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Navigating Urban Sprawl and Green Space Loss:
Strategic Approaches for Sustainable Development in Nairobi

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Abstract

Urban sprawl poses a significant threat to green spaces in rapidly expanding cities like Nairobi, Kenya, undermining both environmental sustainability and social equity. This paper explores the dynamics of green space degradation, using Kahawa West Community Park as a case study to inform targeted interventions. The study aimed to identify the key factors driving park degradation, assess community usage and perceptions, evaluate the effectiveness of current management strategies, and propose sustainable development strategies. Using a mixed-methods approach, data was gathered through surveys (n=338), interviews with key informants, and field observations. The results revealed severe park decline: 68% of respondents rated cleanliness as poor or very poor, citing waste accumulation and lack of sanitation, while 62% reported significant biodiversity loss due to habitat fragmentation. Infrastructure was also in poor condition, with 70% of respondents identifying inadequate facilities. Despite these challenges, only 25% of residents visited the park regularly, with safety concerns and a lack of recreational amenities cited as major barriers. The study highlights the failure of management, as evidenced by low ratings of coordination and responsiveness, and identifies funding shortages (75%) and encroachment (80%) as significant challenges. Findings emphasize the need for policies that protect urban green spaces, with recommendations focused on collaborative governance, sustainable financing, and targeted interventions to address the consequences of sprawl. This research contributes to the ongoing discourse on sustainable urbanism, offering practical insights for policymakers in Nairobi and other rapidly growing cities.

Keywords: Urban sprawl, green space degradation, Nairobi, sustainable development, community perceptions, management practices, biodiversity loss, policy reforms, collaborative governance, peri-urban planning

INTRODUCTION

Urbanization is a key driver of economic growth, technological innovation, and cultural development, making cities central to national progress (United Nations, 2018; World Bank, 2020). However, rapid urban expansion also leads to significant environmental challenges, especially in developing countries where urban sprawl outpaces planning efforts. The uncontrolled spread of cities fragments ecosystems, reduces green space, and compromises urban resilience (Kabisch et al., 2015; Haaland & van den Bosch, 2015). Urban Green Spaces (UGS) play a crucial role in enhancing city resilience by providing essential ecosystem services, including air purification, stormwater management, carbon sequestration, and biodiversity support (Wolch et al., 2014; Jennings & Bamkole, 2019). Additionally, UGS contribute to social well-being by offering recreational spaces that reduce stress and promote physical activity.

In Nairobi, Kenya's capital and a major economic hub in Africa, urban sprawl has significantly altered the landscape, particularly in peri-urban areas like Kahawa West. The expansion of infrastructure and housing along major roads, such as the Thika Superhighway, has resulted in the loss of 22% of Kahawa West's green cover from 2012 to 2018 (Badiane, 2021; Makworo & Mireri, 2011). These changes have not only undermined the ecological value of the area but also limited access to green spaces for low-income communities, exacerbating social and health inequalities (Gwaambuka et al., 2023). With UGS coverage falling below 10%

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in many areas, Nairobi faces a pressing need to address these issues through more sustainable urban planning strategies (Kasuku et al., 2022; Omollo, 2021).

This paper examines the state of green spaces in Nairobi, focusing on Kahawa West Community Park as a microcosm of broader urban challenges. The park, once a vibrant recreational area, has suffered from poor management, encroachment, and inadequate infrastructure. These issues are representative of a larger trend in many cities of the Global South, where urban sprawl leads to the degradation of public spaces (Fuwape & Onyekwelu, 2011; Oduwaye, 2013). Through this case study, the paper aims to explore the factors driving green space degradation, assess community engagement, and propose strategies for the sustainable management of UGS.

Research Rationale and Gap

While much of the existing literature on urban green space focuses on cities in the Global North, there is limited research on the specific challenges faced by cities in the Global South, particularly those in sub-Saharan Africa (Rogers et al., 2020; Gwaambuka et al., 2023). Nairobi, as one of the fastest-growing cities in the region, presents a unique opportunity to study how urban sprawl impacts green space management and the associated social, ecological, and economic consequences. Previous studies have highlighted the importance of UGS in promoting urban sustainability but have not sufficiently addressed how the rapid urbanization seen in African cities leads to the fragmentation and loss of these vital spaces (Geneletti & Zardo, 2016; Kabisch et al., 2016). This study aims to fill this gap by focusing on the local-scale impacts of sprawl on UGS in Nairobi, particularly the degradation of Kahawa West Community Park.

Objectives and Research Questions

The primary aim of this research is to examine the degradation of green spaces in Nairobi due to urban sprawl, using Kahawa West Community Park as a case study. The study seeks to achieve the following objectives:

i. To identify the key factors contributing to the degradation of Kahawa West Community Park.
ii. To assess community usage patterns and perceptions of accessibility, safety, and recreational needs.
iii. To evaluate the effectiveness of current management practices in maintaining the park's ecological and social functions.
iv. To propose sustainable strategies for the protection and enhancement of UGS in Nairobi.

The research is guided by the following questions:

i. What are the primary drivers of degradation in urban green spaces like Kahawa West amidst sprawl pressures?
ii. How do residents use and perceive these spaces, and what barriers affect equitable access?
iii. How effective are current management practices in addressing the needs of both the environment and the community?
iv. What strategies can be implemented to mitigate the effects of urban sprawl and promote sustainable green space management?

Significance and Structure

This paper contributes to the growing body of research on urban sustainability and green space management in African cities. By focusing on Kahawa West, it provides empirical evidence on the impact of sprawl on local green spaces, which can inform urban planning policies aimed at mitigating the negative effects of rapid urbanization. The paper is structured as follows: the next section reviews the relevant literature on urban sprawl, green space management, and theoretical frameworks, followed by a detailed explanation of the research methodology. The results are then presented and discussed, with a focus on their implications for theory and practice in Nairobi. Finally, the paper concludes with recommendations for policy and practice, aiming to improve the sustainability of urban green spaces in the face of ongoing urban expansion.

THEORY

The conceptual framework for this study integrates urbanization pressures—such as sprawl and urban policies—as independent variables, management interventions like governance and funding as moderators, and UGS outcomes (e.g., sustainability) as dependent variables. This framework posits that a multitargeted approach to urban planning and management can mitigate the challenges posed by rapid urbanization in Nairobi.

Definitions and Classifications of Urban Green Spaces (UGS)

Urban Green Spaces (UGS) are defined as vegetated areas that combine natural, semi-natural, and built elements to provide ecological, recreational, aesthetic, and social functions (WHO, 2017; Kabisch et al., 2015; Haaland & van den Bosch, 2015). Functionally, UGS include recreational spaces like neighborhood parks, ecological corridors such as greenways, and productive spaces like urban farms. In Nairobi, parks like Kahawa West primarily serve recreational purposes, while urban forests like Karura contribute to biodiversity preservation. Riparian greenways, though connecting urban areas, are often fragmented by development pressures (Makworo & Mireri, 2011; Gwaambuka et al., 2023). UGS can be classified as public, semi-public, or private, with public spaces dominating Kenyan policy (Republic of Kenya, 2018).

Since the 1970s, Nairobi's green cover has significantly declined. Despite plans like the Nairobi Integrated Urban Development Master Plan (NIUPLAN) allocating 20–30% for green space, actual coverage is less than 10%, with Kahawa West experiencing a 20%+ loss due to encroachment (Omollo, 2021; Kasuku et al., 2022). GIS mapping of Nairobi reveals that green cover, which was dense in the 1990s, has been increasingly fragmented, particularly along the Thika Superhighway (Kasuku, 2024b). The quality of these spaces has also deteriorated, with overgrown vegetation, poor sanitation, declining biodiversity, and waste accumulation (Darkhani et al., 2019). Similar trends are observed in other African cities like Lagos and Accra, where UGS coverage has fallen below the WHO's recommended 9 m^2 per person due to rapid population growth (Oduwaye, 2013; Mensah, 2014). These challenges necessitate tropical adaptations, advocating for a more substantial UGS allocation to support livelihoods in informal urban areas (Yusof, 2012; Gomes & Moretto, 2011).

Benefits and Values of UGS

UGS offer a broad range of benefits: ecological (e.g., air purification, flood prevention, carbon sequestration), social (e.g., improved well-being, social cohesion through exercise and socialization), and economic (e.g., enhanced property values, health savings, tourism) (Kabisch et al., 2015; Tzoulas et al., 2007). In Nairobi, UGS like parks also serve as vital environmental buffers, helping mitigate air pollution and supporting endemic species (Terfa et al., 2020; Makworo & Mireri, 2011; Sikorska et al., 2020). Socially, proximity to green spaces has been linked to lower rates of mental disorders (Twohig-Bennett & Jones, 2018; Wolch et al., 2014). In Kahawa West, parks provide equity for low-income residents, despite ongoing degradation (Gwaambuka et al., 2023; Jennings & Bamkole, 2019; Makworo, 2011; Mwanzu et al., 2023). Economically, UGS help buffer climate vulnerabilities in cost-effective ways, while their undervaluation increases the risk of conversion into built-up areas (Haaland & van den Bosch, 2015). There is an urgent need for monetized models to reflect their value in urban development (Kabisch et al., 2016; Kasuku, 2024a; Omollo, 2021).

Policies, Institutions, and Legal Frameworks

Kenya's regulatory frameworks, such as the Environmental Management and Coordination Act (EMCA, 1999/2015), play a crucial role in UGS maintenance through zoning and environmental assessments. Additionally, the National Environment Policy (2013) and Climate Change Act (2016) advocate for integrating green infrastructure in line with SDGs (Kathambi, 2023). Local regulations mandate the inclusion of 10–15% open spaces in new developments (Nairobi County Government, 2020). However, enforcement remains weak due to resource limitations and institutional overlaps, particularly between NEMA and county governments (Okech & Nyadera, 2022; Omollo, 2021; Kasuku et al., 2022). The Nairobi Integrated Urban Development Master Plan (NIUPLAN) envisions green corridors and parks to combat sprawl, but monitoring lapses have allowed encroachments to persist (Republic of Kenya, 2014; Mwaura & Odera, 2021). Informal settlements and land grabs often evade penalties, further undermining green space preservation (Amoako & Korboe, 2011). These challenges highlight the need for better inter-agency coordination and greater community engagement to establish robust governance structures (Gwaambuka et al., 2023; Mensah, 2016; Darkhani et al., 2019).

Management Practices and Challenges

Effective UGS management requires participatory planning, monitoring, and adaptation. Globally, community stewardship plays a key role in

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fostering ownership and sustainable management (Neal & Community First Partnership, 2016; Kabisch et al., 2016). Digital tools and GIS can support UGS monitoring, while partnerships can enhance financial flexibility (Lindholst et al., 2017). The challenges in UGS management are primarily due to funding shortages, which lead to reactive rather than proactive maintenance (Mensah, 2014; Okpala, 2009; Amoako & Korboe, 2011; Seto et al., 2012). Encroachment from both speculative development and growing populations exacerbates these issues (Haaland & van den Bosch, 2015; Darkhani et al., 2019). In Nairobi, the Thika Road corridor has fragmented green spaces, while Kahawa West suffers from inadequate clean-up efforts, underfunding, and poor sanitation (Kasuku, 2024b; Omollo, 2021; Gwaambuka et al., 2023). There is a clear need for coordinated frameworks to address these pressures and enhance resilience (Mwanzu et al., 2023).

Global and Regional Case Studies

Global examples offer valuable lessons. European cities like Copenhagen have preserved green spaces through strategic planning, such as the Finger Plan, which integrates green wedges amidst densification (Haaland & van den Bosch, 2015; European Environment Agency, 2022; Kabisch et al., 2016). In the U.S., successful projects like New York's High Line and Central Park showcase the reuse and protection of green spaces, while Portland's zoning laws encourage infill development (Wolch et al., 2014; Nowak & Greenfield, 2018; EPA, 2002). However, inequities persist in low-income areas, particularly in exurban regions (Jennings & Bamkole, 2019).

In Africa, cities like Lagos and Harare face similar challenges with UGS degradation due to sprawl, weak enforcement, and encroachments (Fuwape & Onyekwelu, 2011; Oduwaye, 2013; Mpofu, 2013). Nairobi's Karura Forest has been a success story, where community management helped restore the area post-1990s degradation (Makworo & Mireri, 2011; Mwanzu et al., 2023). However, Thika's expansion has led to a 22% loss of green cover (Badiane, 2021; Kasuku, 2024b), highlighting the need for hybrid governance strategies to mitigate these challenges (Otieno & Zwane, 2021; Darkhani et al., 2019).

Theoretical and Conceptual Frameworks

Urban Green Spaces (UGS) are vital for urban resilience, providing ecological, social, and economic benefits such as air purification, carbon sequestration, and recreational spaces (Kabisch et al., 2015; Haaland & van den Bosch, 2015). However, rapid urbanization, particularly urban sprawl, threatens the existence and quality of these spaces, as seen in Nairobi's Kahawa West Community Park, where infrastructure development and encroachment have led to green space degradation (Seto et al., 2012; Gwaambuka et al., 2023).

This study draws on three theoretical frameworks to address the challenges of green space management in Nairobi. The Garden City Model emphasizes the integration of greenbelts and self-sustaining communities, promoting the preservation of UGS amidst urban expansion (Howard, 1902; Blazy, 2022). Smart Growth Theory advocates for compact, mixed-use development to limit sprawl and conserve open spaces (**Figure 1**), making it highly relevant for Nairobi's urban planning (EPA, 2002; Sivula, 2022). Finally, Collaborative Governance Theory stresses the importance of multi-stakeholder collaboration in decision-making, particularly in overcoming institutional fragmentation (**Figure 2**), a major issue in Nairobi's green space management (Ansell & Gash, 2008; Emerson et al., 2012).

These theories, when integrated, provide a comprehensive approach to sustainable urbanism by promoting green space preservation, compact development, and inclusive governance. They offer valuable insights for addressing Nairobi's urban sprawl while ensuring the sustainability of its green spaces.

Central to this approach are four theories, conceptually placed in a framework which ties sprawl to UGS outcomes through management as a mediator. By integrating independent variables (urbanization pressures) with moderators (policies, governance), the researchers can impact dependent variables (UGS perpetuity) and underline that multitargeted efforts are the best approach to overcoming the problems affecting Nairobi.

RESEARCH METHODS

The research utilized a case study design to explore the impact of urban sprawl on green space

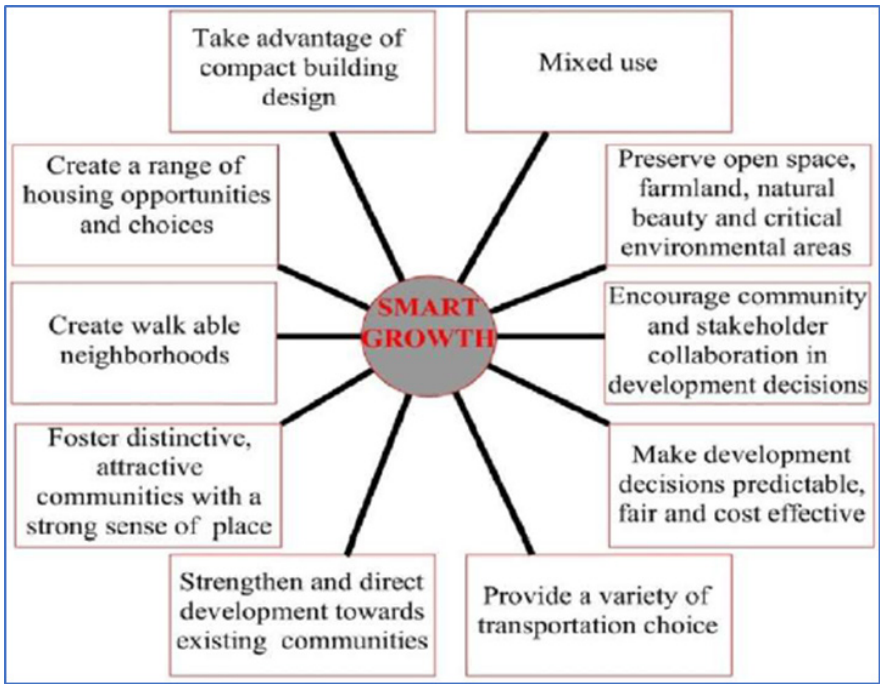

FIGURE 1
The Smart Growth Theory
Source: Adapted from EPA (2002); Singh & Singla (2021); Sivula (2022)

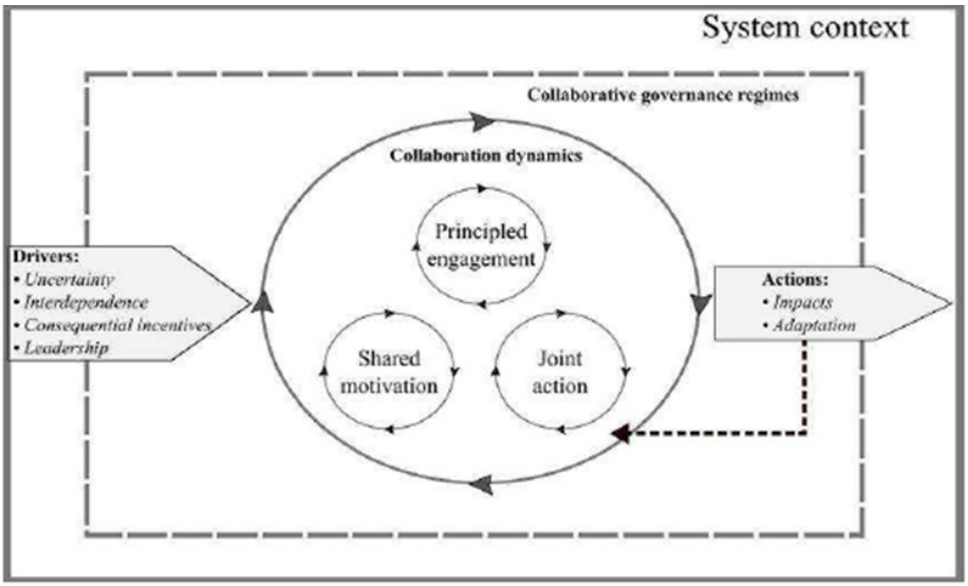

FIGURE 2
Collaborative Governance of Urban Space Theory
Source: Adapted from Ansell & Gash (2008); Emerson et al. (2012)

management in Nairobi, employing a descriptive mixed-methods approach that combined qualitative and quantitative data to ensure a comprehensive analysis. This triangulation allowed for a robust examination of park usage, stakeholder experiences, and management practices, enabling generalizable recommendations for urban sustainability. The study focused on Kahawa West Community Park, a peri-urban area that has faced significant degradation due to encroachment, illegal cultivation, and land grabs since the expansion of the Thika Superhighway in the

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2000s. Geospatial mapping revealed a 22% loss of green space between 2012 and 2018, highlighting the risks posed to urban green spaces as Nairobi's population grows.

The target population consisted of 2,080 individuals, including 2,000 nearby households, 20 county officials, 10 NEMA officers, and 50 local stakeholders. Stratified random and purposive sampling methods were used to select 338 respondents. Data collection involved questionnaires administered to 322 residents, semi-structured interviews with 16 officials and stakeholders, and field observations to document park conditions, biodiversity, and infrastructure. Validity was ensured through expert review and pilot testing, with a Cronbach's alpha of 0.81 for the overall data set. Quantitative data were analyzed using SPSS, while NVivo software was employed for thematic coding of interviews and observations, reducing biases. Ethical considerations, including informed consent and confidentiality, were strictly followed, and the study was reviewed by relevant authorities. Limitations included potential self-report inaccuracies and the cross-sectional nature of the data.

RESULTS

Current State of Green Spaces Amid Sprawl

The evaluation of Kahawa West Community Park reflects a strong tendency of disarray corresponding to the prevailing processes of urban sprawl in Nairobi as green spaces peri-urban areas begin to be absorbed by uncontrolled growth and government inactivity. Empirical evidence suggests that the provisions, ecological characteristics, and the general state of the park have deteriorated greatly due to reasons such as encroachment of infrastructure developed since the construction of the Thika Superhighway and the inadequate maintenance patterns. This decline is corroborated by quantitative assessments where 68 percent of people responding gave poor marks or rather a very poor mark on cleanliness in the park due to charring waste and absence of sanitation facilities. **Table 1** presents the distribution of cleanliness perceptions among surveyed residents and stakeholders.

The results confirm widespread dissatisfaction with cleanliness, consistent with earlier observations. These patterns align with ongoing sprawl pressures.

Ecological features fare similarly poorly, with biodiversity compromised by overgrown vegetation and habitat fragmentation. Survey data show 62% of participants noting reduced species diversity, linked to unchecked agricultural incursions and erosion. **Table 2** delineates biodiversity conditions.

Overall, respondents confirmed clear signs of habitat fragmentation.

Physical infrastructure exhibits comparable decay, with broken pathways, collapsed walls, and absent amenities reported by 70% of respondents. **Table 3** summarizes these conditions.

TABLE 1
Cleanliness Status of Kahawa West Community Park (n=338)

Cleanliness Level	Frequency	Percentage (%)
Very Clean	12	3.6
Clean	45	13.3
Neutral	60	17.8
Poor	120	35.5
Very Poor	101	29.9

Source: Field Survey, 2025

TABLE 2
Status of Biodiversity in Kahawa West Community Park (n=338)

Biodiversity Indicator	Agree (%)	Neutral (%)	Disagree (%)
Diverse Flora/Fauna	18.9	19.2	61.9
Well-Maintained Vegetation	15.4	22.5	62.1
Habitat Fragmentation Evident	75.1	12.4	12.5

Source: Field Survey, 2025

TABLE 3
Condition of Physical Infrastructure in Kahawa West Community Park (n=338)

Infrastructure Element	Good (%)	Fair (%)	Poor (%)
Pathways/Walkways	10.1	20.4	69.5
Seating/Benches	8.3	15.7	76.0
Lighting/Security Features	5.9	12.1	82.0

Source: Field Survey, 2025

Infrastructure conditions were consistently rated poor across all items. **Figures 3, 4, 5** and **6** provide additional visual evidence of these conditions.

Community Usage and Perceptions

Community engagement with Kahawa West Community Park is markedly low, reflecting perceptual barriers exacerbated by urban sprawl's transformation of accessible green spaces into underutilized, insecure zones. Survey findings indicate that only 25% of residents visit the park weekly, with 45% reporting infrequent or no usage, primarily due to safety concerns and inadequate facilities amid encroaching informal developments. This pattern underscores how sprawl disrupts equitable access, disproportionately affecting vulnerable demographics in peri-urban Nairobi.

Demographic analysis from **Table 4** reveals usage variations: younger respondents (18–35 years, 55% of sample) exhibit higher visitation (35% weekly) compared to older groups (over 55 years, 15% weekly), potentially linked to recreational preferences, while females (48% of sample) report lower engagement (20% weekly) due to heightened safety perceptions. Education levels correlate positively with awareness, with tertiary-educated individuals (30% of sample) more likely to advocate for improvements.

Perceptions of recreational adequacy are predominantly negative, with 65% disagreeing

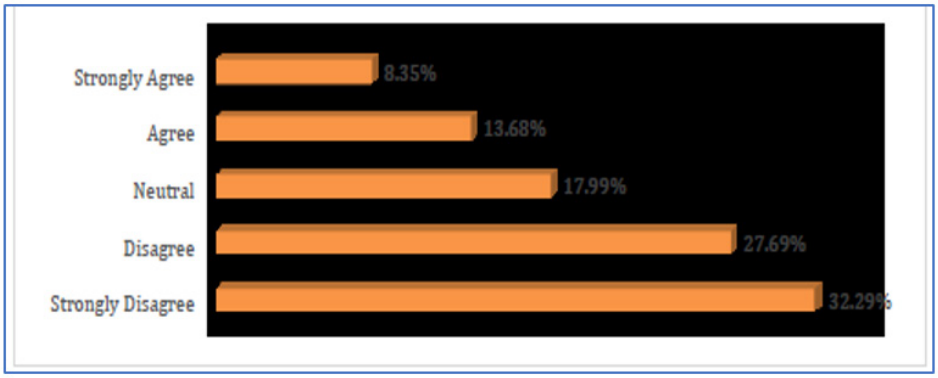

FIGURE 3
Cleanliness of Kahawa West Community Park
Source: Field Observation and Documentation, 2025

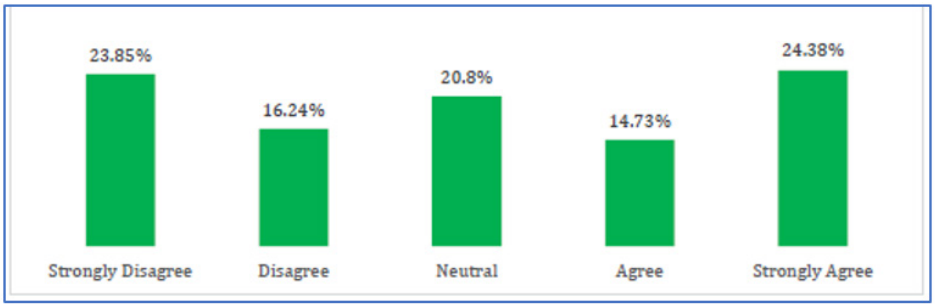

FIGURE 4
The status of biodiversity in Kahawa West Community Park
Source: Field Observation and Documentation, 2025

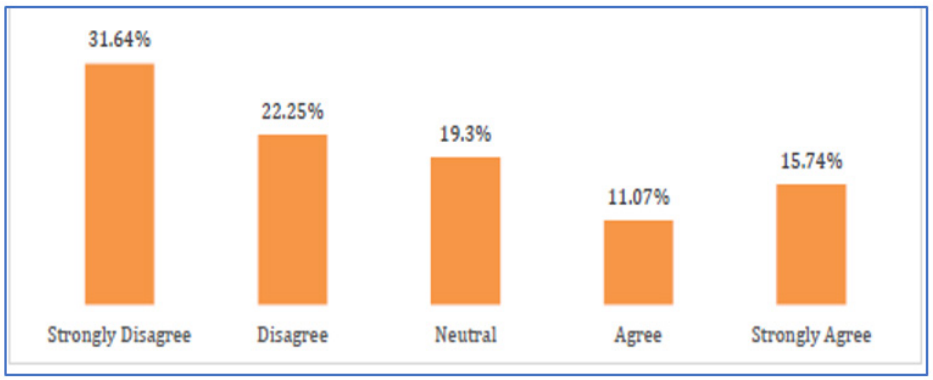

FIGURE 5
The Condition of Physical Infrastructure of Kahawa West Community Park
Source: Field Observation and Documentation, 2025

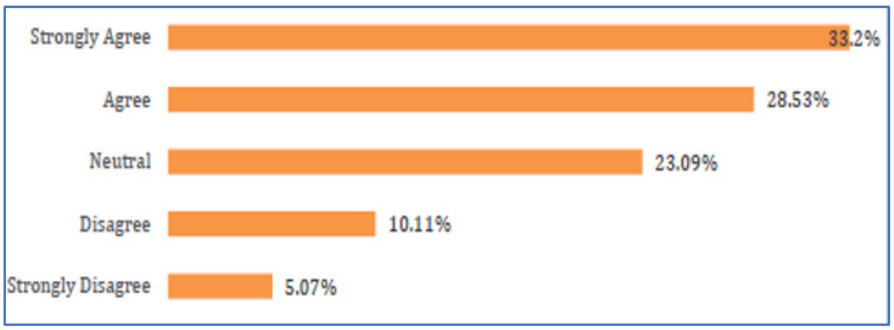

FIGURE 6
Development and Implementation of Comprehensive Management
Source: Field Observation and Documentation, 2025

that the park meets needs, citing absent amenities like playgrounds and lighting. **Figure 7** highlights the low visitation trend. Similarly, **Figure 8** reinforces these perceptions.

Facility satisfaction is low, with 70% expressing discontent, particularly regarding maintenance. **Figure 9** bar chart reveal breakdowns, such as 80% rating sanitation poor, which analytical scrutiny links to institutional neglect amplifying health inequities. Safety perceptions further deter usage, with 60% viewing the park as unsafe due to overgrown vegetation creating hiding spots. **Figure 10** histogram (mean = 3.95, SD = 1.08) highlights this, positing that sprawl's informal encroachments heighten crime vulnerabilities, which aligns with general safety concerns around poorly maintained green spaces. Demographic crosstabs show lower-income groups (40% of sample, earning <KSh 20,000 monthly) perceive

greater risks, emphasizing environmental justice dimensions where marginalized communities bear sprawl's burdens. Overall, these findings analyze usage as a barometer of urban livability, urging strategies to restore perceptions through targeted enhancements.

Effectiveness of Management Practices

Management as it is currently being practiced in Kahawa West Community Park has proven

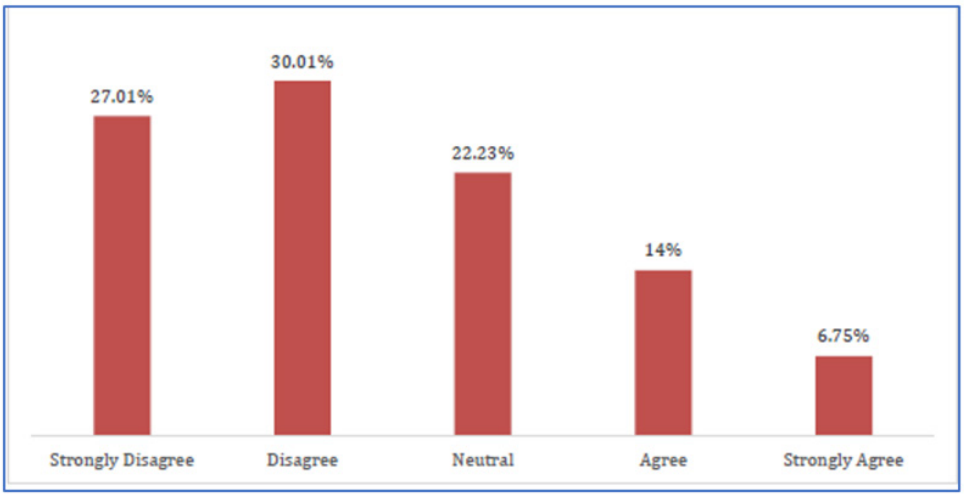

FIGURE 7
Visitation of Kahawa West Community Park
Source: Community Survey & Park Assessment Data, 2025

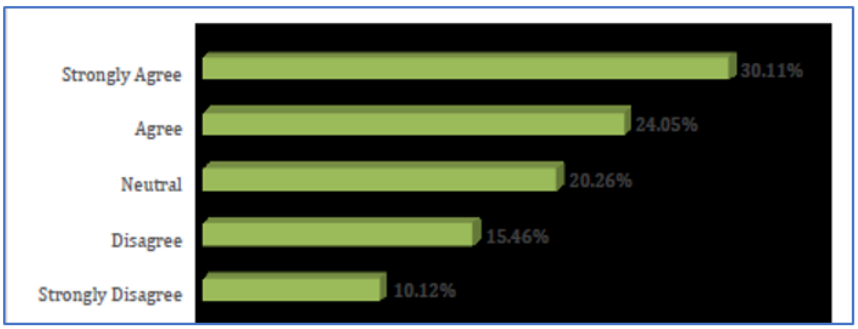

FIGURE 8
Kahawa West Community Park Meets my Recreational Needs
Source: Community Survey & Park Assessment Data, 2025

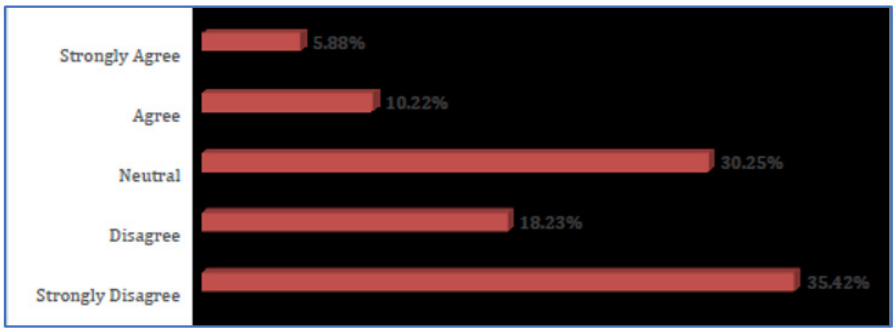

FIGURE 9
Satisfaction of the facilities available at Kahawa West Community Park
Source: Community Survey & Park Assessment Data, 2025

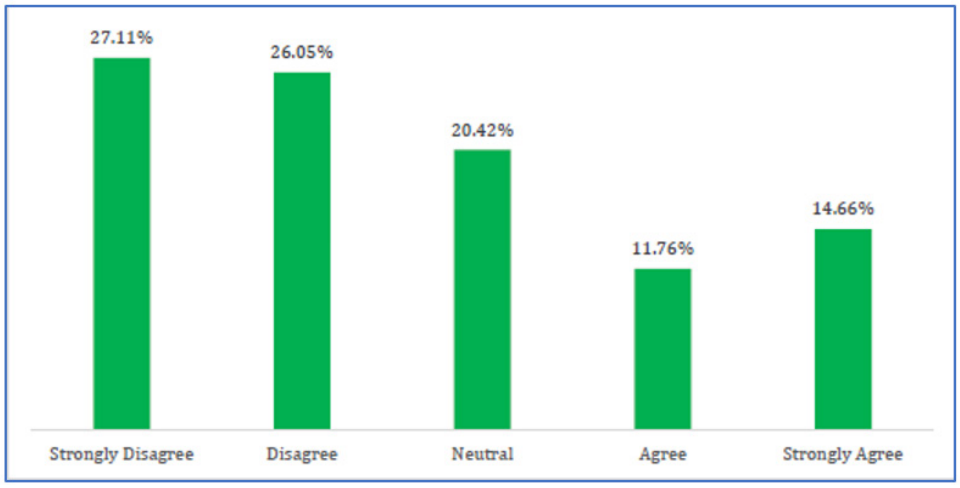

FIGURE 10
The Park Provides a Safe Environment for all Visitors
Source: Community Survey & Park Assessment Data, 2025

ineffective, showing a tendency of responding rather than being proactive and well-coordinated because it focuses on reversing the erosive effect that urban sprawl has on the green infrastructure of Nairobi. Quantitative evaluation shows that half of the respondents' rate maintenance as ineffective, and grass trimming and similar activities are converted monthly or less on average (60 percent). This ineffectiveness is attributable to the fragmentation of the institutions where the roles of the Nairobi County and NEMA lack synergy.

Community-driven initiatives, such as periodic clean-ups, offer partial mitigation, with 40% of participants aware of such events, yet these are ad hoc and underresourced. **Figure 11** indicates generally low satisfaction with maintenance. Institutional gaps manifest in low responsiveness, with only 30% agreeing management addresses feedback. Awareness levels were low (**Figure 12**).

Feedback responsiveness is similarly deficient, where 58% disagree (mean = 3.70, SD = 1.12), linking to bureaucratic inertia amid sprawl demands (**Figure 13**).

Maintenance frequency, **Figure 14** shows quarterly or rarer interventions for 65%, analyzed as reactive rather than proactive, allowing degradation to compound. Such polarisation points to effectiveness gaps: outreach activities lead to immediate improvements (e.g., temporary cleanliness), but funding and enforcement gaps remain frail, pointing to the necessity of a systemic response to create resilience against disorder in ramifying environments such as Nairobi.

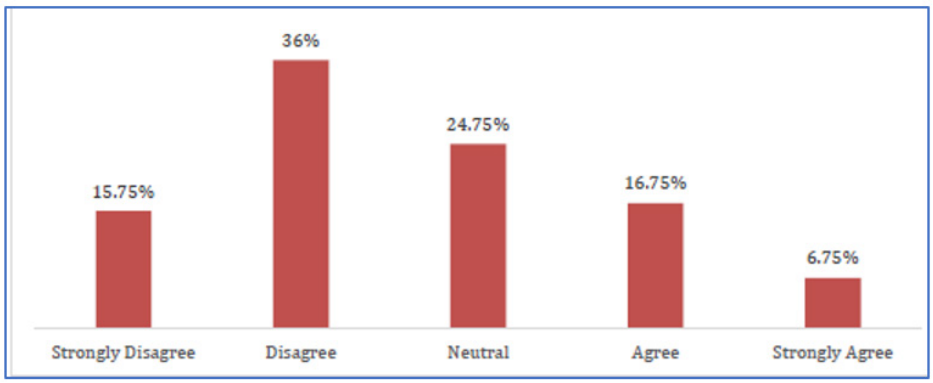

FIGURE 11
Effectiveness of the Management of Kahawa West Community Park is in maintenance
Source: Community Survey & Park Assessment Data, 2025

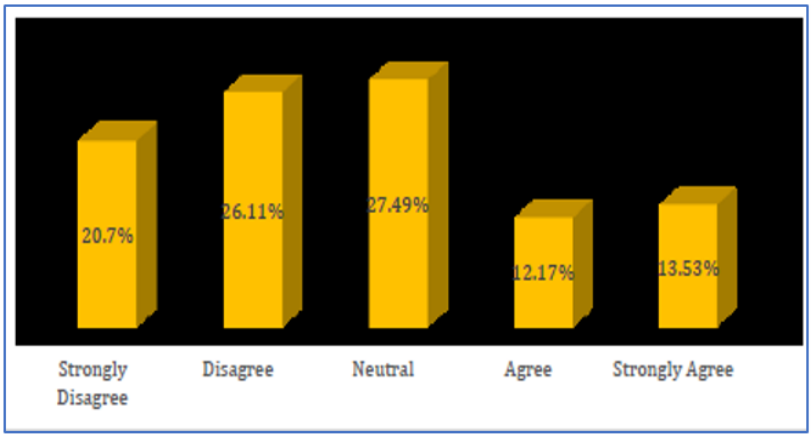

FIGURE 12
Awareness of the Management's Efforts to Improve the Park
Source: Community Survey & Park Assessment Data, 2025

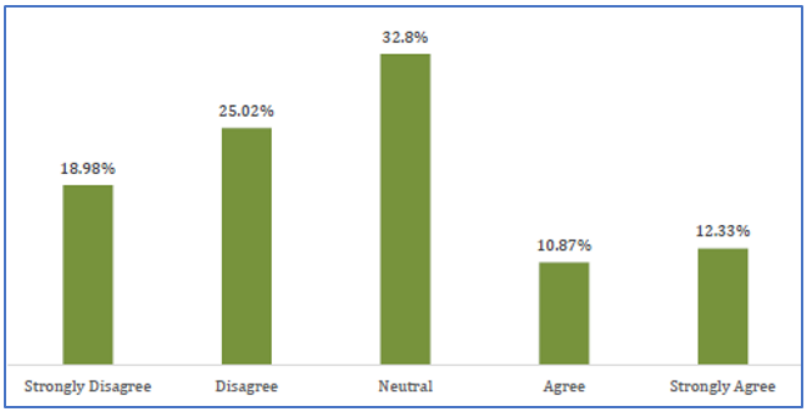

FIGURE 13
The Park's Management is Responsive to Community Feedback and Concerns
Source: Community Survey & Park Assessment Data, 2025

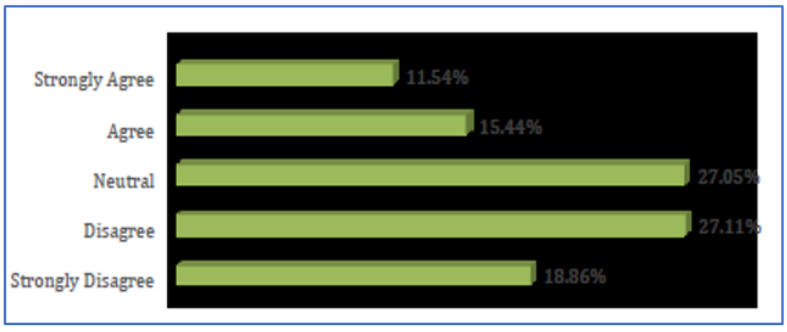

FIGURE 14
Frequency of Maintenance activities
Source: Community Survey & Park Assessment Data, 2025

Applying it to larger points in African urbanism, inadequacy of funds on practices is also associated with the underlying economic contexts of limited funds provided to the greening of cities whereby cities spend less than 5% on green spaces as the city governments give priority to housing and transportation needs. In Kahawa West, this is demonstrated by the way deferring on repairs increases safety-related problems and decreases usage as it was supported by the perception data. A comparative assessment in line with the Smart Growth principles indicates that it is losing on the

opportunities of the compact and green-integrated administrations, and with the modifications of the policy, it would be more effective.

Challenges to Green Space Management

Green space management in Nairobi faces multifaceted challenges, with Kahawa West exemplifying how urban sprawl amplifies institutional, financial, and social barriers to sustainability. Foremost is funding inadequacy, cited by 75% of respondents as a primary obstacle, constraining maintenance and restoration amid competing urban priorities. **Figure 15** bar graph affirms this, with strong agreement (mean = 4.10, SD = 0.95), **Figure 15** confirms funding inadequacy as a key challenge.

Low public awareness and engagement hinder sustainable practices, with 62% noting limited involvement. **Figure 16** shows moderate agreement (mean = 3.85, SD = 1.05), critiqued as a knowledge gap perpetuating apathy, particularly in diverse demographics where education levels influence participation.

Encroachment and illegal activities threaten preservation, reported by 80% as critical. **Figure 17** illustrates high consensus (mean = 4.20, SD = 0.90), linking to weak zoning enforcement post-infrastructure booms.

Inadequate maintenance leads to amenity deterioration, with 72% agreement. **Figure 18** (mean = 4.05, SD = 1.00) underscores this cycle, where sprawl accelerates wear without interventions.

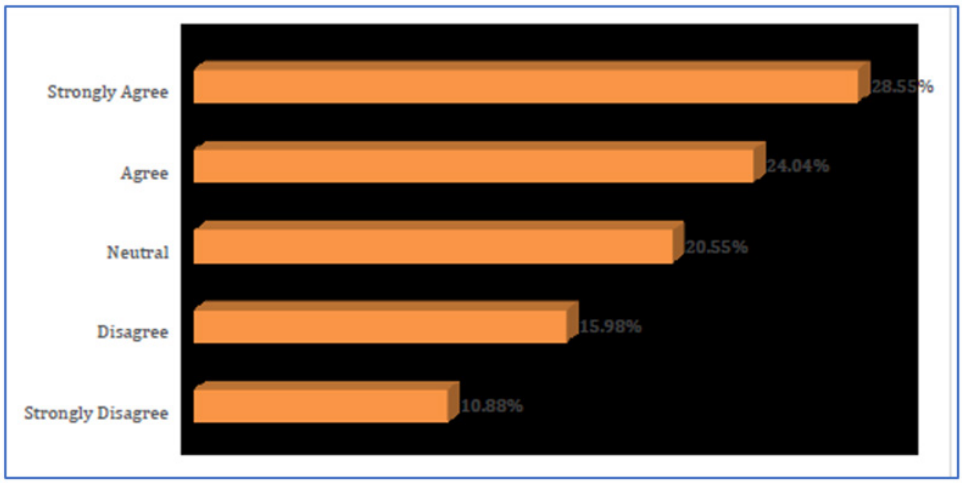

FIGURE 15
The lack of adequate funding poses a significant obstacle
Source: Community Survey & Park Assessment Data, 2025

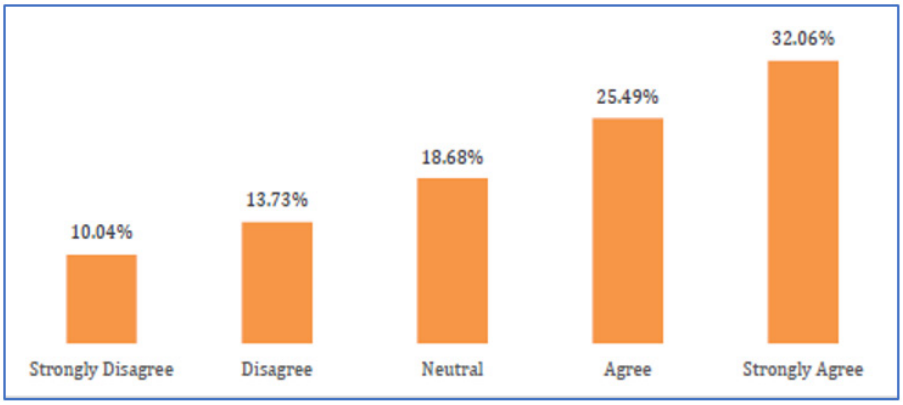

FIGURE 16
Limited public awareness and engagement hinders
Source: Community Survey & Park Assessment Data, 2025

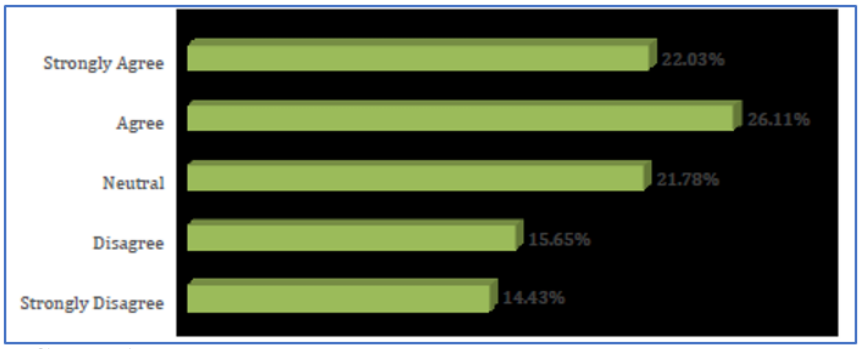

FIGURE 17
Encroachment and illegal activities
Source: Community Survey & Park Assessment Data, 2025

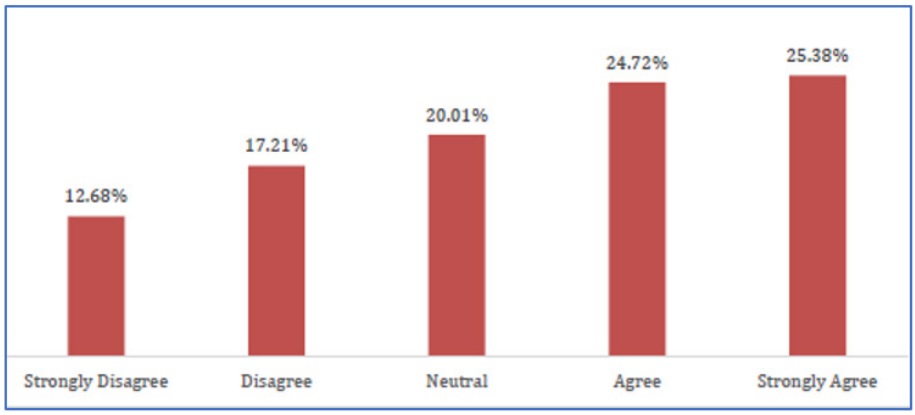

FIGURE 18
Inadequate maintenance and upkeep
Source: Community Survey & Park Assessment Data, 2025

DISCUSSION

The findings from the study of Kahawa West Community Park shed light on the broader issues of urban sprawl and the degradation of green spaces in Nairobi. The observed decline in cleanliness (68% rating it poor), biodiversity (62% reporting a decline), and infrastructure (70% reporting poor conditions) aligns with global trends of urban sprawl causing habitat fragmentation and loss of ecosystem services (Seto et al., 2012). This is particularly evident in Kahawa West, where encroachment and infrastructural development, such as the Thika Superhighway, have led to a 22% loss in green space between 2012 and 2018 (Badiane, 2021). The findings highlight the exacerbated effects of urban heat islands and the reduction of carbon sequestration, trends that are also observed in other African cities (Huang et al., 2021; Terfa et al., 2020).

The study also revealed social inequities in green space access, with only 25% of residents using the park weekly and 65% dissatisfied with recreational amenities. This is consistent with Wolch et al. (2014), who found that green space inaccessibility disproportionately affects low-income groups. In Nairobi, this is evident as marginalized communities experience a decline in social cohesion due to poor green space quality (Makworo & Mireri, 2011). The ineffective management practices, including reactive maintenance and poor responsiveness (58% disagreed with management feedback), further reflect institutional failures (Okpala, 2009), which are seen in the disorganized cleanup activities at Kahawa West (Haaland & van den Bosch, 2015).

Funding (75% agreement on its insufficiency) and encroachment (80% concern) are critical issues in Nairobi, exacerbated by land speculations and illegal activities (Amoako & Korboe, 2011). These issues, coupled with weak regulation and institutional fragmentation, are visible in the poor

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condition of Kahawa West, where the overlapping mandates of NEMA and county governments hinder effective green space management (Okech & Nyadera, 2022). Kahawa West reflects broader challenges in Nairobi, where the Nairobi Integrated Urban Development Master Plan (NIUPLAN) 2014–2030 aims to integrate green spaces but fails to implement these plans effectively (Republic of Kenya, 2014; Mwaura & Odera, 2021). This underscores the need for systemic reforms to mitigate the socio-ecological costs of urban sprawl in Nairobi and other cities in the Global South (Gwaambuka et al., 2023; Kasuku, 2024b).

Theoretical frameworks, including the Garden City Model (Howard, 1902), Smart Growth Theory (EPA, 2002), and Collaborative Governance Theory (Ansell & Gash, 2008), help contextualize these findings. The Garden City Model stresses the need for balanced urban-rural connections, but Nairobi's rapid expansion, especially along corridors like Thika Road, challenges its application (Blazy, 2022; Kasuku et al., 2022). Similarly, the Smart Growth Theory advocates for compact, mixed-use development to limit sprawl and conserve green spaces, which aligns with the findings that compact planning could alleviate the 22% loss of green cover in Nairobi (Sivula, 2022; Williams et al., 2020). However, informal encroachments complicate the application of these theories in resource-limited settings like Nairobi, requiring adaptive strategies to accommodate local needs (Geneletti & Zardo, 2016).

The Collaborative Governance Theory is particularly relevant to addressing management inefficiencies in Nairobi. The study found that 45% of residents were unaware of cleanup efforts, reflecting institutional silos and power imbalances in managing green spaces. The theory advocates for multi-stakeholder involvement and facilitative leadership to overcome these challenges (Emerson et al., 2012; Sullivan & Skelcher, 2002). In Nairobi, improving coordination between NEMA, county governments, and communities could enhance decision-making and reduce encroachment, as seen in successful models from Nordic countries (Backstrand, 2006; Soderstrom et al., 2014).

From a policy perspective, the findings emphasize the need for stronger funding mechanisms, such as public-private partnerships and green bonds, to ensure sustainable green space management in Nairobi. The lack of funding for maintenance and improvement, highlighted by the 75% agreement on the issue, calls for proactive investments in urban parks (Neal & Community First Partnership, 2016; Lindholst et al., 2017). Additionally, participatory planning processes, including community forums, should be expanded to increase public involvement in park revitalization efforts, which could address the low visitation rates (38% participation) and enhance social cohesion (Kabisch et al., 2016; Otieno & Zwane, 2021).

Enforcing zoning regulations to prevent encroachment, coupled with digital monitoring and fines, could help curb illegal land use in green spaces (Okech & Nyadera, 2022; Mwaura & Odera, 2021). At the micro-scale, incorporating green urbanism principles, such as green corridors and rooftop gardens, can help mitigate the impacts of sprawl. Additionally, capacity-building for officials in collaborative governance and adaptive management approaches would improve the responsiveness of green space management (Kathambi, 2023). These policy implications, if implemented, could help transform Nairobi's green infrastructure and improve its resilience to urbanization.

The study is limited by its single-case focus on Kahawa West, and future research should explore comparative studies across Nairobi's sub-counties, particularly in informal settlements and affluent areas. Investigating the use of digital tools for real-time monitoring could also enhance future urban sustainability assessments (Darkhani et al., 2019; Kasuku et al., 2022).

CONCLUSION

Summary of Key Findings

This paper has examined the interconnections between urban sprawl and green space loss in Nairobi, using Kahawa West Community Park as a case study. The findings reveal that urban sprawl, particularly after infrastructure projects like the Thika Superhighway, has contributed significantly to the degradation of green spaces. This is reflected in deteriorating facilities, ecological imbalances, and reduced productivity. Quantitative data show that 70% of respondents report poor infrastructure conditions, while 68% rate cleanliness as poor or very poor. Additionally,

62% of participants noted a loss of biodiversity due to habitat degradation and overgrown vegetation, mirroring global trends of urban sprawl leading to ecosystem fragmentation (Seto et al., 2012; Terfa et al., 2020).

Socially, the park fails to meet recreational needs, with only 25% visiting weekly and 65% expressing dissatisfaction with the park's recreational offerings. Demographically, lower-income and female respondents reported more negative experiences, highlighting the environmental justice concerns associated with urban sprawl in peri-urban areas (Wolch et al., 2014; Gwaambuka et al., 2023). Management was found to be ineffective, with 58% of respondents indicating poor responsiveness to feedback. This inefficiency, compounded by funding issues (75% agreement) and encroachment (80% concern), contributes to the deterioration of the park and the surrounding area (Makworo & Mireri, 2011; Kasuku, 2024b).

RECOMMENDATIONS

Strategic Approaches for Sustainable Development

The study recommends several strategic approaches to mitigate urban sprawl and green space loss in Nairobi, based on the research findings. First, strengthening zoning enforcement is essential to curb encroachment and land speculation. Revising the Environmental Management and Coordination Act (EMCA) and Nairobi County regulations to impose stricter penalties and require environmental impact assessments for peri-urban development could help protect green spaces (Republic of Kenya, 2018; Okech & Nyadera, 2022). Establishing green belts along infrastructural corridors, such as Thika Road, would help recover some of the 22% green space loss in the area (Badiane, 2021; Howard, 1902).

Second, improving inter-agency collaboration is critical. The overlap in responsibilities between Nairobi County and the National Environment Management Authority (NEMA) has hindered effective green space management. Implementing formalized multi-agency procedures and fostering stakeholder dialogue, as suggested by Collaborative Governance Theory (Ansell & Gash, 2008), could improve efficiency in managing green spaces (Emerson et al., 2012).

Third, community participation is key to revitalizing parks and enhancing their use. Organizing forums, clean-up activities, and co-design sessions can increase public involvement and ownership, particularly among low-income residents who face barriers to green space access (Kabisch et al., 2016; Mwanzu et al., 2023). These participatory measures would foster social cohesion and improve access to recreational amenities.

Fourth, innovative financing models, such as public-private partnerships (PPPs) and eco-tourism development, can address funding shortages. Green taxation on development projects and corporate sponsorships could provide a sustainable revenue stream to maintain and enhance parks (Neal & Community First Partnership, 2016; Lindholst et al., 2017). This would reduce the reactive nature of current management practices and enable long-term investments in biodiversity restoration and infrastructure.

Fifth, the use of Geographic Information Systems (GIS) and digital platforms for real-time monitoring of green spaces can aid adaptive management. Time-sequenced mapping and remote sensing technologies can help detect encroachments early, while community reporting systems could enhance public participation in park management (Mwaura & Odera, 2021; Kasuku et al., 2022). These tools would enable more evidence-based decision-making and improve the overall management of green spaces in Nairobi.

Broader Contributions and Call to Action

This study contributes to the academic understanding of sustainable urban development in the Global South, particularly in African cities facing rapid urbanization. By localizing theoretical frameworks such as the Garden City Model, Smart Growth Theory, and Collaborative Governance Theory to Nairobi's context, the study provides valuable insights for adaptive urbanism (Howard, 1902; EPA, 2002; Ansell & Gash, 2008). The findings also have practical implications for policymakers, highlighting the need for comprehensive green space management strategies that promote resilience and social equity in urban areas.

The study aligns with the Sustainable Development Goals (SDG 11) on sustainable cities and communities, advocating for the integration of green spaces into urban planning to improve environmental and social outcomes (United Nations, 2018). The conservation of UGS in Nairobi will support biodiversity and foster community engagement, contributing to long-term urban resilience. Policymakers, including county governments and NEMA, should prioritize green spaces in their development agendas, dedicating resources to the recommended strategies to ensure the sustainability of urban green spaces for future generations (Kasuku, 2024b; UN-Habitat, 2022).

Pilot restoration projects, such as those in Kahawa West, could spark broader changes that benefit both the environment and the community.

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