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Resilience and Sustainability in African Cities: Exploring Residents' Living Environment Across Kigali City Neighbourhoods

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Abstract

Rapid urbanization is intensifying inequality in cities, particularly in Africa, where informal neighbourhoods present significant challenges, often exposing vulnerable residents to precarious living conditions. Building resilient communities and ensuring satisfaction with livelihoods are fundamental to determining quality of life. This study examines the living environments and satisfaction levels of residents across Kigali's neighbourhoods, based on the premise that the neighborhood is a key framework for analysing residents' livelihoods and their distinct characteristics. Using spatial data, 130 residential neighbourhoods were mapped and analysed, while a quantitative survey collected information on residents' living conditions from 1,092 households. The results revealed significant differences in neighborhood living environments. However, contrary to common perceptions, residents of informal areas reported high levels of satisfaction with their neighbourhoods. The study concludes that, despite disparities, living conditions across Kigali's neighbourhoods are generally adequate. Drawing from detailed evidence, it further confirms that the neighborhood scale is a valuable framework for studying resilience and sustainability in African cities.

Keywords: Living environment, Neighbourhood, Residents, Resilience, City of Kigali.

1. Introduction

For several decades, urbanization has been recognized as one of the primary factors contributing to economic growth and positively influencing the sustainable living conditions of urban residents. Globally, more people now live in urban areas than in rural ones, with 55% of the world's population residing in cities. This figure is expected to rise to 68% by 2050 (UN, 2019), leading to significant structural changes in cities as they accommodate growing populations. However, in rapidly developing countries, the urban poor face significant disparities in terms of well-being (UN, 2019).

Since the 1990s, many African countries have experienced rapid urbanization (Hove et al., 2013; Güneralp, 2017; UN, 2019; Clark, 2019; Makuwira, 2022). Taking Rwanda as an example, from 1960 to 1980, urbanization grew gradually, with the urban population increasing from 2.6% to 4%, reflecting modest urban expansion. Between 1980 and 1990, this slow growth persisted, with the urban population reaching 5.42%. However, a rapid urbanization surge occurred between 1990 and

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2000, with the urban population escalating to 14.93%, likely driven by post-genocide reconstruction efforts. From 2000 to 2010, urban growth stabilized, reaching 17% by 2010, indicating sustained but slower development. Between 2010 and 2022, the urbanization rate increased significantly, with the urban population reaching 27.9%, suggesting an accelerated pace of urban development in recent years (NISR, 2012; 2022).

Over the past two decades, the Government of Rwanda has been committed to boosting urbanization, enhancing the functionality and competitiveness of cities for regional and international outreach, and promoting sustainable liveability in towns (MININFRA, 2015). This is evident in the city of Kigali, the country's economic and demographic hub, where significant improvements in residents' living standards have been observed (World Bank, 2017).

As the world's least urbanized continent (APC, 2020), Africa is undergoing an urbanization process that presents both challenges and opportunities for livelihoods. Urban policies in African countries aim to promote cities as drivers of development and keys to the continent's future prosperity (Güneralp et al., 2017). However, these trends often fail to meet predetermined goals, particularly regarding sustainable living conditions for urban residents. Saghir et al. (2018) describe sub-Saharan Africa as the world's fastest-urbanizing region, with the potential to propel growth, create jobs, reduce widespread poverty, and provide essential services to urban dwellers. In this context, urbanization is expected to improve living conditions and promote liveability in cities.

However, Africa's rapidly growing cities face significant challenges related to well-being. Some urban dwellers enjoy favourable living conditions, while others, particularly those living in slums, face precarious situations (Simiyu, 2019). Indeed, most of the urban population in sub-Saharan Africa resides in informal settlements. In 2015, nearly two-thirds of Africa's urban population lived in informal settlements or slums. Although the proportion decreased from 65% in 2000 to 55.9% in 2015, the absolute number increased from 128 million to 200 million and continues to grow (UN-Habitat, 2015). In these settlements, access to basic services such as water, sanitation, and electricity remains a critical challenge (Vetter-Gindele, et al., 2023; Parienté, 2017).

Discrepancies in the implementation of urban policies have led to spatial urban inequality in African cities, undermining the goals of fast-growing urban centres. Kigali is no exception. The urban landscape reflects residential disparities. Living condition challenges are still evident among residents in different types of neighbourhoods. Although dispersed across the city, Manirakiza et al. (2020) and Baffoe et al. (2020) observed inequalities among these neighbourhoods, which are distinguishable by housing types and spatial patterns.

Briefly, achieving high-quality living conditions requires city development to align with population growth and the provision of infrastructure and amenities to improve city dwellers' satisfaction (Adedayo et al., 2015; O'Farrell et al., 2019; Giyasov et al., 2020). Numerous studies have assessed urban neighborhood living conditions and satisfaction, particularly in sub-Saharan Africa and Kigali (Manirakiza et al., 2019; O'Farrell, 2019; Rwampungu et al., 2019; Baffoe et al., 2020; Makuwira, 2022). These studies question the current African neighborhood typologies, recommending that urban spatial planning structures be streamlined with clear roles and responsibilities to ensure efficient resource use and effective service delivery.

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This study aims to examine the status of urban neighbourhoods in Kigali City, one of Africa's fastest-growing urban centres. It considers these neighbourhoods as a key framework for studying residents' resilience and sustainability in African cities, based on their distinct characteristics. It aims to address the following questions: What is the status and disparity of residents' living environments across different neighbourhoods in Kigali? To what extent are residents satisfied with living in their respective neighbourhoods?

Understanding the concepts of 'neighbourhood' and 'living environment' is essential for exploring the context of Kigali. It is important to note that there is no universal definition, which poses challenges for researchers trying to define it (Galster, 1986). Most definitions incorporate both social and spatial dimensions. For example, Olowoporoku et al. (2017) describe a neighborhood as a physical space characterized by complex interactions, while Park & Rogers (2015) define it as a group of people sharing services and social cohesion. Kallus & Law-Yone (2000) emphasize physical boundaries, whereas Bonds, Kenny, & Wolfe (2015) focus on neighbourhoods as products of social interactions. Baffoe (2019) refers to neighbourhoods as areas where people live and spend most of their time. In this study, a neighborhood is understood as a "geographically distinct community within a larger city, town, or suburb, characterized by its unique blend of physical space, social interactions, shared services, and collective identity." This definition captures the dynamic relationship between social life and physical structures, including residential areas, public spaces, and commercial zones. Neighbourhoods are defined by both formal boundaries like streets and landmarks, as well as informal boundaries shaped by social connections and communal activities.

The concept of an urban living environment generally refers to the conditions in which people live, including the lifestyle and social circumstances associated with urban life. According to Giyasov et al. (2020), it encompasses the environmental characteristics of urban spaces where individuals spend time throughout their daily, weekly, and long-term routines. These characteristics include residential density, community interactions, and a variety of services and amenities, which are key factors in shaping neighbourhoods. In this paper, the living environment is analysed based on neighborhood types and subtypes, categorized by income levels (ranging from high to low income) and the level of satisfaction with their needs. Housing condition indicators, such as type of dwelling and house ownership, are used. Indicators of basic household amenities, such as sources of drinking water, type and usage of toilets, type and usage of kitchens, and modes of garbage disposal, are also considered. Together, these factors reflect households' safety and satisfaction within their neighbourhoods.

This paper is structured into five sections: the introduction, the methodology, findings, the discussion and conclusion. The findings are presented in two parts: first, the mapping, categorization, and description of Kigali's neighbourhoods; and second, the survey results on residents' living environments.

2. Methodology

The study involved the collection of both primary and secondary data. Secondary data were sourced from published papers and scientific reports to supplement the empirical data. Primary data

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included spatial data from remote sensing imagery. This data was used to examine the nature, patterns, and spatial distribution of neighbourhoods. Additionally, quantitative data were gathered through a survey to analyse the resident's living environment.

2.1. Neighbourhoods' analysis

The neighbourhood analysis emphasized first their mapping by taking into consideration of two dimensions (Antoni, 2009). The first is the content. That is the social status of its inhabitants (rich or poor neighbourhood) or specialization of activities. The second is the location and physical structure. This dimension reflects the neighbourhoods' characteristics including urban fabric, date of construction, typology of buildings and constructions.

The neighbourhoods were mapped using the participatory and remote sensing image analysis approaches. The participatory approach involves field visit and interaction with its residents while the remote sensing (RS)-based approach uses image processing techniques to map different urban entities or neighbourhoods from satellite imagery (Divyani Kohli, 2015). In that regard, three steps have been applied. The first step consisted of the field visits to observe the main characteristics of the neighbourhood and conduct the key informants (local leaders and residents) interviews. Interviews provided data on the historical background of the neighbourhood (first occupants) and the circumstances for their creation (spontaneous settled or planned /developed site) while the observation allowed noting data related to site occupancy. The second step consisted of describing and ranging the neighbourhoods into three categories viz planned, unplanned and mixed neighbourhoods based on the data collected in the first step. The third step which is the remote sensing-based approach consisted of digitalising neighbourhood boundaries on different google images. The technique was first to refer to the administrative village boundaries where applicable, then digitalise the neighbourhood boundaries in case they do not correlate with the existing village administrative boundaries, and finally conduct a field visit for validation.

2.2. Quantitative survey

Selection and sampling of the neighbourhoods

Purposive sampling was applied to select one neighborhood per each sub-categories, considering geographical location (inner area, city edge, suburb), spatial distribution, and built environment characteristics such as architectural modernity (modern villas vs. older styles) and residential density (Table 1).

The calculated sample for this study consisted of 1,092 households distributed across 15 different neighbourhoods, classified into five categories (see table below). The sample was derived from 46,634 targeted households using Yamane's (1967:888) formula, assuming a 3% level of precision in Kigali. The sample size for each neighborhood was determined based on the number of households within the corresponding administrative villages covered by the selected neighbourhoods. Neighbourhoods were aligned with official administrative entities, from the district level to the sector, cell, and village levels.

To address the small sample size in some affluent neighbourhoods, specifically Estate 2020, Kagunga Estate, and Gasave (with 4, 3, and 10 participants, respectively), the sample size was increased to around 40 participants for all planned and 80 participants for mixed neighbourhoods.

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This increase was balanced by reallocating participants from more represented neighbourhoods in unplanned neighbourhoods to around 100 participants (Table 1).

It is worth noting that, to maximize participation and collect the necessary data, the survey successfully interviewed all 1,092 respondents. Among them, 677 were male and 415 were female, with ages ranging from 18 to 87. The majority of respondents were aged between 25 and 55. Furthermore, the majority of the population in the study area consisted of middle-aged individuals, with a mean age of 42 for males and 40 for females.

Table 1: Sampled neighbourhoods and sample size

Main types	**Name of the neighbourhood**	**Neighbourhoods' subtypes**	**Geographical location in city**	**Neighbo-urhoods Sample**	**Main Types Sample**
Planned	Estate 2020	Private Estate	Edge of city	40	122
	Rebero	Luxurious Multi Storey	Edge of city	42	
	Kibagabaga	Modern villas	Edge of city	40	
	Kagunga Estate	Private estate	Inner area	40	120
	Niboye	Modern villas	Inner area	40	
	Gasave	Modern villas	Inner area	40	
Mixed	Kabeza	Upgraded informal	Edge of city	83	251
	Nyamirambo	Old fashion planned	Inner area	83	
	Masaka	Modern villas	Suburb	85	
Unplanned	Rwarutabura	New low dense	Inner area	100	299
	Nyagatovu	Unplanned	Edge of city	100	
	Karembure	Suburb	Suburb	99	
	Gatenga	Old low dense	Edge city	100	300
	Gitega	Old high dense	Inner area	100	
	Kanserege	Old high dense	Inner area	100	
Total	15	-	-	1092	1092

The figure below presents the sampled neighbourhoods and their boundary for each in the three districts of Kigali City.

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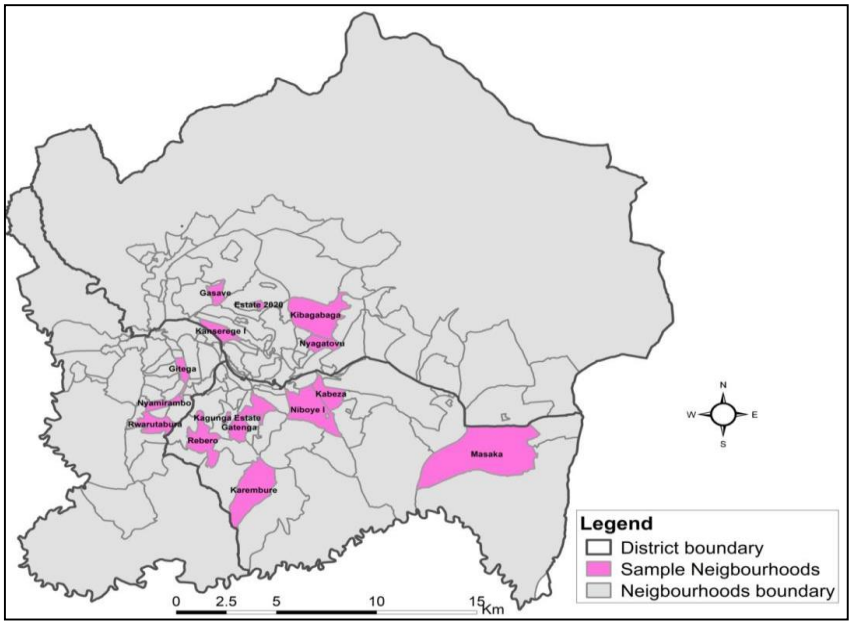
Figure 1: Distribution of the sampled neighbourhoods



2.3. Household and respondents sampling

The selection of households was conducted in two phases: The first phase involved selecting neighbourhoods, and the second phase involved an on-site systematic sampling of households within each sampled neighborhood. This was done using high-definition maps and a red pen to mark every 10th household in all directions for inclusion in the survey. In each neighborhood, the starting point was arbitrarily chosen by the interviewers. If the selected dwelling housed more than one household, the interviewer randomly selected one using cards. If the 10th dwelling was not a household, the nearest household was selected instead.

Regarding respondents, a random selection process was applied within each sampled household. Interviewers used cards to choose which adult (aged 18 years or above) to interview, regardless of whether they were present or absent. If the selected respondent was absent at the time, the interviewer rescheduled the interview based on the respondent's availability. This method ensured the researchers could collect the relevant information needed for the study.

3. Findings

3.1 Main typologies and characteristics of Kigali neighbourhoods

3.1.1 Main typologies

The built environment of Kigali is made of 130 neighbourhoods in Kigali, including 121 residential neighbourhoods and 9 mixed-use quarters (mostly for businesses). The residential neighbourhoods comprise three main types: 44 planned neighbourhoods, 42 unplanned neighbourhoods, and 35

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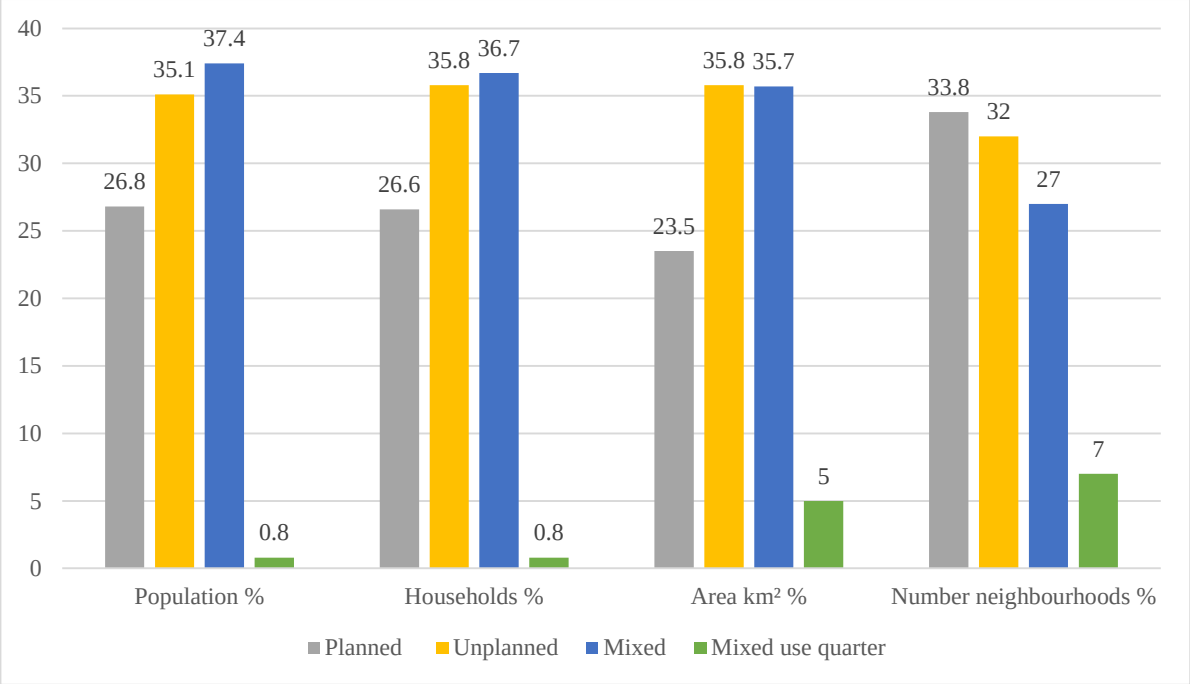
mixed or semi-planned neighbourhoods. Regarding population size, the number of households, and the areas they occupy, the mixed neighbourhoods are predominant.

Figure 2: Quantification (%) of Kigali neighbourhoods on built-up area in 2020



Planned neighbourhoods in Kigali are developed according to a physical plan, featuring organized road networks, demarcated plots, and low-density single-family homes made from durable materials. They are well-served with infrastructure and amenities, primarily housing high-income residents, with a few middle-class households. These neighbourhoods can be categorized into five subtypes: luxurious multi-storey houses (e.g., Nyarutarama, Rebero), private estates (e.g., Vision City, Estate 2020 Gacuriro), modern villas (e.g., Kimironko, Niboye, Kagarama), old-fashioned planned neighbourhoods (e.g., Kiyovu, Kimihurura, Kacyiru, Remera), and low-standing communities (e.g., Karama, Busanza model villages).

In contrast, unplanned neighbourhoods emerge spontaneously without any physical planning. They consist of houses built with non-durable materials, often located in hazardous areas with inadequate services. Residents are mainly low-income individuals, including daily wage workers and informal traders. Unplanned neighbourhoods can be classified into five types based on density and location, including Old High Density (e.g., Cyahafi, Muhima), New High Density (e.g., Nyabisindu), Old Low Density (e.g., Kimisagara, Gatsata), New Low Density (e.g., Rwarutabura), and Suburbs (e.g., Karembure, Gasanze).

Mixed neighbourhoods arise from three process: the merging of planned and unplanned areas surrounding a planned site, such as in Masizi and Zindiro; the upgrading of unplanned neighbourhoods through initiatives driven by residents themselves, as seen in Kabeza and Kanombe, or through government-led projects, like Agatare. Additionally, some planned neighbourhoods experience degradation due to densification, resulting in multiple small, older houses on the same plot while retaining the original planned road network, exemplified by Biryogo.

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3.1.2 Economic characteristics

The identified types mainly from spatial occupancy and housing types reflect the socio-economic characteristics of their residents. Generally, because individual well-being can considerably be affected by the physical, social, and economic environment in which they are situated (Loschiavo, 2019; Baffoe et al., 2020,2024), the identified characteristics bear out that living conditions in Kigali city neighbourhoods are not distanced from the socio-economic structure of each (neighbourhood). Therefore, those types replicate three main wealth groups.

This can be analysed through the average monthly income and perceptions about the use of money. Planned neighbourhoods are typically home too higher-income residents, who are more financially secure. Mixed neighbourhoods represent middle-income households, where financial stability varies. In contrast, unplanned neighbourhoods are associated with lower-income residents (Uwayezu and de Vries, 2020), many of whom struggle to cover essentials.

Table 2 : Average monthly take-home income after tax and deductions (%)

Income bands	**Types of neighbourhoods**			**All**
	Planned	**Mixed**	**Unplanned**	
[0-50,000]	12.0	19.9	50.3	34.8
[50,001-100,000]	5.0	13.5	24.2	17.5
[100,001-200,000]	5.8	18.7	14.2	13.4
[200,001-300,000]	7.4	19.5	5.7	9.2
[300,001-400,000]	7.0	12.0	2.7	5.8
[400,001-600,000]	13.2	6.8	1.8	5.5
[600,001-800,000]	10.3	4.8	0.8	3.8
[800,001-1,000,000]	13.6	4.0	0.2	4.0
[1,000,001-2,000,000]	17.4	0.4	0.2	4.0
2,000,001 and above	8.3	0.4	0	1.9

χ^2 576.406***

The table above shows a clear relationship between income and the type of neighborhood people live in. In the lowest income range (0-50,000), 50.3 of households live in unplanned neighbourhoods, while 12.0 live in planned areas. As income rises, unplanned neighbourhoods become less common, dropping to 24.2 in the 50,001-100,000 range and continuing to decline in higher brackets.

By contrast, planned neighbourhoods increase with income, rising from 5.0 in the 50,001-100,000 bracket to 17.4 for those earning 1,000,001-2,000,000. Mixed neighbourhoods are most common in the middle-income ranges, peaking at 19.5 for households earning 200,001-300,000. In the highest income bracket (over 2,000,001), 8.3 of households live in planned neighbourhoods, while no unplanned areas are recorded.

This data highlights a clear trend: higher-income households are more likely to reside in planned neighbourhoods, while lower-income groups are concentrated in unplanned areas and middle-income households in the mixed neighbourhoods.

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Respondents share their opinions on the level at which the generated monthly income contribute to solve their needs with reference to the last 12 months as can be seen in the table below.

Table 3: Level of satisfying needs with household income (%)

Perception on use of money	Types of neighbourhoods			Total
	Planned	Mixed	Unplanned	
Don't know	0.4	1.6	1.8	1.5
Doing very well with plenty money left after paying for essentials	53.3	15.1	8.8	20.1
Doing ok and has some money left after paying for essentials	21.1	15.9	12.0	14.9
Receives just enough money to pay for food, bills and other essentials	16.5	39.0	25.9	26.8
Occasionally short of money for essentials	8.3	24.7	37.7	28.2
Struggling to pay bills or to afford to feed everyone most of the time	0.4	3.6	13.7	8.4
Total	100.0	100.0	100.0	100.0

χ^2 308.586***

Regarding the perception on satisfying needs with the monthly income, the analysis highlights the impact of neighborhood type on household financial well-being, with planned neighbourhoods offering more financial security and unplanned neighbourhoods being more vulnerable to economic hardship.

Households in planned neighbourhoods generally enjoy greater financial stability, with the majority experiencing financial security and only a small minority facing economic challenges. In fact, 53.3% of households in these areas report being financially comfortable, with ample money remaining after covering essential expenses. This figure is notably higher compared to households in mixed and unplanned neighbourhoods. Additionally, 21.1% of households in planned areas are managing well, with some funds left after paying for necessities. Only 8.3% occasionally struggle to cover essential costs, and just 0.4% find it difficult to pay bills or afford food. These percentages are significantly lower than those observed in mixed and unplanned neighbourhoods.

In mixed neighbourhoods, financial conditions are more varied. Many households have tight budgets, with the largest group receiving just enough to cover essentials. The percentage of households doing very well is lower than in planned neighbourhoods. 15.1% of households report doing very well, with plenty of money left after essentials. 39.0% of households in mixed neighbourhoods are just receiving enough money for essentials, and 24.7% occasionally fall short of money for essentials. A small percentage (3.6%) are struggling to pay bills or afford food most of the time

Unplanned neighbourhoods are more likely to be associated with economic challenges. A significant number of households are short of money for essentials or struggling to make ends meet.

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Only 8.8% of households reported that they have been doing very well with plenty of money left after essentials. A significant portion (25.9%) is just receiving enough to cover food, bills, and other essentials, and 37.7% of households are occasionally short of money for essentials. A higher percentage (13.7%) of households in unplanned neighbourhoods are struggling to pay bills or afford food most of the time, compared to planned and mixed neighbourhoods.

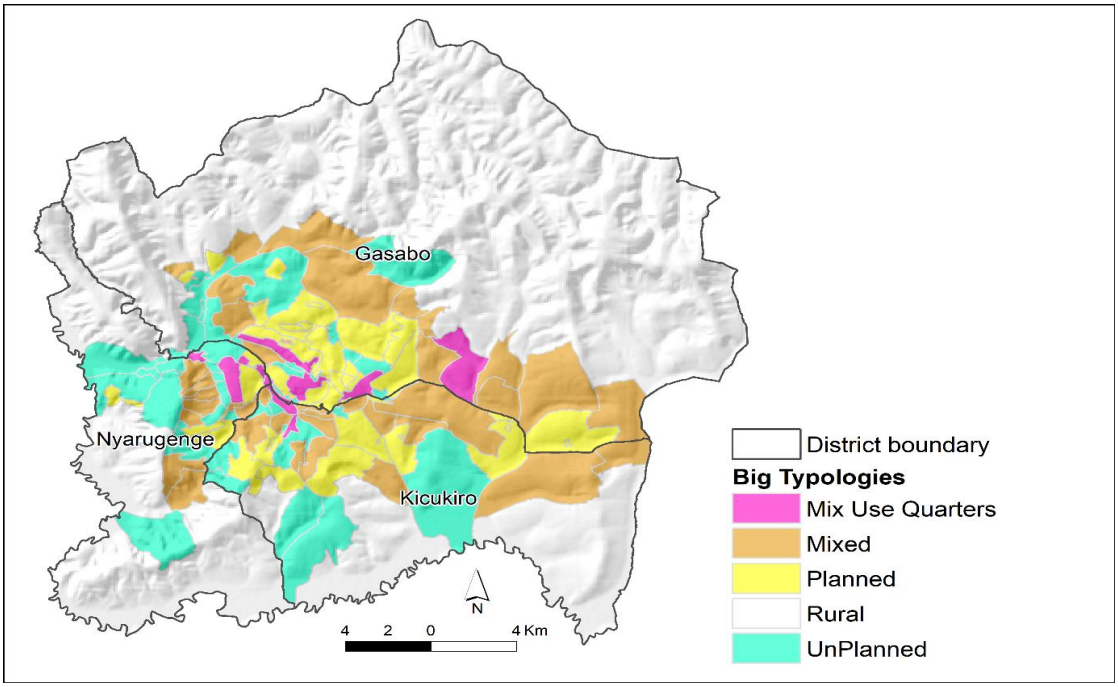
The Pearson Chi-Square test result (308.586, p-value = 0.000) suggests a strong and significant relationship between household financial planning (planned, mixed, unplanned) and their financial situation (very well, OK, just enough, short, struggling). Since the p-value is less than 0.05, the differences between groups are statistically significant.

3.1.3 Spatial distribution

Regarding the spatial distribution of neighbourhoods, most low-income neighbourhoods are in Nyarugenge district. This district has many unplanned and poor neighbourhoods like Gitega, Muhima, Rwezamenyo, Cyahafi and Kimisagara. Their residents are concentrated in the informal sector of activity in the CBD and Nyabugogo commercial hub. They prefer to live around their working place as they cannot afford the transport cost vis-à-vis their salary.

High income group lives mainly in modern neighbourhoods of Gasabo district like Nyarutarama, Kibagabaga and different private estates. The majority of the middle-income group neighbourhoods are in mixed neighbourhoods of Kicukiro. As mentioned above, these two districts have a relatively good topography that attracts real estate investors who build residential houses and estates to sell to high-income categories of urban residents.

Figure 3: Spatial distribution of the main types of neighbourhoods



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3.2. Residents' living environment across the neighbourhoods

The Kigali living environment is assessed through three key indicators: housing, basic amenities, and safety and satisfaction which together offer a comprehensive view of the quality of urban living. Housing conditions are evaluated by the type of dwelling, ownership status, and house size, which provide insight into residents' living standards. Basic amenities such as the source of drinking water, type and usage of toilet (shared or not), garbage disposal methods, cooking energy sources, and the use of a kitchen are crucial factors determining the quality of household lifestyle. Additionally, perceptions of safety, both within the home and in the neighborhood, along with overall satisfaction with one's dwelling and community, are essential for understanding residents' well-being. For all indicators, the Pearson Chi-Square value is statistically significant.

3.2 .1 Housing

This section delves into the fundamental aspects of housing, which play a crucial role in shaping residents' living conditions. It examines three key factors: the types of dwellings to understand the diversity of housing options available to residents, house ownership to explore the level of housing security, and the size of the dwelling, providing insights into space availability and its implications for family comfort.

Type of dwellings
Planned neighbourhoods are predominantly composed of detached houses (71.1%) and semi-detached houses (22.3%), reflecting higher-quality, low-density living. Mixed neighbourhoods display more variety, with detached houses (68.5%) still common, but with a presence of cluster houses (8.4%) and some informal dwellings (2.4%). Unplanned neighbourhoods are marked by cluster houses (37.6%) and a significant proportion of informal dwellings (9.5%), indicating high-density living. Overall, housing quality and density vary greatly across these neighbourhoods, with planned areas offering the most spacious and formal housing, while unplanned areas feature more informal and densely packed options.

Table 4: Types of houses (%)

Type of dwelling	Types of neighbourhoods			All
	Planned	Mixed	Unplanned	
Traditional dwelling	2.1	2.4	5.3	3.9
Detached house	71.1	68.5	29.2	47.5
Semi-detached house	22.3	7.6	5.7	9.8
Townhouse / terraced house	1.2	5.2	8.0	5.9
Cluster house in a complex	1.2	8.4	37.6	22.8
Flat/apartment & other formal dwelling	2.1	5.6	4.7	4.3
Other types of informal dwelling	0	2.4	9.5	5.8
Total	100.0	100.0	100.0	100.0

χ^2 352.025***

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House ownership

Ownership options in neighbourhoods reveal distinct patterns across types. In planned neighbourhoods, 68.6% of households own their homes outright, indicating a strong level of homeownership. In mixed neighbourhoods, this figure is lower at 59.8%, while in unplanned neighbourhoods, only 43.6% own their homes outright, reflecting higher levels of renting. Renting from private landlords is most common in unplanned neighbourhoods (52.8%) and also significant in mixed neighbourhoods (36.3%). Overall, 52.8% of households across all neighbourhoods own their homes outright, but renting is notably prevalent, particularly in unplanned areas. The category mentioned as 'Other' includes various housing ownership types including rent from government / social organization, employer provided housing and informally occupying dwelling.

Table 5: House ownership (%)

Ownership option	Types of neighbourhoods			All
	Planned	Mixed	Unplanned	
Own in full, outright	68.6	59.8	43.6	52.8
Own, paying off mortgage	2.1	3.2	1.2	1.8
Rent from private landlord	27.7	36.3	52.8	43.4
Other	1.6	0.8	2.5	2
Total	100.0	100.0	100.0	100.0

χ^2 68.603***

Size of the dwelling

The number of rooms in households varies significantly across neighborhood types. In planned neighbourhoods, many homes have 4 rooms (38.4%) or 5 rooms (30.2%), reflecting a preference for larger living spaces. In mixed neighbourhoods, the distribution is more varied, with 3 rooms (20.7%) and 4 rooms (34.3%) being common, while 2 rooms account for 21.5%. Conversely, unplanned neighbourhoods show a higher prevalence of smaller homes, with 3 rooms (25.4%) and 2 rooms (21.5%) being the most common. Overall, 32.5% of all households have 4 rooms, highlighting a trend towards larger homes in planned areas, while unplanned neighbourhoods tend to have a higher number of smaller dwellings.

Table 6: Number of the rooms of the dwelling (%)

Nr of rooms	Types of neighbourhoods			All
	Planned	Mixed	Unplanned	
1	0	1.2	7.3	4.3
2	0	2.4	21.5	12.4
3	7.9	20.7	25.4	20.4
4	38.4	34.3	29.4	32.5
5	30.2	31.1	11.7	20.2
6 and more	23.50	10.40	4.70	10.20
Total	100.0	100.0	100.0	100.0

χ^2 267.520***

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3.2.2 Basic amenities

This section focuses on the essential basic amenities that significantly impact daily living standards within urban neighbourhoods. It explores various aspects, including the sources of drinking water, the types of toilets available, and the prevalence of shared toilet facilities. Additionally, the analysis covers garbage disposal methods, and the types of cooking energy utilized by residents, along with how kitchens are used in different households. By examining these critical components, we gain valuable insights into the quality of life, health, and hygiene conditions within communities, ultimately highlighting the disparities that may exist among different neighborhood types.

Source of drinking water

The main source of drinking water used by households varies significantly across neighborhood types. In planned neighbourhoods, a predominant 80.6% of households drink mineral water purchased from vendors. This is affordable by the rich families. Conversely, in mixed neighbourhoods, 60.6% of households rely on piped water from a garden or yard, while 22.7% also purchase water from vendors. In unplanned neighbourhoods, access to water is more challenging, with 37.4% using street taps or stand-pipes and 44.1% relying on piped water in the yard. Overall, the reliance on vendor-purchased water is markedly higher in planned neighbourhoods and highlights significant disparities in water access across different neighbourhoods.

Table 7: Main source of water used by the household for drinking (%)

Source of water	Types of neighbourhoods			Total
	Planned	Mixed	Unplanned	
Piped / tap – inside house	9.9	8.8	2.0	5.3
Piped / tap – in garden/ yard	8.7	60.6	44.1	40.0
Street taps or stand-pipes	0.8	4.8	37.4	21.8
Hand-pumps, borehole, river or other	0	3.2	5.9	4
Water purchased from vendor	80.6	22.7	10.5	28.8
Total	100.0	100.0	100.0	100.0

χ^2 579.488***

Type and usage of toilet

The type of toilet used by households varies significantly among different neighbourhoods. In planned neighbourhoods, a substantial 69.8% of households have flush toilets linked to public sewers, indicating higher sanitation standards. In contrast, mixed neighbourhoods show a strong reliance on pit latrines, with 73.3% of households using them, and only 26.7% having access to flush toilets. The situation is even more pronounced in unplanned neighbourhoods, where 84.6% of households rely on pit latrines, while only 15.4% have flush toilets. Overall, the data reveals significant disparities in toilet access and sanitation facilities across neighborhood types, with planned neighbourhoods exhibiting the highest standards.

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Table 8 : Type of toilet (%)

Type of toilet	Types of neighbourhoods			Total
	Planned	Mixed	Unplanned	
Flush toilet linked to public sewer	69.8	26.7	15.4	30.1
Pit latrine	30.2	73.3	84.6	70.0
Total	100.0	100.0	100.0	100.0

χ^2 308.248***

The use of toilets varies significantly across neighborhood types. In planned neighbourhoods, an overwhelming 99.2% of households have their own toilets, indicating a high level of sanitation and privacy. In mixed neighbourhoods, this figure drops to 88.4%, with some households sharing toilets. In unplanned neighbourhoods, only 49.9% have their own toilets, while a notable 50.1% rely on neighbour's or shared toilets, reflecting lower sanitation standards and increased vulnerability. Overall, there is a marked disparity in toilet ownership, with planned neighbourhoods providing the greatest access to private sanitation facilities.

Table 9: Usage of toilet (%)

Use of toilet	Types of neighbourhoods			Total
	Planned	Mixed	Unplanned	
Own toilet	99.2	88.4	49.9	69.7
Neighbour's or shared toilet	0.8	11.6	50.1	30.3
Total	100.0	100.0	100.0	100.0

χ^2 14.700**

Garbage disposal

The mode of waste collection differs significantly among neighborhood types. In planned neighbourhoods, nearly all households (99.6%) benefit from door-to-door waste collection, indicating a high standard of waste management. In mixed neighbourhoods, this percentage drops to 82.5%, while 82.1% of households in unplanned neighbourhoods also have access to door-to-door collection, demonstrating a relatively good level of service. However, a notable 17.5% of mixed neighbourhoods and 17.9% of unplanned neighbourhoods rely on alternative waste disposal methods, such as open dumping or burning. This is because in these neighbourhoods' residents still have space that they can use for garden agriculture and use waste as fertilizer. Overall, while door-to-door collection is prevalent, unplanned neighbourhoods still face challenges in waste management compared to planned areas.

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Table 10 : Mode of garbage disposal per neighbourhoods (%)

Collection mode	Types of neighbourhoods			Total
	Planned	Mixed	Unplanned	
Door-to-door collection	99.6	82.5	82.1	86.1
Other (burnt, open dumping, fertilizer)	0.4	17.5	17.9	13.9
Total	100	100	100	100

χ^2 58.153***

Source of main cooking energy

The type of cooking energy used by households varies significantly across neighborhood types. In planned neighbourhoods, a dominant 81.4% of households use gas for cooking, with only 5.4% relying on electricity. In contrast, mixed neighbourhoods show a more diverse energy usage, with 54.6% using gas and 40.2% utilizing charcoal. In unplanned neighbourhoods, charcoal is the primary cooking fuel, with 65.3% of households relying on it, while only 28.5% use gas. The reliance on electricity remains minimal across all types, with just 1.7% overall. This data highlights a clear disparity in cooking energy sources, with planned neighbourhoods showing the highest use of gas, while unplanned areas predominantly depend on charcoal.

Table 11: Main type of energy for cooking (%)

Type of cooking energy	Types of neighbourhoods			Total
	Planned	Mixed	Unplanned	
Electricity	5.4	0.4	0.8	1.7
Gas	81.4	54.6	28.5	46.3
Charcoal	13.2	40.2	65.3	47.9
Wood and other natural materials	0	4.8	5.4	4
Total	100.0	100.0	100.0	100.0

χ^2 276.628***

Use of kitchen

The data on household options reveals significant differences across neighborhood types. In planned neighbourhoods, an overwhelming 98.8% of households affirmatively respond to having access to the specified option, indicating high availability and service standards. In mixed neighbourhoods, this percentage decreases to 88.8%, suggesting slightly less access but still a strong majority. In unplanned neighbourhoods, only 52.1% of households have access, while a considerable 47.9% indicate they do not, reflecting substantial disparities in access to services. Overall, the trend shows that planned neighbourhoods enjoy the highest levels of access, while unplanned areas face significant challenges.

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Table 12: Household use of sole or not of a kitchen (%)

Option	Types of neighbourhoods			Total
	Planned	Mixed	Unplanned	
Yes	98.8	88.8	52.1	70.9
No	1.2	11.2	47.9	29.1
Total	100.0	100.0	100.0	100.0

χ^2 232.876***

3.2.3 Safety and satisfaction

This section examines two critical aspects of urban living: safety and satisfaction. It explores the perception of safety within individual dwellings, assessing how secure residents feel in their homes and in their neighbourhoods during the daytime. Additionally, the analysis considers residents' perceptions of crime levels, providing insight into their overall sense of security. Lastly, it evaluates satisfaction with dwelling conditions, highlighting how these factors collectively contribute to residents' quality of life and well-being in their respective neighbourhoods.

Safety inside own dwelling

The level of safety perceived by households varies significantly across neighborhood types. In planned neighbourhoods, a substantial 87.2% of residents feel completely safe, reflecting a strong sense of security. This feeling of safety is slightly lower in mixed neighbourhoods, where 84.9% report feeling completely safe, while 14.7% feel safe. In unplanned neighbourhoods, the perception of safety declines notably, with only 68.4% feeling completely safe and 25.4% considering themselves fairly safe. Additionally, 4.7% of unplanned neighborhood residents report not feeling very safe, and 1.5% feel not at all safe. Overall, planned neighbourhoods provide the highest levels of perceived safety, while unplanned areas face greater safety concerns.

Table 13: Safety inside own dwelling (%)

Level of safety	Types of neighbourhoods			All
	Planned	Mixed	Unplanned	
Completely safe	87.2	84.9	68.4	76.4
Fairly safe	12.4	14.7	25.4	20.1
Not very safe	0.4	0.4	4.7	2.7
Not at all safe	0	0	1.5	0.8
Total	100.0	100.0	100.0	100.0

χ^2 55.313***

Safety in the neighbourhood

The data reveals a clear correlation between neighborhood type and perceived daytime safety, with residents of planned neighbourhoods feeling the safest (59.9% completely safe), followed by those in mixed neighbourhoods (46.6%), and the least safe in unplanned areas (31.4%). Conversely, unplanned neighbourhoods report the highest levels of insecurity, with 19.7% feeling not very safe

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and 11.9% feeling not at all safe. Mixed neighbourhoods fall in between, with moderate levels of perceived safety.

Table 14: Safety being out alone in the neighbourhood during the daytime (%)

Level of safety	Types of neighbourhoods			Total
	Planned	Mixed	Unplanned	
Completely safe	59.9	46.6	31.4	41.2
Fairly safe	28.5	31.9	34.1	32.3
Not very safe	5.8	15.9	19.7	15.8
Not at all safe	1.2	1.6	11.9	7.1
Never go out in the day	4.5	4.0	3.0	3.6

χ^2 101.747***

The level of crime in the neighbourhoods

The responses regarding the specified option reveal notable differences across neighborhood types. In planned neighbourhoods, only 6.6% of households affirmatively respond "yes," indicating limited engagement with the option. Similarly, 6.4% of residents in mixed neighbourhoods also respond positively. However, unplanned neighbourhoods show a slightly higher affirmative response of 9.8%. Across all neighbourhoods, a significant majority of 91.7% respond "no," indicating a common lack of access or engagement with the option. Overall, the data suggests that while there is a slight variation in positive responses, the overwhelming majority in all neighborhood types do not engage with the option.

Table 15: Rate of being a victim of crimes in the neighbourhood or in home (past 2 years) (%)

Option	Types of neighbourhoods			All
	Planned	Mixed	Unplanned	
Yes	6.6	6.4	9.8	8.3
No	93.4	93.6	90.2	91.7
Total	100.0	100.0	100.0	100.0

χ^2 101.747***

Level of household satisfaction

The level of satisfaction among residents varies significantly across neighborhood types. In planned neighbourhoods, 60.7% of residents report being very satisfied with their living conditions, which is the highest satisfaction rate among all neighbourhoods. Additionally, 28.5% are satisfied, contributing to a strong overall positive sentiment. In mixed neighbourhoods, satisfaction levels are lower, with 30.3% very satisfied and a notable 46.6% satisfied. Conversely, unplanned neighbourhoods show the lowest satisfaction levels, with only 15.2% very satisfied and 37.6% satisfied. There is also a higher proportion of dissatisfaction in unplanned areas, with 17.5% dissatisfied and 3.7% very dissatisfied. Overall, planned neighbourhoods demonstrate the highest levels of satisfaction, while unplanned neighbourhoods face greater challenges in resident contentment.

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Table 16: Satisfaction in own dwelling and neighbourhood (%)

Level of satisfaction	**Types of neighbourhoods**			**All**
	Planned	**Mixed**	**Unplanned**	
Very satisfied	60.7	30.3	15.2	28.8
Satisfied	28.5	46.6	37.6	37.6
Neither satisfied nor dissatisfied	8.3	16.7	26.0	20.0
Dissatisfied	2.1	6.0	17.5	11.4
Very dissatisfied	0.4	0.4	3.7	2.2
Total	100.0	100.0	100.0	100.0

χ^2 192.879***

4. Discussion

Urbanization is a means to an end; that is, transforming the demographic composition and social structures of urban areas to enhance the quality of the living environment for city residents. The "quality of the living environment" is interpreted as the population's satisfaction with their life, based on various needs and interests. This approach considers various economic categories, working and leisure conditions, housing conditions, social security and guarantees, law enforcement and respect for individual rights, natural and climatic conditions, and indicators of environmental conservation, among others (Fomina et al., 2020). Similarly, quality of life in the city is, in theory, central to urban planning, primarily concerning neighborhood amenities and, in general, the spatial configuration of all aspects of everyday life (Kostas et al., 2021).

For residents of Kigali across neighbourhoods, the living environment is analysed through the lens of housing status (planned, unplanned, or mixed), household amenities (water, energy, housing), and neighborhood residents' socio-satisfaction.

Starting with housing, the quality of housing conditions plays a decisive role in the health status of residents (Bonnefoy, 2007). The study results reveal that the predominant type of dwelling is detached houses. In planned neighbourhoods, most of the high income households live in detached houses, while a majority of the low income households also reside in detached houses, with very few livings in traditional dwellings. On average, detached houses are more common compared to other types of dwellings. Traditional and informal dwellings in Kigali are relatively rare. This serves as a key indicator that housing in Kigali is an important domain of satisfaction and a useful predictor of liveability and quality of life in the city (Mouratidis, 2020), unlike other urbanizing cities in Africa, where substandard housing remains a significant problem (Ijasan et al., 2014). For instance, according to the United Nations Human Settlements Programme (UN-Habitat, 2020), approximately 60% of urban populations in African cities like Lagos, Nairobi, and Kinshasa live in informal settlements with inadequate housing conditions.

The study found that residents are generally satisfied with their dwellings and neighbourhoods. Consistent with Permentier et al. (2010), dwelling satisfaction is a strong predictor of neighborhood satisfaction. Residents who are satisfied with their dwellings are more likely to be content with their neighbourhoods compared to those dissatisfied with their current living conditions. Across Kigali's neighbourhoods, both affluent and low-income, residents report high satisfaction with

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their living environments, particularly in terms of housing. The study also revealed a weak association between the quality of the living environment and residents' overall satisfaction. Contrary to theoretical expectations, residents of Kigali's unplanned settlements expressed substantial satisfaction with their living environments.

Furthermore, the study findings align with Wamba et al. (2021), who assert that urbanization in developing countries must be a solution rather than a challenge for residents' living conditions. One of the critical issues in many developing cities is poor or non-existent access to drinking water. However, in Kigali, access to drinking water is not a significant challenge. Most residents, from rich to poor, have access to water via taps within their gardens, while wealthier households often have indoor plumbing. Although some purchase water from vendors, access remains relatively straightforward. When it comes to safety, indeed, the findings indicate that safety is not a major concern for residents across Kigali's neighbourhoods. In contrast to the pockets of poverty and rising urban crime evident in other African cities (African Policy Cycle, 2020), Kigali neighbourhoods show a remarkable distinction, as most residents feel safe and secure. For example, the African Development Bank (2022) reports that cities like Johannesburg and Cairo experience higher rates of urban crime, particularly in informal settlements, where poverty and lack of infrastructure contribute to insecurity.

However, safety is better perceived in planned neighbourhoods, where wealthier residents live, compared to unplanned neighbourhoods where poorer residents reside. Related to this situation, residents, especially the poor, are much safer when they are inside their dwellings than when they are outside alone. More efforts could be devised to ensure security is fully guaranteed, particularly during the day when residents are alone outside their homes.

For a neighborhood to be sustainable, its residents ought to live in harmony with their urban environment from one generation to the next (Valenzuela et al., 2022). Personal and household characteristics, one of three main determinants of neighborhood satisfaction, influence the impact of spatial attributes on neighborhood satisfaction, as well as assessments of neighborhood characteristics (Mantey, 2021). Neighborhood satisfaction is not only an element of a socially sustainable neighborhood but also an intrinsic component of quality of life (reflected in life satisfaction), determined by both the opportunities created by the built environment and individual perceptions of what is important in life (Mantey, 2021).

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The findings from this study reflect that Kigali residents are satisfied with their neighbourhoods. On average, 49.4% of residents report being satisfied with life in their neighbourhoods, largely due to the availability of basic needs and amenities.

Since neighbourhoods remain the most basic unit of the city and affect the quality of life of residents (Hur et al., 2008), this study demonstrated that both planned, unplanned, and mixed neighbourhoods in Kigali have basic conditions for meeting human needs. In contrast to Lall et al. (2017), who argue that many African cities are overcrowded with people lacking adequate formal housing and infrastructure, this study presents Kigali as an exception. For example, while cities like Lagos and Kampala struggle with high population densities and inadequate infrastructure, Kigali maintains a balanced urban growth with sufficient housing and services (World Bank, 2021). Across its neighbourhoods, home ownership is not a significant challenge, as the poor own their own homes and are satisfied with their living environments. Regardless of income level - whether rich, middle class, or poor - residents generally have access to drinking water, and security is not a major issue.

Most strikingly, the study confirms that Kigali residents are more satisfied with their living conditions than residents in other rapidly urbanizing African cities. According to the International Institute for Environment and Development (IIED, 2023), Some African cities like Nairobi and Addis Ababa face significant challenges in maintaining living standards amidst rapid urbanization, including inadequate infrastructure, rising inequality, and insufficient public services. Based on the study's findings, it can be concluded that living conditions in Kigali neighbourhoods align with Sagitova (2018), who argues that in all countries of the world, including Rwanda, priority areas for sustainable living conditions should include environmental regulation and the creation of conditions that meet human needs.

5. Conclusion

The current study provides valuable insights into livelihoods in urban African settings, focusing on neighbourhoods as a fundamental unit for urban studies. The research presents evidence on various aspects of living conditions and inequality, particularly within the context of Kigali, one of Africa's fastest-growing cities. The survey revealed significant differences in housing types across neighbourhoods. For example, most respondents from higher-income areas reported living in detached houses, while those from lower-income neighbourhoods typically resided in cluster houses within complexes. This housing disparity highlights broader socio-economic inequalities across the city's neighbourhoods.

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Additionally, the study observed high levels of resident satisfaction across Kigali's neighbourhoods, which distinguishes the city from other rapidly urbanizing cities. However, there are differences in access to key household amenities, such as drinking water, toilets, and kitchens. An exception is observed in the modes of garbage disposal, with over 80% of households benefiting from door-to-door collection services. As such, urban planning policies must focus on improving living environments for residents, recognizing that urbanization can be a solution rather than a challenge. Overall, the findings suggest that Kigali is making commendable progress in improving residents' livelihoods, with a notable exception in sanitation and hygiene, positioning it among the cleanest cities in Africa.

Conducted at the neighbourhood level, this study offers a detailed examination of living conditions, a perspective that is often overlooked in city-level analyses. By focusing on neighbourhoods, it highlights the importance of this approach as a more insightful framework for assessing urban resilience and sustainability, and recommends it for addressing urban inequality and promoting sustainable development in Kigali and other cities across Africa.

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