



## RESEARCH ARTICLE

### URBAN SPATIAL STRUCTURE, ACCESSIBILITY AND MOBILITY: ASSESSING THE ROLE OF DECENTRALISED URBAN HUBS IN OUAGADOUGOU, BURKINA FASO

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#### ABSTRACT

Rapid urban growth in many African cities has reinforced monocentric urban structures characterised by the concentration of employment, educational institutions, commercial activities and public services within central urban districts. This spatial organisation generates extensive commuting flows, increases travel distances and contributes to growing road safety challenges. Ouagadougou, the capital city of Burkina Faso, illustrates these dynamics through rapid urban expansion, increasing mobility demand and a high incidence of road traffic accidents. This study investigates the extent to which the development of decentralised urban hubs can contribute to safer and more sustainable mobility patterns in Ouagadougou. A mixed-methods approach was adopted, combining documentary analysis, field observations, mobility surveys, traffic counts and semi-structured interviews. Data were collected from 230 participants, including urban residents, transport users and institutional stakeholders involved in urban planning, mobility management and road safety. The findings reveal that daily mobility is strongly influenced by the concentration of activities within the metropolitan core. Employment-related trips account for 39% of total journeys, while educational trips represent 27% of travel demand. Traffic congestion is particularly severe along the city's major radial corridors, with Travel Time Index values reaching 4.0 on some routes, thereby increasing users' exposure to road traffic risks. The results further show that 87% of respondents consider decentralised urban hubs an effective strategy for reducing travel distances, improving accessibility and mitigating road safety risks. However, the effectiveness of these hubs depends on their capacity to accommodate major trip-generating functions, particularly employment opportunities, educational facilities and commercial services. The study concludes that road safety should be considered not only as a transport issue but also as an urban planning challenge. By promoting a more balanced distribution of urban functions, decentralised urban hubs can reduce travel exposure, enhance accessibility and support safer mobility outcomes. The findings provide practical evidence for integrating land-use planning and transport policies in rapidly urbanising African cities.

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## INTRODUCTION

Urbanisation is transforming cities worldwide and profoundly reshaping patterns of land use, economic activity and mobility. According to the United Nations (2019), nearly 68% of the global population is expected to live in urban areas by 2050, with Sub-Saharan Africa accounting for a substantial share of this growth. While urbanisation can stimulate economic development and social transformation, it also generates major challenges related to accessibility, infrastructure provision, mobility management and environmental sustainability (UN-Habitat, 2022). African cities are among the fastest-growing urban areas globally. Their expansion is frequently characterised by peripheral residential growth, low-density development and weak coordination between land-use planning and transport systems (Fox et al., 2018;

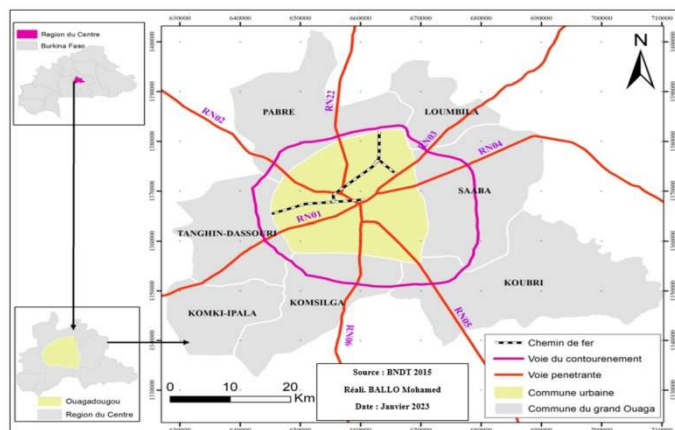
Pieterse & Parnell, 2014). As a consequence, employment opportunities, educational institutions, commercial activities and public services often remain concentrated within central urban districts, while residential areas continue to spread towards the urban fringe (Turok & McGranahan, 2013). This spatial imbalance generates increasing travel demand and contributes to longer commuting distances. The relationship between urban form and mobility has been widely documented in the literature. Studies show that the spatial organisation of cities significantly influences travel behaviour, accessibility conditions and transport demand (Cervero & Kockelman, 1997; Ewing & Cervero, 2010). In rapidly expanding metropolitan areas, the concentration of urban functions within a limited number of locations often results in heavy commuting flows, traffic congestion and growing dependence on motorised

transport modes (Banister, 2008; Handy, 2020). These challenges are particularly important in relation to road safety. According to the World Health Organization (2023), approximately 1.19 million people die annually in road traffic crashes worldwide, with low- and middle-income countries accounting for the overwhelming majority of fatalities. In African cities, rapid motorisation, insufficient transport infrastructure and weak traffic management systems further increase road safety risks. Although road safety policies traditionally focus on engineering measures, enforcement and behavioural change, increasing attention is being paid to the role of urban planning in influencing travel exposure and accident risks (Litman, 2022; Wegman et al., 2017). In this context, polycentric urban development has emerged as a promising planning strategy. Polycentricity refers to an urban structure characterised by multiple interconnected activity centres distributed across the metropolitan area rather than concentrated within a single dominant core (Meijers, 2008; OECD, 2012). By decentralising employment opportunities, public services and commercial activities, polycentric development seeks to improve accessibility, reduce excessive commuting and promote more balanced territorial development (Burger & Meijers, 2012; Veneri & Burgalassi, 2012). Ouagadougou, the capital city of Burkina Faso, provides a relevant case study for examining these issues. Over recent decades, the city has experienced rapid demographic growth and extensive spatial expansion. According to the National Institute of Statistics and Demography (INSD, 2022), Ouagadougou had more than 2.4 million inhabitants in 2019. Urban growth has been accompanied by the expansion of peripheral residential districts and increasing daily commuting flows towards the metropolitan core. At the same time, motorcycles have become the dominant mode of urban transport, increasing users' exposure to road traffic risks (Nikiema & Bonnet, 2021). To address these challenges, public authorities have promoted the development of decentralised urban hubs through programmes such as the second phase of the Ouagadougou Sustainable Development Project (PDDO II). These interventions aim to strengthen local service provision and improve accessibility within peripheral areas. However, limited empirical evidence exists regarding the extent to which such spatial planning initiatives can contribute to safer and more sustainable mobility outcomes. This study therefore investigates the relationship between urban spatial structure, accessibility, mobility patterns and road safety in Ouagadougou. Specifically, it examines whether the development of decentralised urban hubs can reduce travel exposure and contribute to safer mobility conditions. The article argues that road safety should be understood not only as a transport issue but also as an urban planning challenge. By improving the spatial distribution of urban functions, decentralised urban hubs may reduce travel demand, improve accessibility and support more sustainable mobility patterns in rapidly urbanising African cities.

### Study area and methodology

**Study area:** The study was conducted in Ouagadougou (see figure 1), the capital city of Burkina Faso and the country's principal economic and administrative centre. Located in the central part of the country, Ouagadougou has experienced rapid demographic and spatial growth over the last three decades. According to the National Institute of Statistics and Demography (INSD, 2022), the city had a population exceeding 2.4 million inhabitants in 2019, representing nearly

12% of the national population. Urban expansion has been characterised by the proliferation of peripheral residential neighbourhoods, many of which remain poorly served by public facilities and transport infrastructure. Consequently, a large proportion of daily trips are directed towards the city centre where most administrative services, commercial activities and employment opportunities remain concentrated. This spatial configuration generates significant travel demand and contributes to increasing traffic congestion and road safety challenges.



**Fig. 1. Geographic location of the study area in Ouagadougou, Burkina Faso**

**Research design:** This study adopted a mixed-methods approach combining quantitative and qualitative data collection techniques. The approach was selected to capture both measurable mobility characteristics and stakeholder perceptions regarding accessibility, urban development and road safety. Primary data were collected through questionnaire surveys, semi-structured interviews and field observations. Secondary data were obtained from planning documents, statistical reports and previous studies related to urban mobility and territorial development in Ouagadougou.

**Data collection:** A total of 230 stakeholders participated in the study (see table 1). The sample included 203 urban residents and transport users surveyed in public spaces, workplaces and commercial areas, as well as 27 technical experts and institutional representatives involved in urban planning, mobility management and road safety governance. Questionnaire surveys focused on travel behaviour, mobility constraints, accessibility conditions and perceptions regarding the development of decentralised urban hubs. Semi-structured interviews were conducted with institutional actors to collect information on urban planning strategies, mobility policies and road safety challenges. Field observations were also undertaken in selected neighbourhoods to assess the spatial distribution of urban facilities and the characteristics of mobility patterns within the city.

**Table 1. Distribution of survey participants by stakeholder category**

Stakeholder category	Number of participants
Urban residents and road users interviewed in public spaces, workplaces and commercial areas	203
Technical experts and institutional representatives from public agencies, local authorities and organisations responsible for urban planning, mobility management and road safety	27
<b>Total</b>	<b>230</b>

Source: BALLO Mohamed Ibrahim, field surveys, janvier 2025

**Data analysis**

Quantitative data were processed using descriptive statistical techniques, including frequency distributions and percentage analysis. Qualitative information obtained through interviews was analysed using thematic content analysis. The analysis focused on identifying relationships between urban spatial structure, accessibility conditions, travel demand and road safety outcomes. Particular attention was paid to the perceived contribution of decentralised urban hubs in reducing travel distances, improving accessibility and enhancing road safety conditions.

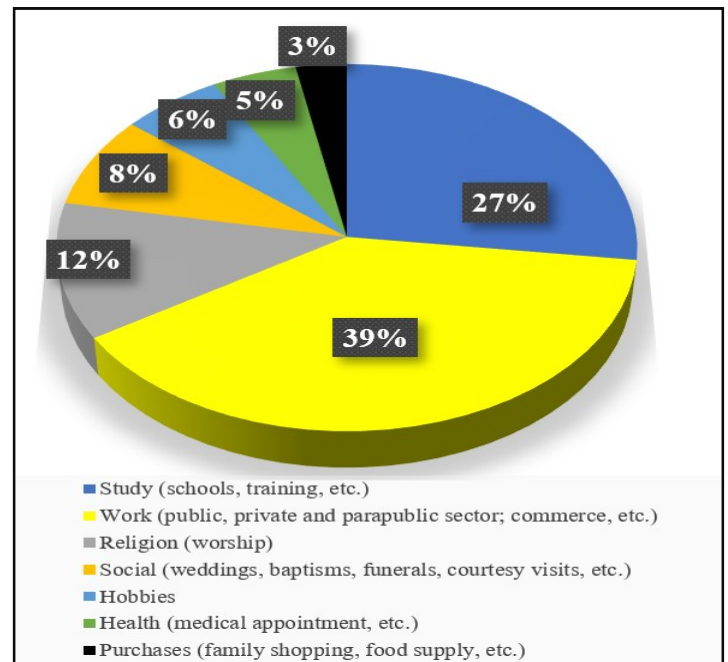
**Analytical framework:** The study is based on the assumption that urban spatial structure influences the distribution of activities and services across the city. This distribution affects accessibility conditions, which in turn shape travel demand and mobility patterns. Mobility patterns determine travel exposure levels and ultimately influence road safety outcomes. Within this framework, the development of decentralised urban hubs is expected to improve accessibility, reduce travel exposure and contribute to safer and more sustainable mobility.

**Research limitations:** Several limitations should be acknowledged. First, part of the analysis relies on stakeholders' perceptions concerning the expected impacts of decentralised urban hubs, which may differ from long-term observed outcomes. Second, the study focuses on a single metropolitan area, thereby limiting the direct transferability of findings to other urban contexts.

Third, while traffic counts and mobility surveys provide valuable evidence regarding current mobility conditions, longitudinal data would be necessary to assess the long-term effects of ongoing urban development interventions on road safety. Nevertheless, the combination of documentary analysis, stakeholder interviews, mobility surveys, traffic observations and spatial analysis strengthens the reliability of the findings and provides a robust basis for understanding the relationships between urban form, mobility patterns and road safety in Ouagadougou.

**RESULTS**

**Mobility patterns and travel demand in Ouagadougou:** The findings indicate that mobility patterns in Ouagadougou remain strongly influenced by the city's predominantly monocentric urban structure. Although residential neighbourhoods have expanded considerably towards peripheral areas, most employment opportunities, educational institutions, administrative services and commercial activities remain concentrated within the city centre. Consequently, daily commuting flows are largely oriented towards the metropolitan core. Motorcycles constitute the dominant mode of transport and remain the primary means of mobility for a large proportion of urban residents. While they provide flexible and affordable mobility, their widespread use increases exposure to road traffic risks, particularly on congested urban corridors. Survey results reveal that travel demand is mainly generated by employment and educational activities. Work-related trips account for approximately 39% of reported journeys, while educational trips represent 27% of total travel demand. Other travel purposes include access to markets, healthcare services, religious activities and leisure opportunities (see figure 2).



Source: BALLO Mohamed Ibrahim, field surveys, June 2025

**Fig. 2. Main travel purposes in Ouagadougou**

The predominance of work and education as major trip generators suggests that any strategy aimed at reducing travel demand should prioritise the decentralisation of these functions within peripheral urban districts.

**Travel exposure and congestion dynamics:** The concentration of activities within the city centre contributes to high levels of travel exposure among urban residents. Travel Time Index (TTI) calculations reveal significant congestion along the principal radial corridors connecting peripheral neighbourhoods to central destinations (see table 2).

**Table 2. Travel Time Index by major corridor in Ouagadougou**

Corridor	TTI	Condition
NR1	1.6	Moderate
NR2	4.0	Critical
NR4	2.5	Severe
NR6	3.8	Critical

Source: BALLO Mohamed Ibrahim, field surveys, September 2025

The most critical congestion levels were observed along National Roads 2 and 6, where travel times during peak periods were almost four times longer than under free-flow conditions. These findings indicate that a substantial proportion of daily mobility is concentrated along a limited number of corridors, increasing travel times and users' exposure to accident risks.

**Road safety challenges and mobility risks:** The mobility patterns identified above have important implications for road safety. Data obtained from the National Road Safety Office indicate that the Centre Region consistently records the highest number of road traffic accidents in Burkina Faso. Given the concentration of population and economic activities within Ouagadougou, the city constitutes the principal hotspot of road traffic injuries nationwide. Interviews conducted with transport officials and road safety practitioners emphasised the role of mobility exposure in shaping accident risks. Respondents frequently associated increasing accident rates with longer commuting distances, growing traffic volumes and the

widespread use of motorcycles. Field observations further revealed that congestion contributes to risky driving behaviours, including unsafe overtaking manoeuvres, excessive speed variations and conflicts between different categories of road users. These behaviours are particularly prevalent along major radial corridors connecting peripheral neighbourhoods to the city centre. The predominance of motorcycles amplifies these risks. Unlike occupants of private vehicles, motorcycle users benefit from limited physical protection and are therefore more vulnerable to severe injuries in the event of a collision. This situation reinforces the importance of reducing unnecessary travel demand as part of broader road safety strategies. The results suggest that road safety cannot be understood solely through behavioural or engineering perspectives. Rather, accident risks appear closely linked to the spatial organisation of activities that generate daily travel demand.

**Stakeholder perceptions of decentralised urban hubs:** A central objective of this study was to assess perceptions regarding the potential contribution of decentralised urban hubs to improving mobility conditions and road safety outcomes. The results reveal strong support for the development of decentralised urban hubs among both institutional stakeholders and urban residents. Approximately 87% of respondents considered that the creation or strengthening of local service centres could significantly reduce long-distance commuting within the city (see table 3).

Interviewees emphasised that many daily journeys are undertaken because essential services remain concentrated within the metropolitan core. According to respondents, increasing the availability of educational facilities, healthcare services, markets, administrative offices and recreational amenities within peripheral areas would reduce the need for residents to travel long distances. Several stakeholders also highlighted the relationship between accessibility and safety. In their view, shorter travel distances would reduce exposure to traffic risks while simultaneously improving quality of life. The development of local service centres was therefore perceived not only as an urban planning intervention but also as a road safety strategy. The findings further indicate that the effectiveness of decentralised urban hubs depends on their capacity to accommodate functions associated with the main generators of travel demand. Since work and education represent the principal reasons for daily mobility, investments targeting employment opportunities, schools and vocational training facilities are likely to generate the greatest impacts on travel reduction.

**Table 3. Perceived benefits associated with the development of local urban hubs**

Perceived benefit	Share of respondents (%)
Reduced travel exposure and lower risk of road traffic accidents	87
Shorter commuting times and reduced delays	4
Improved access to essential urban services (healthcare facilities, schools, markets, etc.)	7
Lower household expenditure on transportation	2
<b>Total</b>	<b>100</b>

Source: BALLO Mohamed Ibrahim, field surveys, June 2025

**Emerging dynamics of polycentric urban development:** Recent urban development initiatives suggest the emergence of a gradual transition towards a more polycentric urban structure in Ouagadougou. Through the implementation of the PDDO II programme, significant investments have been directed towards peripheral areas in order to improve accessibility and strengthen local urban functions. These investments include the construction and upgrading of transport facilities, markets, educational infrastructure, public spaces and community services. One notable example is the development of the West Bus Terminal, which seeks to improve transport connectivity while reinforcing the role of peripheral urban centres. Stakeholders generally perceive these interventions as positive steps towards a more balanced urban structure. By redistributing services and economic opportunities throughout the metropolitan area, decentralised urban hubs may reduce dependence on the city centre and improve accessibility for residents living in peripheral districts. However, respondents also stressed that the long-term success of this strategy depends on maintaining coherence between urban planning policies and mobility planning objectives. The mere construction of infrastructure is unlikely to achieve significant mobility benefits unless accompanied by investments capable of attracting economic activities, public services and employment opportunities. Overall, the results suggest that decentralised urban hubs have the potential to contribute to safer and more sustainable mobility patterns. Their effectiveness, however, depends on their ability to function as genuine centres of activity capable of modifying existing travel behaviours and reducing the need for long-distance commuting.

## DISCUSSION

**Road safety as an urban planning challenge:** The findings of this study suggest that road safety should not be understood exclusively as a transport engineering or traffic management issue. Rather, they demonstrate that road safety is intrinsically linked to urban spatial organisation and land-use planning decisions. This perspective aligns with a growing body of literature arguing that mobility outcomes are shaped not only by transport infrastructure but also by the spatial distribution of activities and opportunities within cities (Ewing & Hamidi, 2015; Litman, 2022). In Ouagadougou, the concentration of employment opportunities, educational institutions, administrative services and commercial activities within the metropolitan core generates substantial daily commuting flows from peripheral residential areas. As demonstrated by the Travel Time Index analysis, these flows create congestion along major corridors and increase the time spent within the transport system. Since road safety risks are strongly associated with travel exposure, longer and more frequent journeys inevitably increase the probability of accidents (Wegman et al., 2017). These findings support the argument that urban form constitutes a structural determinant of mobility-related risks. While behavioural interventions and enforcement measures remain essential components of road safety policies, they may not adequately address the underlying spatial factors that generate excessive travel demand. Consequently, strategies aimed at reducing travel exposure through improved urban accessibility deserve greater attention within road safety frameworks. The case of Ouagadougou therefore reinforces calls for a more integrated approach to transport planning and urban development. Such an approach

recognises that mobility patterns are largely produced by land-use decisions and that safer mobility requires interventions extending beyond the transport sector alone.

**Polycentric development and accessibility enhancement:**

The results further indicate that the development of decentralised urban hubs may contribute to improving accessibility and reducing dependence on the metropolitan core. This finding is consistent with theories of polycentric urban development, which advocate the decentralisation of urban functions as a means of improving territorial balance and reducing excessive commuting (Burger & Meijers, 2012; Meijers, 2008). The strong support expressed by respondents for the development of decentralised urban hubs reflects widespread recognition of existing accessibility deficits within the city. The concentration of services and opportunities within a limited number of locations forces many residents to undertake long journeys to satisfy routine daily needs. This situation is particularly problematic for low-income households, which often face significant mobility constraints and transport costs. The findings suggest that the effectiveness of decentralised urban hubs depends not merely on physical infrastructure investments but on their capacity to host functions associated with major trip generators. In the case of Ouagadougou, employment and education account for the largest share of travel demand. Consequently, investments targeting schools, vocational training institutions, commercial facilities and employment opportunities are likely to generate greater mobility benefits than investments focused solely on public amenities.

This observation confirms previous research indicating that accessibility improvements depend primarily on the spatial distribution of opportunities rather than on transport infrastructure alone (Geurs & van Wee, 2004). Urban centres that fail to attract significant economic and social activities may have limited influence on mobility patterns despite substantial public investment. The findings also resonate with contemporary debates surrounding proximity-based planning approaches such as the “15-minute city” concept (Moreno et al., 2021). Although developed within different socio-economic contexts, both approaches emphasise the importance of reducing unnecessary travel by bringing essential services closer to residents. In rapidly urbanising African cities, however, the challenge lies not only in improving proximity but also in ensuring equitable access to employment and economic opportunities across metropolitan territories.

**From mobility management to travel demand reduction:**

A significant contribution of this study lies in its emphasis on travel demand reduction as a road safety strategy. Conventional transport policies often seek to improve mobility by increasing road capacity, enhancing traffic management systems or strengthening public transport services. While such measures remain important, they frequently focus on accommodating mobility demand rather than reducing its underlying causes. The results obtained in Ouagadougou suggest that substantial mobility demand originates from spatial imbalances between places of residence and activity centres. As urban expansion continues, these imbalances may become even more pronounced unless urban development policies actively promote a more balanced distribution of services and opportunities. From this perspective, decentralised urban hubs can be viewed as instruments for managing mobility demand through spatial planning. By reducing the

need for long-distance commuting, they may decrease traffic volumes, alleviate congestion and reduce exposure to accident risks. Such outcomes would contribute not only to road safety but also to broader sustainability objectives, including lower transport costs, reduced emissions and improved quality of life. This argument supports emerging accessibility-based planning paradigms that prioritise access to opportunities rather than movement itself (Handy, 2020; Litman, 2022). Rather than measuring success solely in terms of travel speed or traffic flow, accessibility-oriented approaches evaluate the extent to which urban residents can satisfy their daily needs within reasonable spatial and temporal constraints. The findings therefore suggest that reducing mobility demand through strategic spatial planning may represent a complementary pathway towards safer and more sustainable urban mobility.

**Implications for rapidly urbanising African cities:** Although this study focuses on Ouagadougou, its findings have broader relevance for many African cities experiencing rapid demographic growth and spatial expansion. Across the continent, metropolitan regions are increasingly confronted with similar challenges, including peripheral urbanisation, inadequate transport infrastructure, growing motorisation and rising road safety concerns (UN-Habitat, 2022; Turok, 2016). Many African cities continue to exhibit strongly monocentric spatial structures inherited from historical planning models and reinforced by the concentration of public and private investment within central districts. As urban populations grow, these structures generate increasing mobility pressures that existing transport systems struggle to accommodate. The experience of Ouagadougou suggests that strengthening decentralised urban hubs may constitute a viable strategy for addressing these challenges. By redistributing activities and services throughout metropolitan areas, polycentric development can improve accessibility while reducing travel exposure and transport-related vulnerabilities. However, successful implementation requires strong institutional coordination and long-term planning commitments. The creation of secondary centres should not be limited to physical infrastructure projects but should involve integrated interventions encompassing employment creation, public service provision, transport connectivity and land-use regulation. Without such integration, secondary centres may fail to attract sufficient activity to influence mobility patterns significantly. Consequently, the findings reinforce the importance of aligning urban planning and transport policies within a common framework oriented towards accessibility, sustainability and road safety. Such integration is likely to become increasingly important as African cities continue to expand and confront the challenges associated with rapid urbanisation.

## CONCLUSION

This study investigated the relationship between urban spatial structure, accessibility, mobility patterns and road safety in Ouagadougou, Burkina Faso. The findings indicate that the city's predominantly monocentric urban structure continues to shape daily mobility patterns by concentrating employment opportunities, educational facilities, commercial activities and public services within the metropolitan core. As a result, substantial commuting flows are generated between peripheral residential neighbourhoods and central urban districts, contributing to traffic congestion, extended travel times and

increased exposure to road traffic risks. The results show that employment and education are the principal drivers of travel demand, accounting for the majority of daily trips. In a context where motorcycles remain the dominant mode of transport, these mobility patterns significantly increase users' exposure to road safety risks. The study further demonstrates strong stakeholder support for the development of decentralised urban hubs as a strategy for improving accessibility and reducing travel exposure. Most respondents considered the decentralisation of services and economic activities an effective approach to limiting long-distance commuting and mitigating road safety risks. The findings highlight the importance of integrating land-use planning and transport policies in rapidly urbanising cities. Rather than addressing road safety solely through traffic management and infrastructure interventions, urban planning policies should also promote a more balanced spatial distribution of activities and services. Improving accessibility within peripheral neighbourhoods can contribute to reducing unnecessary travel demand and supporting safer mobility outcomes. This research contributes to the growing body of knowledge on urban mobility and spatial planning in Sub-Saharan Africa by providing empirical evidence from Ouagadougou. It demonstrates that decentralised urban hubs can play a significant role in improving accessibility and promoting sustainable mobility when supported by adequate public services, employment opportunities and commercial activities. Although the study focuses on a single metropolitan area and partly relies on stakeholder perceptions, it provides useful insights for urban planners, transport authorities and policymakers. Future research should evaluate the long-term impacts of completed urban development projects on travel behaviour and road safety outcomes and extend the analysis to other African cities. Overall, the study concludes that a more balanced urban structure can contribute to safer and more sustainable mobility. Strengthening decentralised urban hubs, improving accessibility and coordinating urban development with transport planning should therefore be considered key priorities for addressing mobility and road safety challenges in rapidly growing African cities.

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