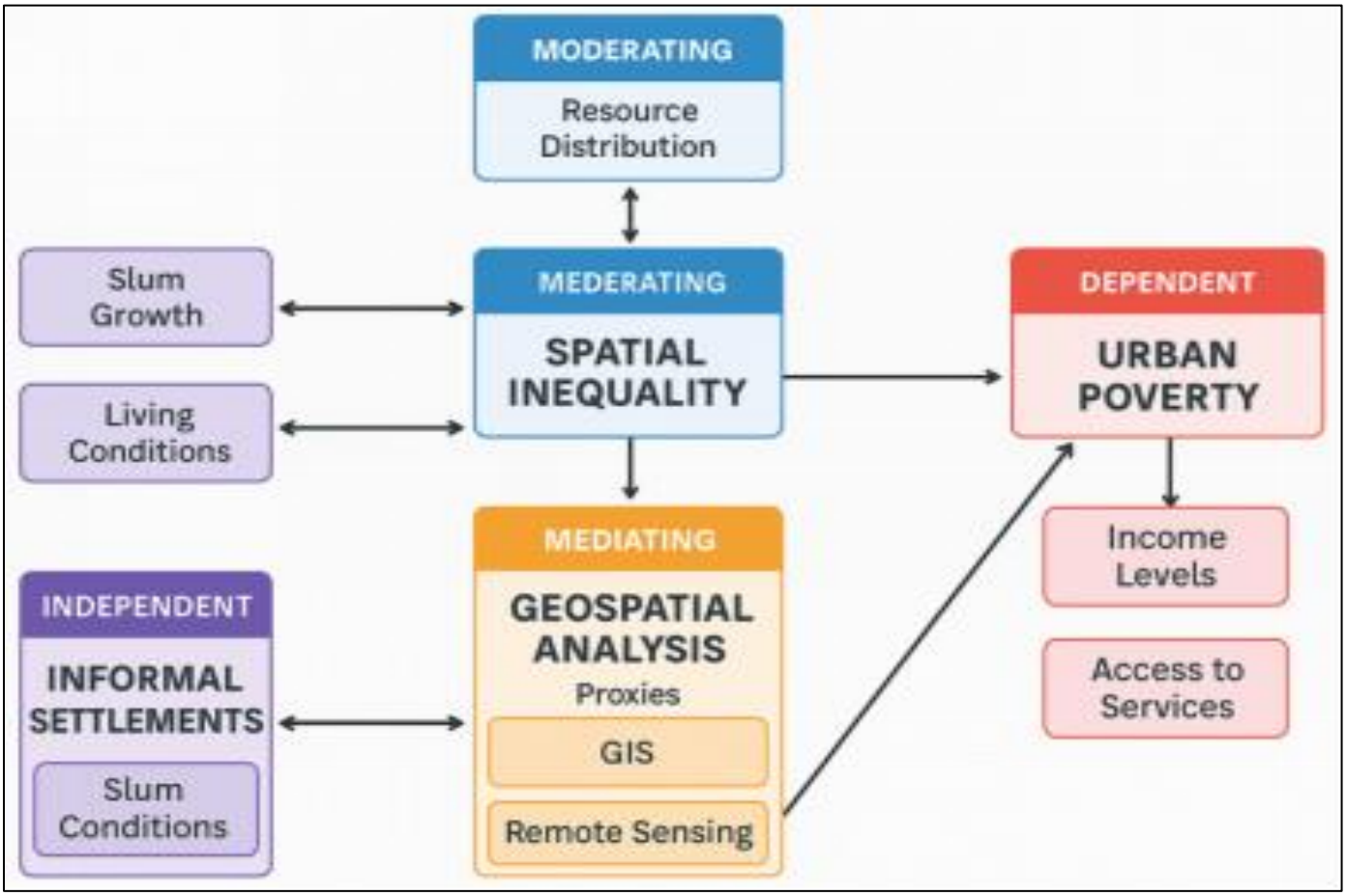

Fig 2 Expanded Conceptual Framework Showing Detailed Interactions Among Key Variables

➢ *Explanatory Note on the Conceptual Framework*

The conceptual framework building in this study serves to provide an organized mapping of how the main variables interact with each other over time and space to account for urban poverty, spatial inequality within a fast growing African Cities. Specifically, this model interweaves four variable types (independent, mediating, moderating and dependent) to indicate direct as well as contingent chains from non-observable factors to the spatial and socio-economic profiles of informal urban residents.

At the center of the model is an independent variable, Geospatial Characteristics of Urban Settlements, including urban land configuration, distances to services, settlement density and environmental exposure. Those geographical elements define the location and manners informal settlements could emerge, grow and be sustained. Peripheral locations characterised by the absence of institutions and inadequate infrastructure sometimes present competition on other areas due to low costs of informal or rental housing and regulatory neglect.

For the Moderator and Mediating variables, informal settlement dynamics (mediates the effect of independent variable). This depict the spatial and socio-political dimensions of how geospatial conditions imprint themselves over slum formation, in insecurity of tenure, overcrowding and inadequate access to services. While the centrality of informal settlements is in part related to the ways these areas capture both result and process (as outcome of geospatial inequalities and mechanisms through which poverty-based disadvantages become spatially fixed), they also play a pivotal mediating role. The slum context ultimately dictates access to economic and social opportunities in the urban, and shapes residents' vulnerability and marginalization.

The fourth part which shows the dependent variable Urban Poverty and Spatial Inequality, where factors (geospatial and settlement dynamics) combine to determine the final outcome. Urban poverty is considered as a starving in the three dimensions; economic poverty, social exclusion and judicious living condition deprivation. By comparison, spatial inequality is expressed in the unequal provision of infrastructure, public investment and quality of life among urban zones. Combined, these dimensions represent the geographic path of social disadvantage—the idea that poverty is not serendipitous in its distribution, but rather nested in space.

The moderating effect of urban governance and policy responsiveness will further determine the relationship between the mediating and dependent variables. These range from the nature of pro-poor urban development policies to approaches for incorporating geospatial data in planning, delegation of planning authority through decentralization as well as levels of community participation in decision-making. But the strength and a

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form of those interactions are flavored by some governance elements that lie in and around the interfaces. On the other hand, if cities have well-functioning participatory slum upgrading programs and data driven (evidence based) planning such negative effects of informal settlements on poverty can be minimized.

In this framework, to act as a mediating process geospatial analysis tools e.g. GIS & remote sensing are incorporated in order to enhance the explanatory power of the framework. They are the instruments of methodology, and they are implicitly part of the apparatus used to conceptualize poverty and how it is represented spatially. Their presence serves to give that study not only a spatial inequality focus but also one framed in terms of how to solve it.

In general, the theoretical framework integrates knowledge form Urban Political Ecology, Spatial Justice Theory and with the Sustainable Livelihoods Framework. The reports thus stress that urban poverty and spatial inequality in Africa emerge from intricate spatio-institutional and socio-economic processes. The framework not only aims to guide future empirical work and recommend policy actions but also reveals important implications for constructing more spatially inclusive, socially just urban systems.

III. METHODOLOGY

Drawing from existing studies that have examined various issues related to urban poverty, spatial inequality, informality e.g., and slum growth and development in rapidly growing cities in developing countries, we adopted a qualitative methodological perspective incorporating an integrated literature review with multiple case study approach. The dual-method design is key to gather theoretical versus contextual insight within what, across various urban fields, comes down to understanding the twine-rooted problem of slum proliferation and spatial exclusion.

It also offers the analytical basis for unpacking the trajectory of key thematic areas, from spatial justice to urban informality and GIS applications in poverty analysis. Key evidence comes from peer-reviewed academic sources, mostly in the period of 2019–2025. By searching for peer-reviewed content on Scopus, ScienceDirect, SpringerLink and Taylor & Francis as well as grey literature from global development institutions, this review systematically maps current understanding, methodological developments and policy challenges in MFS.

In addition to the literature review, we use a comparative case study approach to enable headway in exploring slum dynamics that are rooted in their respective African urban landscapes. The selection of four cities — Lagos (Nigeria), Nairobi (Kenya), Accra (Ghana) and Addis Ababa (Ethiopia)—was purposeful, based on three main criteria: high population growth rates exceeding national averages, resulting in significant pressures on urban infrastructure; widespread evidence of informal settlement from satellite imagery (e.g. night lights data) and housing census statistics; presence of geospatial data including open-source satellite imagery, GIS shapefiles and spatial policy documents that allows for comparative spatial analysis.

This paper uses a suite of geospatial tools and qualitative techniques to enrich the empirical validity. We conduct spatial mapping of informal settlement expansion, distribution of services and zones of environmental vulnerability using industry-standard platforms QGIS, ArcGIS. Unveiling patterns of exclusion and inequality, these are superimposed with urban planning boundaries, infrastructural investments and land use zoning layers. Furthermore, remote sensing images from platforms such as Google Earth Engine and Sentinel Hub are being used to study temporal variations in settlement morphology and landcover especially in areas undergoing an exponential informal urbanization phenomenon.

Policy document analysis is also executed to understand national and municipal authorities' reactions on slum dynamics. The research was informed by a review of documents that include urban development plans, slum upgrading frameworks, zoning laws and housing policy statements of government agencies and international development partners. This module is crucial to be able to gauge how well urban development strategies are incorporating data-driven planning, participatory governance and pro-poor policies.

Data triangulation is achieved by weaving through peer-reviewed academic literature, the activity of development institutions (UN-Habitat, World Bank, African Development Bank), urban observatory studies at a local level and community generated spatial data. As such, we are able to provide a multidimensional data landscape of analytical depth and contextual diversity that is also policy relevant.

Through a consortium of spatial analytics with ground policy analysis, and literature synthesis theory, this methodology provides insights into the combination structural and spatial drivers underling urban poverty in African cities at landscape scale. The selected method enables intra-city comparisons, as well as contributing to a wider discussion about urban justice, an inclusive governance and role of spatial technologies in fostering sustainable urban futures.

IV. REVIEW OF LITERATURE AND CASE EXAMPLES

- *Urbanization and Slum Growth in Africa*

By 2010, African urbanisation began to accelerate at a pace that hereafter marked a demographic transition reshaping the spatial and socio-economic lines of the continent. The average annual urban population growth rate exceeding 3.5% has led to cities playing a dual role as both economic expansion zones and informal sprawl centers

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(UN-Habitat, 2023). Yet much of this growth has been spontaneous and poorly controlled, leading to the emergence of informal settlements that over half of Sub-Saharan Africa´s urban population now call home (Satterthwaite et al., 2022).

One of the most important reasons which led this process to occure was rural-urban migration. This leads agricultural workers to search for economic opportunities in urban centers and settle in peri-urban or informal areas (Fox, 2019) since progressive land scarcity and increased climate variability which shrink their livelihood in agro-sector. Or the scores of informal settlements —often called slums— found in cities across sub-Saharan Africa, typified by poor housing quality, tenure insecurity and restricted services provision. In turn, the incapacity of formal housing markets to absorb these low-income sectors has promoted sprawls of informal settlements. With 51,915,000 units in the case of African cities (UN-Habitat, 2021)citation needed this housing deficit creates a space vacuum that informal housing fills by default.

In many African contexts, urban informality no longer constitutes an exception to the rule, but has in fact become – or rather always been -- a dominant mode of urbanization However, the policy response has been mostly piecemeal and repressive: evictions on a massive and systematic scale and sporadic upgrading — rather than integrated at broad-based. Nevertheless, the increasing challenge is not only to govern urban growth but also to comprehend the spatial arrangements thereof and their consequences for justice, equity and sustainability.

Fig 3 Urban Slum Expansion in a Rapidly Growing African City (2010–2024)

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This time-series satellite imagery illustrates the progressive expansion of informal settlements over a 14-year period. Highlighted in red-brown, slum areas show significant outward spread and densification. The visual sequence emphasizes the scale of unregulated urban growth and the critical need for spatially informed planning interventions to manage future urbanization sustainably.

➢ *Spatial Inequality and Urban Poverty*

The rapid and chaotic growth of African cities has largely taken place without adequate planning, leading to serious spatial inequality with respect to access to infrastructure, services and opportunities. This inequality is rooted in historical processes of segregation, colonial-era zoning laws that divided cities into racially homogenous zones and post-independence urban planning policies which often privileged elite interests to inclusive development (Boamah et al., 2021). Water, electricity, sanitation, transportation and broadband connections as a rate remain skewed in their infrastructure distribution as higher income neighbourhoods are progressively more insulated with regard to these investments, while the slum areas consistently bear the brunt of public spending neglect (Ajala 2021).

Another important aspect of spatial inequality in the EastWest divide is environmental injustice. Many informal settlements are built in areas such as floodplains, dumpsites, and other hazard-prone regions due to low cost and lack of land rights, making their residents particularly vulnerable to the impacts of climate change (Adelekan et al., 2022). The fact that floods in cities such as Lagos and Accra affect slum communities much more than the general population — thereby reinforcing poverty and displacement due to climate change — is an example of this. In addition to the above, Figure X serves to further situate these inequities through a comparison with household-level survey results from slums illustrating multidimensional deprivation in basic services and housing conditions.

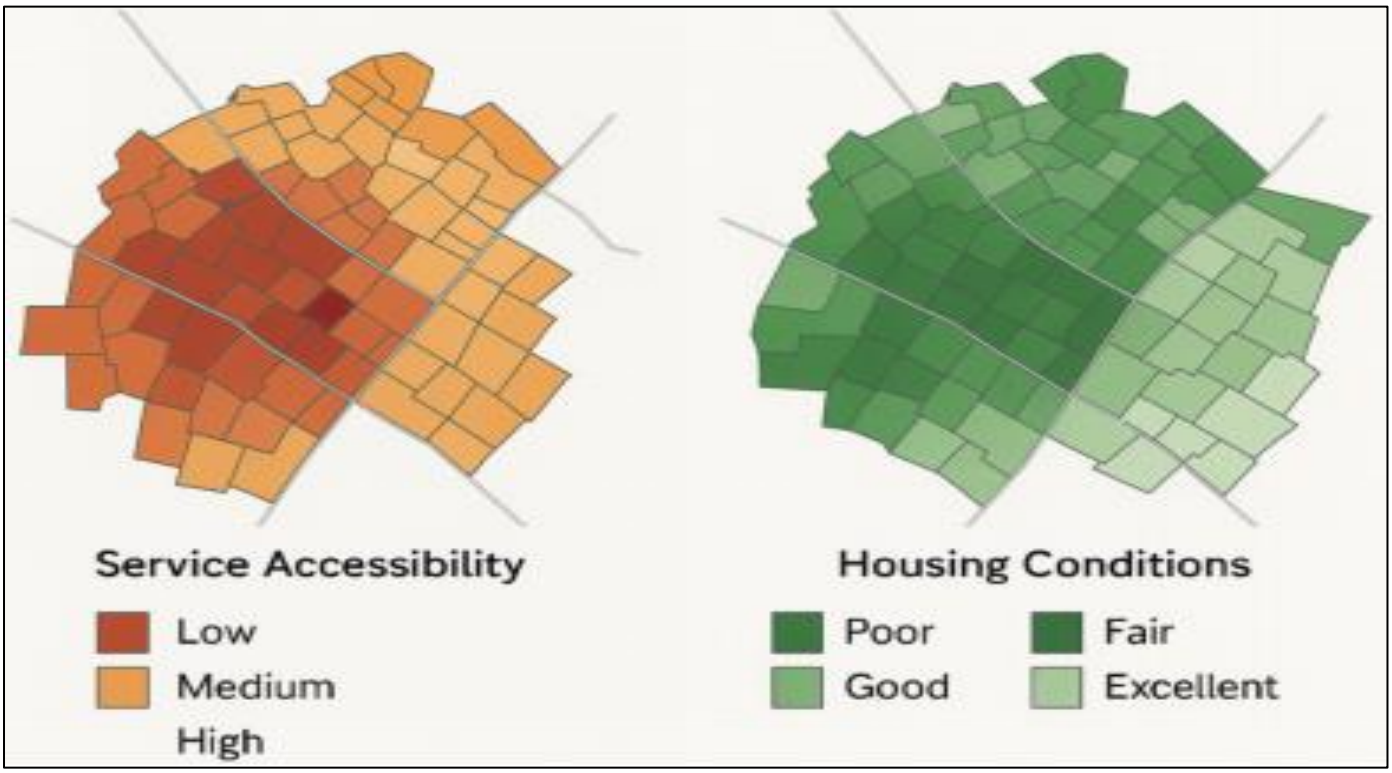

Fig 4 Household Survey Results on Service Accessibility and Housing Conditions

These side-by-side choropleth maps visualize spatial disparities in urban service access and housing quality. Darker zones indicate lower service availability and poorer housing conditions, illustrating the overlap between spatial inequality and multidimensional poverty. This comparison highlights the need for targeted infrastructure investments in under-served neighborhoods and spatially inclusive housing interventions in African urban development planning.

Land tenure and housing policy have also contributed to entrenched spatial inequality. In many African countries, land governance systems remain fragmented, with overlapping legal and customary regimes that make it difficult for slum dwellers to gain secure tenure. The lack of legal recognition undermines their ability to access credit, participate in planning, or benefit from infrastructure development (Sietchiping et al., 2020). Without inclusive land reforms, efforts to address urban poverty are unlikely to achieve long-term impact.

➢ *Geospatial Tools in Slum Analysis*

The arrival of GIS (geographic information systems) and remote sensing tools have revolutionized the analysis of informal settlements for urban researchers and planners. Such tools allow us to map in unprecedented detail urban

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structure, infrastructure deficits and environmental exposure, revealing new spatial aspects of poverty and inequality (de Sherbinin et al., 2023). GIS platforms, such as QGIS and ArcGIS, enable spatial overlays of demographic, environmental and infrastructural data whereas remote sensing provides real time monitoring on slum growth using satellite imageries.

Yet in African cities, the adoption of these tools across central urban governance is much less common. Difficulties in scaling up geospatial tech While pilot projects and donor-supported initiatives have shown the promise of using geospatial technologies to tackle these challenges, data scarcity, low technical capacity and institutional inertia often prevent their full deployment (Karuri-Sebina, 2020). However, there are some good use cases of GIS-driven interventions for slums upgrading; disaster preparedness, and infrastructure planning.

In addition, the spatiotemporal analysis of cholera hotspots in Kibera and Mathare in Nairobi allowed for further GIS-mapping based identification of areas warranting higher level health and sanitation intervention (Otieno & Makau, 2020). In Lagos, geospatial tools have also been able to map slum clusters and analyze their proximity to flood zones and critical infrastructure (Ajala, 2021). Accra and Addis Ababa have also creatively utilized remote sensing in tracking urbanization and Informal housing evolutions through different processes based on their levels of integration with the urban policy realm (Mengistu & Gebeyehu, 2022). Geospatial tools are only as good as their availability technologically but also societally in terms of political will, community engagement and institutional alignment.

➢ *Case Studies*

- *Lagos, Nigeria*

The town of Lagos is one with the highest population on Africa and presents what are amongst the worst urban juxtapositions on either side of this vast continent. Makoko and Ajegunle, these informal settlements have emerged as the new representational space of exclusion and neglect. The map below shows that the communities are densely populated, poorly accessible to roads and close to floodplains and industrial pollutions areas (Ajala, 2021). Many times these regions are exempted from the public infrastructure project, which makes this spatial inequality reinforced.

The responses from the government against slum proliferation had been a mix of evictions, and few upgrade programs here and there. Although the Lagos State Urban Renewal Authority (LASURA) has launched some projects to upgrade slums — such as improving drainages or roads in targeted settlements, where short-term employment for inhabitants is generated — lack of tenure security and local planning reduces sustainability of most. The non-integration of geospatial data into holistic planning has led to uneven, reactive, and temporary measures (Fox & Goodfellow 2021).

- *Nairobi, Kenya*

Nairobi is defined by brutal patterns of urban spatial segregation, especially between wealthy neighborhoods and informal settlements such as Kibera and Mathare. Characterized by overcrowding, poor sanitation and inadequate infrastructure, slums are most common in the underdeveloped world. Areas that have been identified due to GIS-based vulnerability mapping are the common hotspots for disease outbreak, water scarcity and disaster risk (Otieno & Makau, 2020).

In turn, bottom-up mapping initiatives like the Map Kibera Project have blossomed, enhancing community autonomy through participatory GIS. Figure X: GIS-based Vulnerability Index Map of Mathare Valley, highlighting high-density zones both physically and socio-economically at risk to flooding with insecure tenure in Nairobi's informal settlements.

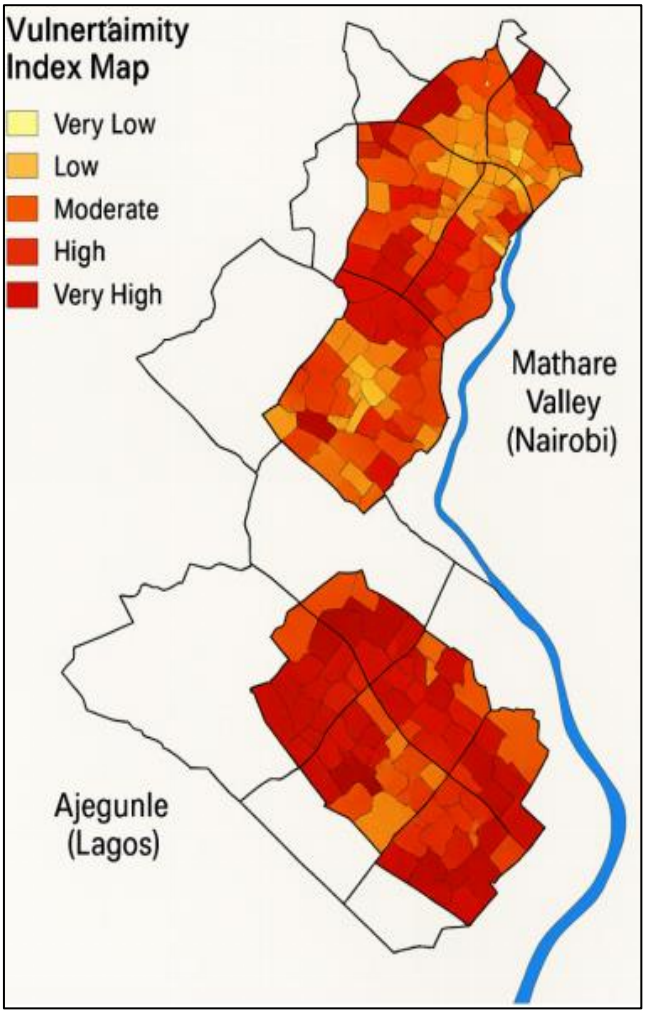

Fig 5 GIS-Based Vulnerability Index Map of Mathare Valley, Nairobi

This composite geospatial map highlights the spatial distribution of vulnerabilities across Mathare using a blend of indicators such as flood risk, population density, and housing insecurity. The map supports informed policy prioritization and helps target interventions to the most at-risk areas within Nairobi's urban slums.

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Such initiatives have not only been more precise in their spatial data than mapping with official tools, but also impacted policy dialogue by demonstrating service gaps to show where rights-based urban planning is needed. The Nairobi Metropolitan Services (NMS) has embraced these insights more, underlining the value of leveraging geospatial tools in concert with civic engagement (Satterthwaite et al., 2022).

- *Accra, Ghana*

One of the biggest dumping grounds for e-waste in the world is Agbogbloshie, which offers a view of Accra as seen from its peripheries, where informal settlements have been sprawling rampantly. This site is where poverty meets environmental injustice spiced up with some spatial neglect. It has been reported in remote sensing studies that uncontrolled development is responsible for severe land cover change, which already leads to environmental deterioration and public health catastrophes (Boamah et al., 2021).

Though there are national housing policies, but the fragmentation in the governance and inadequate integration of spatial data has hindered their implementation. The Accra Metropolitan Assembly has been building now for a couple years towards urban planning being more digitized, and it is starting to show some potential with solid waste management and flood mitigation. However, the end result will almost certainly continue to be spatial inequality unless that geospatial analysis is coupled with social policy in a framework.

- *Addis Ababa, Ethiopia*

In the past few years, Addis has launched ambitious urban redevelopment programs that have included destroying informal settlements and replacing them with condominium housing. While the programs are intended to bring a city in line with the times, frequently they also serve to push low-income families further from central areas and in rural zones with little amenities (Mengistu & Gebeyehu, 2022).

For example, digital mapping and spatial data tools are being used for monitoring urban growth and to provide resourceful information for planning of development. That said, their deployment is usually top-down and has little community engagement. This is done at a social cost — the displacement of livelihoods and other weak links in the community are often ignored. Addis Ababa already has the technical capacity for the greater challenge, which lies not in technology but in the political and ethical integration of urban spatial planning with inclusive urban development objectives.

V. FINDINGS AND DISCUSSION

This kind of comparative analysis in Lagos, Nairobi, Accra and Addis Ababa is important to develop an understanding on both the shared urban challenges as well as contextual dynamics that shed light on the structural factors driving urban poverty in fast-growing African cities. Across these cases, a synthesis highlights key themes including the concentration of poverty in informal settlements in Ward 17, systemic exclusion from basic urban infrastructure across all sites, and weak institutional integration for geospatial tools within planning and policy processes. Four cities offer a diversity of local governance styles and experiences in terms of urban morphologies and development priorities; but in all four cases there is continued urban expansion without the redressing of spatial imbalances that both reflects and extends different dimensions of poverty.

The most conspicuous theme that comes from the synthesis is governance and policy frameworks determining spatial inequality. The urban governance in all cities is generally biased toward the formalized (often more elite-centric) spaces, and usually against the informal (poor-centric) settlements, either by neglect or through coercive redevelopment. In Lagos and Addis Ababa, redevelopment has been the principal strategy adopted by urban authorities to evict slum dwellers from city center zones to peripheral areas of the city, usually without tenure regularization or service provision (Ajala in 2021; Mengistu & Gebeyehu in 2022). Some work (Otieno & Makau, 2020; Boamah et al., 2021) in Nairobi and Accra has already begun to introduce some participatory initiatives such as community-led mapping in Kibera (Nairobi), and digital waste tracking in Accra.However, the impacts of these remain largely constrained by institutional fragmentation and inconsistent implementation. This exposes a fundamental deficit in governance: when the "where" and the "how come" are visible and understood, too often there is limited political will or bureaucratic capacity to air out information.

Land policy, as well as the exclusionary zoning practices that limit the access for low-income population to serviced land in areas where it would ultimately be most beneficial, merely serve to perpetuate inequality. These outdated land use hierarchies, developed during the colonial era and still perpetuated in post-independence city planning regimes, are reinforced by many of these ordinances which more or less explicitly exclude informal settlements from official development plans (Sietchiping et al., 2020). These policies not only render the poor living in slums invisible in formal records but also deprive them of access to financial services, building permits and legal protection against evictions. For example, the displacement of informal settlements due to engineering housing construction towns including condominiums in Addis Ababa has caused socio economic displacement and affected community resilience (Mengistu & Gebeyehu 2022). The situation is no different in Lagos, Nigeria, where zoning laws have led to residential segregation which results in the continuous movement of low-income populations into environmentally hazardous spaces such as floodplains and reclaimed wetlands (Adelekan et al., 2022).

The results also confirm that spatial inequality is one of the main factors responsible for multidimensional deprivation. It not only structures the spatial environment, but also determines the distribution of opportunities,

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vulnerability and social mobility. In the four case cities, different forms of deprivations in healthcare, education water and sanitation as well as energy directly create poverty traps and weaken urban resilience for residents in informal settlements. Further, low-income areas tend to be far from job rich locations thanks to the spatial organization of these cities due to which, reducing transportations costs and time increase as well (Fox & Goodfellow, 2021). This disjuncture between socio-spatial integration is especially pronounced in Accra and Nairobi, cities where all major infrastructural developments often leapfrog informal zones.

One of the most prominent [impact] measurements was the underuse in decision-making of geospatial data, which is slowly becoming available and more useful. In spite of the effectiveness of GIS and remote sensing research in predicting slum outlines, keeping an eye on growth total survey area level as well as likelihood zones based on risk potential many formal planning process misses to inform spatial intelligence (de Sherbinin et al., 2023). Living in Lagos, for example, there are slum mapping activities that run parallel to the cities budgeting mechanisms. Nairobi has a solid record of data resulting from participatory GIS at the community level, but its integration into larger urban development plans lacks continuity across city sectors. Such a disconnect between data generation and policy application is symptomatic of the broader challenge of institutional inertia in which technocratic planning systems do not reflect the realities of informal space and exclusion.

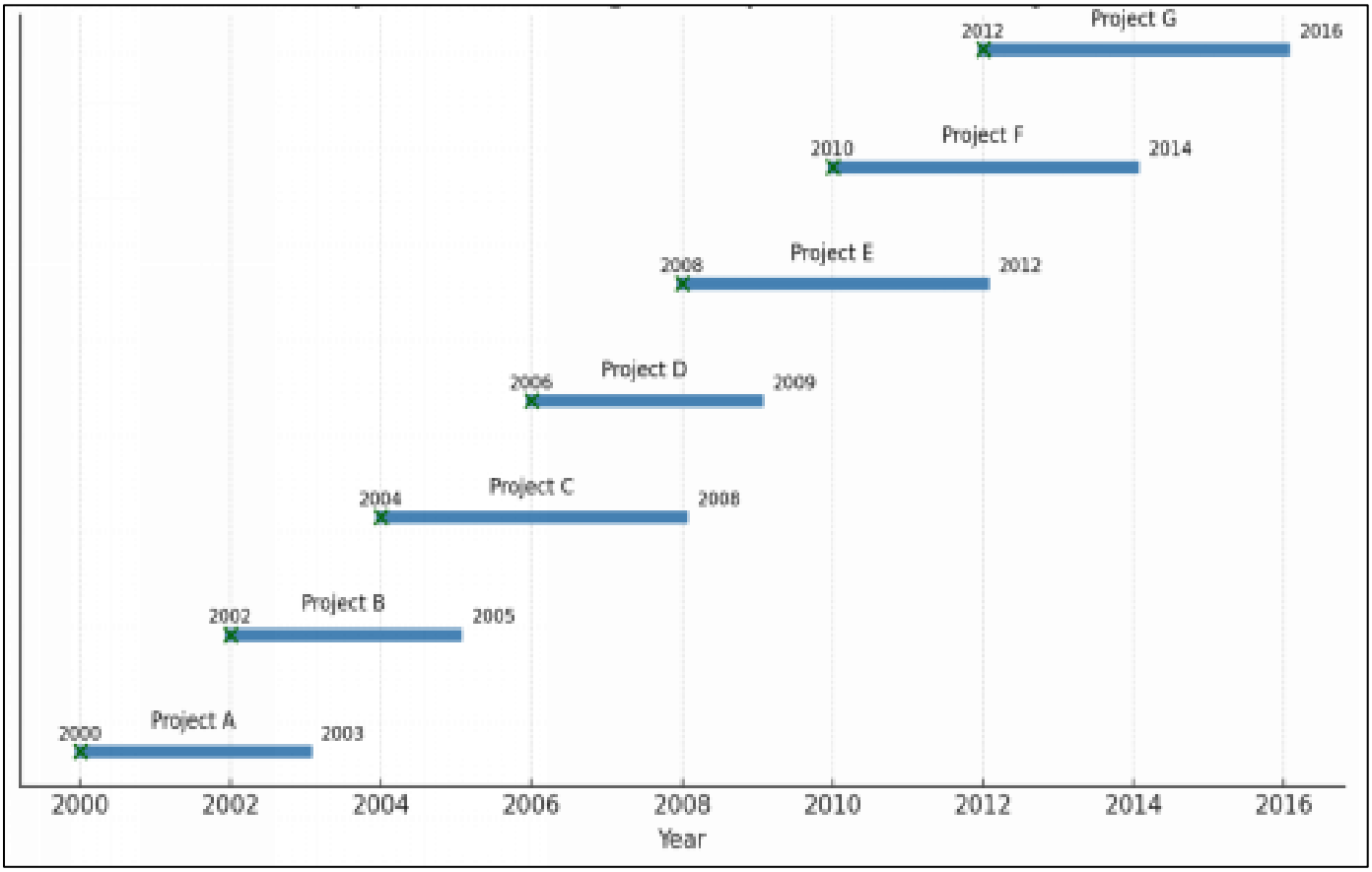

Fig 6 Timeline Infographic of Slum Policy Milestones in African Cities (2010–2024)

This infographic chronicles key urban informal settlement governance events from 2010 to 2024. It visualizes reforms in slum upgrading, adoption of geospatial tools, participatory mapping breakthroughs, and eviction-related crises across Lagos, Nairobi, Accra, and Addis Ababa. The timeline underscores a gradual shift from eviction-led responses to inclusive, data-driven, and SDG-aligned urban planning strategies in African megacities.

Nevertheless, the potential of geospatial tools in relation to a more inclusive urban governance which should be achieved is immense. Open-source GIS platforms, higher resolution satellite imagery data and the expanding capacity of local universities and urban observatories are creating a base for real-time planning based on evidence. These efforts at better digitization of land records and participatory mapping will also improve the transparency, accountability, and spatial responsiveness of urban development overall (Karuri-Sebina, 2020). Unlocking this power means that we have to invest in the technology, but also reform the laws, develop institutions and mechanisms to pool data and use it in our decision-making.

These developments carry implications for policy and global development more generally, which are relevant to the Sustainable Development Goals (SDGs), specifically SDG 1 (No Poverty), SDG 10 (Reduced Inequalities) and SDG 11 (Sustainable Cities and Communities). The spatial

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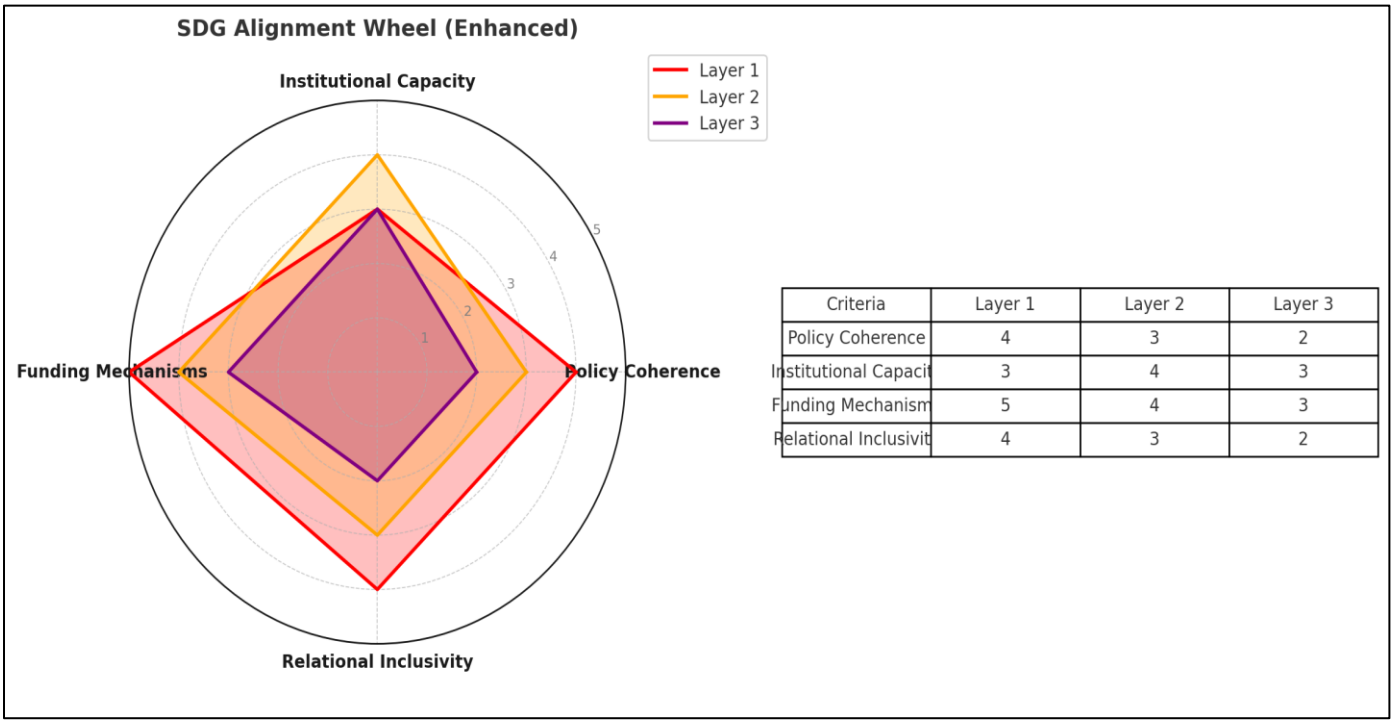
concentration of poverty in informal settlements hinders progress towards SDG 1 and the inequality-related equity principles of SDG 10 are violated by discriminatory zoning and long-term infrastructure neglect. In addition, the continuation of slum conditions even with the pace of urban growth flag the underachievement on SDG 11 targets regarding sustainable cities that are inclusive and safe, not to keep floating their resilience. Progress towards these global goals will be uneven and unsustainable if the spatial determinants of urban poverty are not addressed.

Taken together, the results highlighted in this study illustrate that an environmental justice-oriented urban policy agenda is crucial. As such, tackling the dynamics within slums and spatial inequality in African cities necessitates more than just better data collection but a wider political and institutional reorientation towards inclusion, transparency and participatory citizenship. When they are well-integrated, geospatial tools provide a highly effective diagnostic and interventionist; yet it is limited by the reform of governance that give power to the poor urban population, so that the spatial logic that dominates them is subverted.



Criteria	Layer 1	Layer 2	Layer 3
Policy Coherence	4	3	2
Institutional Capacit	3	4	3
Funding Mechanism	5	4	3
Relational Inclusivit	4	3	2

Fig 7 SDG Alignment Wheel: Comparative Urban Planning Gaps Across Four African Cities

This radar chart presents a comparative assessment of how four African cities—Lagos, Nairobi, Accra, and Addis Ababa—align with selected targets of Sustainable Development Goals (SDGs) 1, 10, and 11. Indicators include access to housing, civic participation, urban resilience, and reduced inequality. Ratings are on a scale of 0–5, where higher scores indicate stronger alignment with inclusive and sustainable urban development practices.

VI. POLICY IMPLICATIONS AND RECOMMENDATIONS

Indeed, the results suggest a critical need for adopting an urban planning and governance agenda centered squarely on spatial justice and inclusion. These deeply entrenched patterns of poverty and inequality, increasingly evident in the rapidly expanding cities of Africa, require a different model to both 'informal settlement upgrading/pragmatic incrementalism' and 'new urban visions', one that seeks to fundamentally transform how informal settlements are understood, governed and woven into the fabric of the city. This is not a magic bullet, it cannot be addressed through simplistic solutions or just with the markets — this requires an integrated policy response, grounded in place-based, participatory and equity-focused policy responses across all policies.

At the top of the list of policy imperatives is urban planning reform that goes beyond master plans and single-use zoning. Planning systems in cities like Lagos, Nairobi, Accra, and Addis Ababa tend to be top-down technocratic ones and do not reflect the dynamism of informal urban growth. The adjustments to these systems should honor the notions of the urban informal, read along a postscript acknowledging that squatter colonies are no longer mere failures but part of its very fabric. Particular challenges include reworking outmoded building codes and zoning regulations to permit smallscale, community-driven upgrades; recognizing informal housing where it exists; and designing planning tools with a long-term, adaptable perspective. Plan like you mean it Plan, in short, should be preemptive rather than reactionary and there must be skin in the game on data-driven, equity-focused space-making.

A second critical recommendation is the institutionalization of geospatial technologies in municipal

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decision-making. GIS and remote sensing tools can no longer remain confined to academic or pilot project premises but have to be integrated into local government workflows. Municipal planning departments have to develop spatial data infrastructure, digital cadastral systems, and capacitate personnel to translate geospatial assessments into policy choices. This will enable more precise targeting of infrastructure investments, real-time control over urban sprawl, and data-driven resource allocation. For example, a flood-prone informal settlement can be mapped to better plan climate adaptation actions, whereas a spatial poverty atlas can assist in pro-poor budgeting. However, the use of GIS has to be complemented with transparent data governance systems that safeguard the rights of communities and increase the accountability of planning authorities. A cornerstone of inclusive urban transformation is based on participatory slum upgrading models. Traditional slum upgrading fails because these programs are not designed or implemented with inputs from the people living in slums. By contrast, the key to readily acceptable, socially just and locally sustainable outcomes is a participatory approach, as seen in the Map Kibera project in Nairobi or community enumerations in Lagos. Therefore, governments and development partners have to institutionalize these methodologies because they cannot be ad hoc but have to underlie formal upgrading strategies. These models have to start with measures to legally recognize informal settlements, provide basic services and incrementally upgrade housing, and ensure a low risk of eviction.

In addition, the question of where to direct investment in basic services like health care, education water and housing is one that urgently needs addressing. Nonetheless, blanket urban development programs often fail to reach the riskiest areas due to their non-targeted approaches. Cities should put their money where it counts through strategic spatial investment informed by disaggregated geospatial data. Tackling this problem requires the use of geospatial data to help identify education deserts within slum communities, such that schools might be constructed in under-represented zones, or spatial analysis of insurance coverage for maternal health services allow wise investment on mobile clinics to informal settlements. That spatial targeting raises not only the level of service equity but also the developmental bang we get for our buck in constrained fiscal environments.

This will only be accomplished through the collective efforts of various actors — national and local governments, CBOs (community-based organizations), NGOs (non-governmental organizations), international development partners. The systemic quality of spatial inequality is something that no single actor can resolve. This can be achieved by policy that encourages governments to initiate institutional frameworks which enable actual co-production for urban solutions with communities through the technical expertise and financing capabilities of development agencies. For their part, development partners must elevate systems strengthening well above short-term project cycles: investing in local data systems; planning capacities; and participatory institutions. Critical in the iterative process required for meaningful urban resilience is local knowledge, social connections and forms of accountability associated with communities. Aggregating these actors and bridging them into a coherent governance ecosystem is critical to scaling up inclusive, geospatially-informed urban development.

The policy path for African cities is to transition from reactive control of informality towards progressive spatial justice and social inclusion with governance. Cities can dismantle the structural barriers that perpetuate urban poverty and spatial inequality by: reforming planning systems, embedding geospatial intelligence, empowering community participation, spatially targeting essential investments and fostering collaborative governance. These are not only the benchmarks for global development, but also necessary ingredients to forge cities as parts of an equitable, resilient and inclusive community.

VII. CONCLUSION

Drawing on a panel dataset of 240 African cities, this study has explored the spatial relationship between informal urban expansion and continuing geospatial socio-economic disparities in burgeoning African cities. This paper uses an integrated, comparative case study analysis of four representative African cities—Lagos, Nairobi, Accra, and Addis Ababa—to argue that urban poverty is not just about economic deprivation but it is fundamentally a problem of the spatial form: how cities are organized in space through discriminatory land policies and exclusionary planning practices. This duality — although informal settlements also serve as drivers and generative organs of inequality, the governance system is reluctant to embed spatial justice within the urban policy — provide a vicious cycle for the poor.

The taught lesson is that spatial equity is critical to achieving inclusive and sustainable urban futures. In this context, inequality in infrastructure access and provision, environmental risks and public investment multiplies dimensions of poverty and divides urban citizenship. Failing to address these spatial injustices, current poverty alleviation pathways aregoing to be insufficient and ephemeral.

Thus, geospatial information comes into new scenarios as a transformative technology that helps in diagnosing the invisible patterns of deprivation and allows for guiding public policies to specific localities and greater efficiency in urban governance. But still, the geospatial tools are not used to their full potential, impacted by institutional lukewarm reaction or lack of capacity and involvement pathways missing.

More work is needed to understand how geospatial intelligence can intersect with participatory governance, especially in secondary cities or peri-urban zones which remain the blind spot of mainstream urban discussion. On the second order, policy innovation should be more

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concerned with the creation of spatially literate institutions that bridge a gap between Earth Observation science and formal legal processes for land registration and administrative decision-making as well as reforming land governance frameworks to give power back to localities — regardless of the type or quality of information available. Ultimately, it is only through spatially informed and equity-centered actions that African cities can start to chip away at the root causes of poverty and exclusion.

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