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RESEARCH ARTICLE

Contribution of Paratransit Reform to Sustainable Urban Mobility in Africa: Case Study of Minibuses in Dakar, Bamako and Conakry

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ABSTRACT

Since 2001, Senegal has undertaken a reform of paratransit in Dakar with the network of the Urban Transport Funding Association (AFTU), inspiring in recent years, Bamako and Conakry. The aim of this study is to analyze the minibus networks in these three cities, based on users' travel conditions, in order to identify the mode of transport that contributes most to sustainable mobility. The methodology is based on spatial analysis using GIS data, completed by field observations and statistical and multi-criteria analysis of user survey data. The results show that minibus users travel is pendular in a context of mixed traffic, low road infrastructure density and topographical constraints. These users' express dissatisfaction with minibus comfort, crew behavior, speed and safety. However, perceptions vary significantly between networks ($p < 0.05$). The AFTU network, despite having the best score in terms of travel conditions, makes only a partial contribution to improving sustainable urban mobility. This research highlights the crucial need for appropriate governance for effective reform aimed at promoting intermodality through the integration of formal and informal transport, rather than multiplying services and road infrastructure.

INTRODUCTION

Sustainable mobility remains a major challenge for the world's cities, particularly those in Africa, which continue to welcome huge numbers of people. Inhabitants of these cities considerably increase the need for basic public services such as transport and housing (Jordová & Brůhová-Foltýnová, 2021; Robinson et al., 2021). The Urbanization and Development Section of the United Nations has shown that the urban population of Africa and Asia has risen from 35% in 2000 to 43.5% in 2020, an increase of 8.5% in 20 years. According to their estimates, by 2035, 50% of Africans and Asians will live in urban areas (Ongo Nkoa & Song, 2019). However, there are disparities in the distribution of urban population in Africa, with megacities such as Cairo, Lagos, Kinshasa, etc., having more than 10 million inhabitants; metropolises such as Dakar, Bamako, Conakry, etc., with average populations of between 3 and 10 million; and small cities with less than 3 million inhabitants, such as Libreville, Kigali, Bangui, etc. (Sène, 2018; Tabutin & Schoumaker, 2020).

In a context of weak governance of urban mobility, where urban planning, transport, and environmental issues are dealt with in a fragmented way, this rapid population growth, rather than being an asset for the city, contributes to poor urban services and reduces the competitiveness of its economy (AFD & CODATU, 2014; Martínez et al., 2021). The transversal nature of the various actions

between central and local government, the private sector and civil society should enable the implementation of sustainable urban transport systems (Stucki, 2015). In addition to the dispersal of responsibilities in urban management, particularly that of transport, the decisions generally taken are not the result of consultation between the various stakeholders, and those (decisions) that are the result of politicians are put forward to the detriment of technical ones (Jordová & Brůhová-Foltýnová, 2021). Add to this the lack of financial and human resources, as well as the physical constraints of certain cities due to their topography and land use, and you get a picture of the complexity of urban accessibility problems in Africa (Dembélé, 2017; Oviedo et al., 2022). The situation is more complicated in urban areas where the main public transport services are provided by paratransit, where the free market is beyond the control of the authorities and often creates disorder (Oviedo et al., 2022; Stucki, 2015). In the context of modernizing urban transport in Africa, the reorganization of the informal sector may seem delicate due to its weight and the reluctance of actors to change, whereas it is urgent to reform this activity in order to sustainably improve the daily lives of city dwellers(Diaou et al., 2024; Godard, 2008). This transformation of artisanal public transport (APT) aims to formalize and professionalize private operators to guarantee better performance of an integrated transport system where formal and informal offers complement rather than compete with each other (Behrens et al., 2016; Salazar Ferro, 2015).

In the literature, many authors agree on the important role played by artisanal public transport (APT) in African cities (Behrens et al., 2016; Bello & Shittu, 2014; Bruun & Behrens, 2016; Godard, 2008; Salazar Ferro, 2015). While some consider it to be an alternative solution for moving people who have moved away from city centres, mainly represented by the poor and the middle class (Guézéré, 2013). Others point out that it is also a major provider of jobs, inserting many people directly and indirectly into the labour market (Behrens et al., 2016). Nevertheless, this mode is often labelled as unsustainable by researchers such as Behrens et al. (2016) and Salazar Ferro (2015), because it does not meet environmental and service quality standards. Self-regulation of APT activity and individual operation management in a context of mixed traffic (sharing road infrastructure with all modes) exacerbates “market competition” and multiplies the negative externalities associated with urban transport (congestion, insecurity, pollution, etc.) (Dementiev & Han, 2020).

Case studies have analysed different approaches to the implementation of sustainable urban transport systems, based on integration of transport and urban planning on the one hand, and on interconnection of modes (or networks) on the other, so as to enable complementary services rather than unhealthy competition between urban transport operators (Behrens et al., 2016; Salazar Ferro, 2015). The best-known reform experiments have used mass transit systems such as Bus Rapid Transit (BRT) to accelerate the formalization of APT and prepare their connection to these transport capacity systems (Boutueil et al., 2020; Diaou et al., 2024; Schalekamp et al., 2009). In Latin America and sub-Saharan Africa, initiatives have been launched to reform the APT by financing their operators. Some researchers, such as Behrens et al. (2016), have examined minibus renewal programs in several African regions: in Nairobi (Kenya) and Dar es Salaam (Tanzania) in East Africa, in Dakar (Senegal), Accra (Ghana) and Lagos (Nigeria) in West Africa, in cities in Morocco in North Africa, and in Cape Town (South Africa) in Southern Africa. Although rare in the literature, other studies, such as that by Roux et al. (2011), have compared different modes of transport in Nairobi, Dar es Salaam and Cape Town, taking into account both formal and informal services.

Despite the significant contributions made by the literature, certain limitations remain in this field of research. On the one hand, specific studies on minibuses remain rare, particularly in the urban contexts of Dakar, Bamako and Conakry. On the other hand, few studies compare old minibus networks (OMN) with the new minibus networks (NMN) that have emerged from the reform of artisanal public transport (APT). Finally, the joint integration of spatial, statistical and multi-criteria approaches in urban mobility studies in Africa is still under-explored in existing research.

In Dakar, Bamako and Conakry, urban organization is confronted with topographical constraints and often inefficient planning. These factors contribute to the specialization of space and accentuate flows between urban centres and peripheral areas. In addition, the low density of the road network leading to the centres of activity, the predominance of poorly structured transport services, notably those of the APT, weak transport governance and insufficiently optimized traffic management, all exacerbate accessibility difficulties and worsen travel conditions for the populations of these cities. This

situation raises the question of the contribution of minibus reform, particularly through the financing of operators, to improving the transport system in these West African capitals.

Generating scientific knowledge on paratransit reform, in particular through operator funding, is an important step towards integrating urban transport services into a global system and developing intermodality. Yet few studies have examined the contribution of minibuses to mobility in Dakar, Bamako and Conakry. This research aims to fill this gap by providing the analytical insights likely to improve the organization of informal transport and the quality of services offered. It also provides an opportunity to learn from African experience in modernizing urban transport through financial support for minibus operators. In concrete terms, this research aims to assess the contribution of minibus reform to sustainable mobility in the three West African capitals mentioned above. It has three specific objectives: to analyse accessibility to high-potential travel areas; to assess user travel conditions in terms of comfort, safety, speed and crew behaviour, using the AFTU, "car rapide", "ndiaga ndiaye", "sotrama" and "magbana" networks; and finally, to identify the network that contributes most effectively to sustainable mobility in these three cities. The results obtained can be applied to other urban contexts in developing countries.

MATERIELS AND METHODS

Spatial analysis using GIS data and field observations

An integrated approach based on Geographic Information Systems (GIS) has been adopted to map, analyse and model urban transport networks. Domènech & Gutiérrez (2017), Dembélé (2017), Habibi et al. (2021) and Bouhet (2006) used spatial analysis tools, notably GIS, to study urban mobility in Costa Dorada in Spain, Bamako in Mali and the Grésivaudan valley in France respectively. For this study, analysis data were extracted from topographic maps, Sentinel-2A satellite images, Google Earth Pro orthophotos and existing road network and bus stop databases. This information was enhanced by field observations in Dakar, Bamako and Conakry. To improve accuracy, dynamic sources such as cell phone and GPS Waypoint data were also integrated. The routes served by the minibuses were vectorized in QGIS 3.24, with enriched attributes such as line type and main stops, etc.). A spatial analysis cross-referenced with urban density data from Landsat image classification was used to assess the accessibility of activity zones (centre), network coverage and territorial imbalances. These results were compared with field observations to validate and adjust the information collected. Finally, thematic maps (or network maps) were produced to identify underserved areas and support the planning of more efficient multimodal transport.

Researchers have used the field observation method to collect data during fieldwork. For example, Batarce et al. (2022) measured, on the basis of field observation, vehicle travel time, waiting time at stops and user walking time to the nearest stop in six public transport systems in Latin America. Diallo (2012) used time-measurement methodology to measure vehicle parking times in Montreal, Canada. Diaou et al. (2025) used this approach to collect data on vehicle frequency at minibus stops in Dakar, Bamako and Conakry. The same method was applied to 13 routes in each of the networks studied, including the AFTU, "car rapide" and "ndiaga ndiaye", 'sotrama' and "magbana" networks. Routes were selected on the basis of their length (short, medium and long) and the area served, enabling analysis of vehicle turnaround times at peak times on working days. In Bamako, the lines serve four zones of the urban area (East, West, North, South). In Conakry, they mainly use the RN1 and the Prince Road, linking Kaloum, Matam or Dixinn to the termini in Coyah and Dubréka via matoto. In Dakar, routes cover urban (internal to the department) and peripheral routes linking the departments of Dakar, Pikine, Guédiawaye, Rufisque and Keur Massar. The manual timing method was used, involving boarding the vehicles to record the round-trip times of the minibuses during peak hours on working days (Batarce et al., 2022; Diaou et al., 2025). Knowing the distance of the targeted routes, it was then easy to calculate the commercial speed of the vehicles (Batarce et al., 2022). These observations were also used to characterize the networks (OMN and NMN) in order to examine the criteria used to assign scores to the selected indicators in the multi-criteria analysis.

User surveys

Information on travel experiences, particularly in terms of safety, staff behaviour, comfort and speed, was collected from users. This primary data was collected using digital questionnaires designed on the Kobo toolbox platform, which facilitated data collection in real time and at distance (Aude &

Emmanuel, 2021, p. 123). The forms were developed on the basis of a literature review on analysis of the quality of public transport services, in particular artisanal public transport (APT), in a variety of contexts, whether African, from other developing cities or from developed cities around the world (Arroyo & Kumar, 2024; Behrens et al., 2016; Kittelson & Associates, Inc. et al., 2013; Nwaogbe et al., 2012; Roux et al., 2011). Subsequently, exchanges with urban mobility professionals (managers, public authorities, private actors, experts, etc.) and academics enabled us to adjust and validate the survey forms. This work was made possible by several trips to Dakar, Bamako and Conakry, carried out as part of internships or fieldwork. The questionnaires took into account the following variables:

Socio-economic characteristics of minibus users (gender, age, level of education, marital status, occupations, motive);

User reasons for travel ;

Passengers' perceptions of safety, crew behaviour, comfort and speed;

Transport modes studied included AFTU minibuses, “cars rapides”, “ndiaga ndiaye”, “sotramas” and “magbanas”. The minimum sample was calculated at 384 individuals for each city, but a total of 1,400 passengers were surveyed. The sample was distributed as follows: 600 in Dakar, 400 in Bamako and 400 in Conakry. In Bamako and Conakry, respondents were randomly selected at terminuses and strategic stops in each municipality, with 66 individuals surveyed per municipality in the Malian capital (6 municipalities) and 57 per municipality in the Guinean capital (7 municipalities), respectively. The same approach was adopted in Dakar. However, due to the existence of two separate networks (OMN and NMN), the survey covered 120 individuals per department (5 departments), i.e., 60 people per network. The minimum sample size was determined using Cochran's formula, widely used in previous work (Ajakaiye et al., 2018; Combary & Atchrimi, 2024). This formula is described in the following equation (1):

$$n = Z \times \frac{P(1 - P)}{e^2} \qquad (1)$$

Where n is the sample size, p is the proportion of the target population, Z is the confidence interval and we are the margin of error.

Statistical analysis

Normality and Chi-square tests were applied in IBM SPSS Statistics software on the basis of user survey data and route observations.

The normality test was used by Diaou et al. (2025), to assess the regularity of minibus services and fares in Dakar, Bamako and Conakry. Peled et al. (2021) used this test to analyse public transport demand in Copenhagen, Denmark. In this work, the normality test is applied to assess the regularity of minibus commercial speed in Dakar, Bamako and Conakry. The hypothesis formulated and the decision rules are similar to those of Wielechowski et al. (2020) and Diaou et al. (2025) : the null hypothesis (H0) is that the variable tested, here the commercial speed (CS) of minibuses, follows a normal distribution, the alternative hypothesis is (H1) that CS does not follow a normal distribution. The decision rule for this test is as follows:

if the calculated p-value of the Shapiro test is greater than the threshold value of 0.05, the distribution is normal, i.e., hypothesis H0 is accepted; otherwise, it is abnormal, i.e. H0 is rejected.

The Chi-square test was applied to data from user surveys, in particular on travel conditions. These include comfort, safety, speed and crew behaviour in the different networks studied. This test is used to verify the relationship between two variables (Jiang et al., 2019). In this study, it was used to analyse the relationship between minibus users' travel conditions and the network used. Nwaogbe et al. (2012), to assess the offer of tricycle in Aba, Nigeria, used both frequency analysis of users' responses to their perception of tricycle service of this mode of paratransit, and the chi-square test. Diaou et al. (2025), for their part, studying minibuses in Dakar, Bamako and Conakry, adopted the same approach to examine the accessibility of transport services of AFTU, “car rapide, ndiaga ndiaye”, ‘sotrama’ and “magbana” networks. As suggested by Alomari et al. (2022) and Yuda Bakti et al. (2020), the following hypothesis was tested: H0 there is a positive relationship between the mode of

transport used and users' perception of service quality, notably comfort, safety, speed and staff behaviour; H1 is the alternative hypothesis: there is a negative relationship between travel conditions and the type of network used by the passenger. The decision rules for this test is as follows:

if the p-value found is less than the threshold value of 0.05, there is a positive relationship between the variables, i.e. hypothesis H0 is accepted; otherwise, it is rejected, i.e. there is no positive relationship between the variables.

Multi-criteria analysis

Widely used in the literature, multi-criteria analysis is not only an aid to decision-making, but is also mobilized in comparative studies, particularly in public transport (PT). It can be used to evaluate different aspects of the service offered (Bashiri et al., 2025; Bodin & Frieman, 2021; Habibi et al., 2021; Ibrahim et al., 2024). Four indicators of public transport travel conditions were used: comfort, safety, speed and crew behaviour. For each network, a scoring system ranging from 1 to 5 was applied, based on the performance of each mode in relation to the selected indicators.

Each selected indicator was weighted according to its importance in the overall assessment of public transport service quality. The classification of the importance of PT performance indicators may depend on the context of the study area, sociocultural characteristics and level of development of the country or city studied (Bonnafous et al., 2007, p. 52-57). Since they are intangible (subjective) measures relating to the user's appreciation of the indicators examined, his environment may influence the way in which he views this indicator (Kittelson & Associates, Inc. et al., 2013, p. 143-147). In their work in Cosenza in Italy, Eboli & Mazzulla (2007) classified indicators for measuring the quality of transport services according to the level of satisfaction of bus passengers. According to them, crew behaviour had the most weight, followed by speed and finally comfort. Another hierarchy in the West African context is different from the previous one. Gomina Mama & Abodohoui (2023), working on artisanal minibus transport in Cotonou (Benin), give priority to safety, then speed, followed by comfort and, lastly, crew behaviour. The last classification seems more appropriate for the present study. Table 1 below gives a description and weighting of the various indicators chosen.

Table 1. Description and weighting of the various indicators.

Indicators	Description	Weight
Safety	Accident, theft, assault, vehicle breakdown risks	35%
Speed	Commercial speed, network coverage, waiting time	30%
Comfort	Vehicle layout, accessibility, passenger information	20%
Crew behavior	Attitude of staff towards users	15%

Source. Author, field observations, 2023-2024

To determine the best network (NMN or OMN), scores are calculated using the following formula (2):

$$Sj = \sum_{i=1}^{4} wi.Rij \qquad (2)$$

Where wi is the weight assigned to each indicator i (Comfort, Safety, Crew behavior, Speed), Rij is the score or performance of network j on indicator i, Sj is the overall score of network j (NMN or OMN), i varies from 1 to 4 (as there are 4 indicators) and j varies from 1 to 2 (as there are 2 networks: NMN and OMN).

Figure 1 below shows the general methodology adopted in this study.

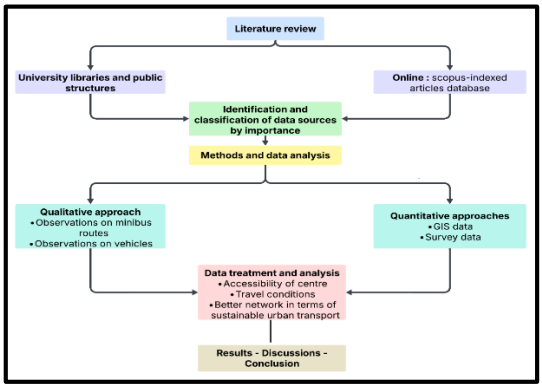

Figure 1. Summary diagram of data collection and analysis methods

RESULTS

Spatial analysis: accessibility of flow-generating zones in Dakar, Bamako and Conakry

Accessibility of activity areas in Dakar

Figure 2 below illustrates the spatial distribution of AFTU network routes. The results show that almost 80% of NMN routes have at least one terminus in Dakar department, while the remaining 22% serve the peripheral areas, their termini being located in the region's other departments. In addition, 42% of AFTU routes have a terminus in the heart of Dakar, notably at the Lat Dior, Petersen and Colobane urban stations, and at the Sham and Dakar University line heads. A further 36% of routes terminate in the Dakar suburbs, in the communes of Yoff, Ouakam, Foire, Ngor, Parcelles Assainies, Liberté 5 and 6. Of the 22% of routes operating outside Dakar, 7% serve Pikine - Rufisque, while Pikine - Keur Massar and Rufisque - Keur Massar each account for 4% of routes. The Guédiawaye - Keur Massar and Guédiawaye - Rufisque connections also account for 3% each. Finally, only 1% of lines provide connections between Pikine and Guédiawaye.

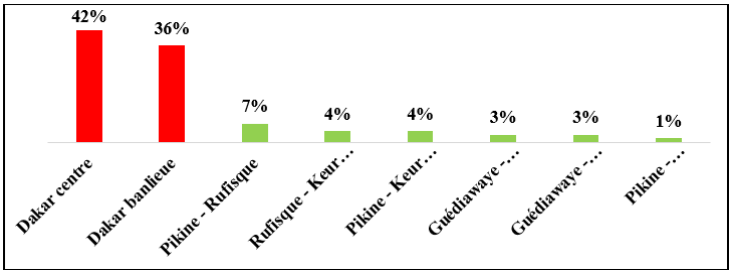

Figure 2. Spatial distribution of Dakar NRM routes

Source. Author, field observations, 2023-2024

In order to get better understanding of the spatial distribution of NMN routes in Dakar, the network map shown in Figure 3 was drawn up using GIS data and field observations. The results show a network that serves not only the primary road networks, but also the secondary and tertiary road networks of the Dakar region, bringing minibus services as close as possible to users. AFTU routes are approved by Dakar Urban Transport Authority (CETUD), and a concession contract and specifications define the reference offer to be applied by operators.

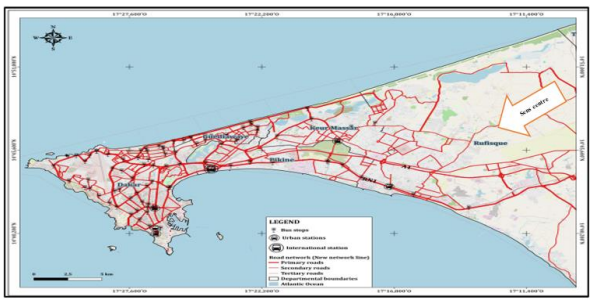

Figure 1. NMN in Dakar.

Source. Author, laboratory work; 2024

Due to individual operation and the lack of organization of the actors, it is difficult to precisely establish the distribution of the OMN routes. However, "cars rapides" and ndiaga ndiaye" operate on the most profitable routes, which are generally the radial roads converging on the city of Dakar. Both in the centre and on the outskirts, OMN and NMN share the same transport equipment (stations, terminals, stops, etc.). The routes, infrastructure and equipment facilitating OMN operations in Dakar are shown on the network map in Figure 4 below.

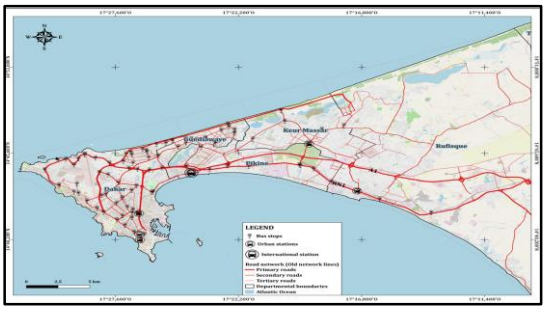

Figure 4. OMN in Dakar.

Source. Author, laboratory work; 2024

The flow of minibus users follows a pendular movement at peak times: in the morning, between 7 and 10:30 a.m., towards Dakar centre, and in the evening, from 4 p.m., towards the peripheries. The origin-destination matrix in table 2 shows journeys on the artisanal public transport (APT) networks in the Senegalese capital. The results show that, on average, more than 60% of trips concern the city of Dakar. These interdepartmental trips, over medium and long distances exceeding 10 km, link the centre, i.e., Dakar department, to other localities in the region. Over 90% of these routes involve Dakar commune, notably Médina, Sandaga, Fann or Colobane. Rufisque stands out with a high proportion (92%) of its passengers heading for Dakar, compared with around 50% for Pikine and Guédiawaye. In Keur Massar, 68% of trips are internal, while only 26% are to Dakar. Exchanges between peripheral localities, such as Guédiawaye, Pikine, Keur Massar and Rufisque, remain low, rarely exceeding 5%. In Dakar, short trips (less than 10 km) are the most frequent (71%), compared with 37% in Pikine, 19% in Guédiawaye and just 6% in Rufisque. Finally, the predominance of long-distance travel is explained by the structuring of minibus routes, designed jointly by operators (OMN) and authorities (NMN), with the aim of optimizing revenue by renewing passengers throughout the service.

Table 2: origin-destination matrix of TCA users by minibus in Dakar.

Departments		Destinations				
		Dakar	Guédiawaye	Keur Massar	Pikine	Rufisque
Origins	Dakar	71%	8%	11%	7%	3%
	Guédiawaye	59%	19%	0%	22%	0%
	Keur Massar	26%	0%	68%	5%	0%
	Pikine	56%	5%	1%	37%	1%
	Rufisque	92%	1%	1%	0%	6%

Source. Author, user Survey, 2023-2024

Analysis of accessibility to Bamako's attraction zones

More than 90% of "sotrama" lines leave peripheral communes 1, 4, 5 and 6 during the morning peak hour (MPH), between 6:30 and 10 a.m., to serve communes 2 and 3, with destinations such as Railda, Vox Parc, Medine Station, Gabriel Touré Hospital, the National Assembly and the sotrama ring. At the end of the day, from 4pm to 8pm, the flow reverses, with journeys moving from the centre of the district to the periphery. Figure 5 (network map) below illustrates the sotrama routes, as well as the infrastructure, transport facilities and main flow-generating areas in the Bamako district. This map highlights the fact that, from the right bank of the River Niger, access to the centre of Bamako is only possible via three bridges: the Martyrs' bridge, the FAHD or second bridge, and the third bridge. The allocation of vehicles to the various routes, and the organization of operations, are not submitted to

any official opinion or control. Although the Department of Regulation, Traffic and Urban Transport (DRCTU), a technical department of the Town Hall of the Bamako District, is involved in approving sotrama routes, its influence on the organization of minibus transport is less visible. Thus, the individual nature of the operation leads to strong competition between "sotrama" operators on the city's major routes.

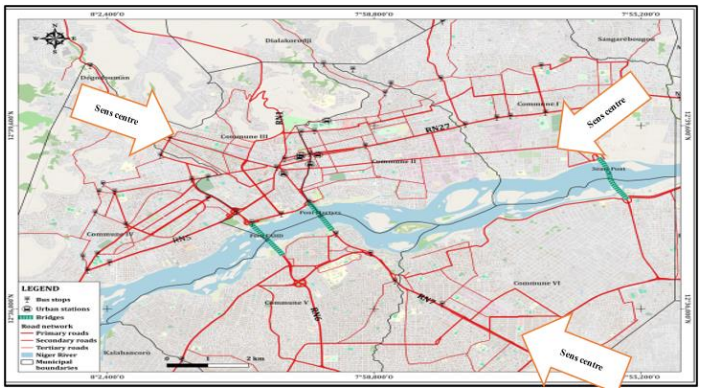

Figure 5. "Sotrama" network in Bamako.

Source. Author, laboratory work; 2024

Minibus trips are characterized by medium and long routes (over 10 km), linking the two banks of the district (right and left) as well as the six communes of Bamako. Nearly 80% of users take these long routes every day, traveling between the departure and arrival terminals. On the other hand, around 15% of minibus passengers alight on ongoing route (short journeys less than 10 km), enabling operators to renew their load and increase their daily revenue.

Table 3 below, which presents the origin-destination matrix of minibus users in Bamako, highlights that short trip (internal < 10km) by "sotrama" users are mostly concentrated in Commune 6, attracting 43% of passengers. By contrast, these trips are low in communes 1 to 5, where the proportion of passengers making these types of journeys rarely exceed 10% (i.e., 2% for commune 1, 12% for commune 2, 10% commune 3, 8% for commune 4 and 6% for commune 5). Morning external trips (between communes > 10 km) are mainly directed towards commune 2 (30% of users), followed by communes 3, 4 and 6, which each account for 15% of "sotrama" passenger's trip. Commune 5, on the other hand, attracts few long-distance users, with only 3% of passengers. Finally, 6% of "sotrama" users come from outside of Bamako district on a daily basis for their activities.

Table 3. Origin-destination matrix of users of sotramas in Bamako.

Municipalities		Destination						
		Com**.1	Com.2	Com.3	Com.4	Com.5	Com.6	Out Ba.*
Origin	Com. 1	2%	59%	13%	20%	0%	2%	4%
	Com. 2	32%	12%	5%	22%	4%	23%	3%
	Com. 3	24%	7%	10%	22%	2%	24%	10%
	Com. 4	5%	53%	14%	8%	3%	18%	0%
	Com. 5	12%	15%	12%	6%	6%	41%	9%
	Com. 6	5%	16%	9%	11%	4%	43%	11%
	Out Ba.*	5%	29%	29%	10%	5%	24%	0%

*Bamako **Commune

Source. Author, user Survey, 2023-2024

Analysis of accessibility to flow-generating areas in Conakry

In Conakry, minibus operators operate mainly on the Fidel Castro freeway (also known as National Road 1 or Niger Road) and the Prince Road, two major routes crossing the seven communes of Greater Conakry. The "magbanas" link Kaloum, the city centre at the tip of the peninsula, to Coyah and Dubréka, serving the municipalities of Matoto, Ratoma, Matam and Dixinn. Figure 6 below illustrates the movement of minibus users in the Guinean capital and the roads on which these

vehicles operate. It shows (Figure 6) that from peripheral areas such as Coyah, Km 36, Dubréka and Cimenterie, “magbanas” often converge on the Madina market, located in the commune of Dixinn, and on Kaloum, the city's main employment hub. Conakry's hilly relief in some areas is an obstacle to public transport accessibility, particularly in neighbourhoods where streets are impassable due to the lack of road infrastructure. The ten transverse routes (T), which link the three main roads (RN1, North Corniche and Prince Road), are served exclusively by shared taxis, tricycles and moto taxis. Despite the creation of the Conakry Urban Transport Authority (AOTUC) in 2023, the minibus offer remains unstructured and unregulated, leading to strong competition on the two main roads they serve.

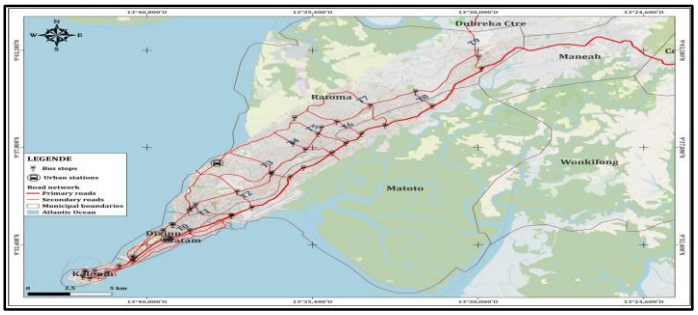

Figure 6. The “magbana” network in Conakry.

Source. Author, laboratory work; 2024

“Magbanas” users travel mainly over medium and long distances, i.e., over 10 km (intercommunal exchanges), accounting for over 80% of trips made. The results of the origin-destination matrix for “magbanas” travellers in Conakry (Table 4) show that, with the exception of Matoto and Kaloum, where internal trips reach 39% and 25% respectively, short trips within the other communes remain very limited, with proportions rarely exceeding 15%. However, the majority of inter-municipal exchanges (external trips) are directed to Dixinn, home to the city's largest market (Medine market), accounting for an average of 29% of external trips (medium and long distances). Matoto, a residential and employment zone (due to the presence of the airport, for example), attracts around 20% of these external trips, compared with 21% to Kaloum, Conakry's city centre and administrative hub. Ratoma also accounts for a significant share of external flows, with an average of 14%. Exchanges with Dubréka, Coyah and Matam remain low in the morning, accounting for 8%, 5% and 3% of external trips respectively. “Magbanas” operate on long routes linking outlying areas such as Coyah and Dubréka with Dixinn and Kaloum. To optimize their transport capacity, drivers renew their loads at each stop, keeping their vehicles filled right up to their final destination.

Table 4. Origin-destination matrix of users of "magbana" in Conakry.

Municipalities		**Destinations**						
		C	**Di**	**Du**	**K**	**Ma**	**Mat**	**R**
Origins	**C**	0%	21%	16%	21%	5%	11%	26%
	Di	2%	2%	5%	24%	6%	54%	8%
	Du	17%	17%	13%	29%	4%	21%	0%
	K	3%	29%	3%	21%	5%	11%	29%
	Ma	0%	33%	17%	28%	6%	6%	11%
	Mat	0%	38%	2%	12%	0%	39%	9%
	R	6%	32%	4%	13%	0%	30%	15%

C = Coyah, Di = Dixinn, Du = Dubréka, K = Kaloum, Ma = Matam, Mat = Matoto and R = Ratoma.

Source. Author, user survey, 2023-2024

Table 5 below shows that, compared with Bamako and Conakry, urban mobility governance in Dakar is better structured, with closer collaboration between transport operators and local authorities. Conversely, in the other two cities, relations between public and private actors are marked by tensions, in a weak institutional context. Dakar is also distinguished by a more developed secondary and tertiary network, as well as by a more recent vehicle fleet that is currently being renewed. This

contrasts with the Malian and Guinean capitals, where the peripheral districts are poorly served and the minibus fleets are made up of very old vehicles (over 30 years old). On a spatial level, the three cities nevertheless share a number of similarities, including a low-density primary network, excessive centralization linked to urban sprawl, deficiencies in traffic management and the high degree of specialization of spaces.

Table 5. Summary of spatial analysis comparing Dakar and the cities of Bamako and Conakry

Common points		
Parameters	**Dakar**	**Bamako et Conakry**
Physical constraints	Yes	Yes
Radial roads	Very limited (less than 5 roads)	Very limited (less than 5 roads)
Pendular movement (urban sprawl)	Periphery-center	Periphery-center
Average distances >10km (travel)	Inter-municipal	Inter-municipal
Traffic	Mixed, poorly managed	Mixed, poorly managed
Accessibility of business areas	Difficult	Difficult
Land use planning	Specialization of space	Specialization of space
Differences		
Local governance	Quite Strong	Low
Specific urban mobility policies	Exists	Not so much
Transport planning	Available	Not so much
Policy and plan implementation	Dynamic	Not dynamic
Institution: Stakeholder collaboration	Fairly favorable climate	Tight climate
Secondary and tertiary road	Relatively developed	Underdeveloped
Minibus offers	Mix of old and new network	Old
Organization of operators	Fairly formal setting	Exclusively artisanal frame

Evaluation of travel conditions in minibus networks in Dakar, Bamako and Conakry

Users of artisanal public transport (APT) expressed their opinions on several aspects of the services offered, including safety, crew behaviour, comfort and speed of minibuses in the networks studied.

Relationships between network type and indicators of travel conditions in minibus networks

Table 6 presents the results of chi-square tests designed to examine the relationship between indicators of travel conditions, such as comfort, safety, speed and staff behaviour, and the various modes of APT, in particular the AFTU, “car rapide” and “ndiaga ndiaye”, ‘sotrama’ and “magbana” networks. The results show that, for all the indicators studied, the p-values obtained are below the 0.05 level of significance, demonstrating a statistically -strong relationship between the selected indicators and the type of network used by the user. In other words, users' perception of safety, crew behaviour, comfort and speed are influenced by the mode of minibus network used.

Table 6. Chi-square test results.

Tests khi-deux	**Theoretical values**	**X-Squared test**	**P-Value**
Safety	> 5	15,15	0,002
Crew Behavior	> 5	26,81	< 0,001
Comfort	> 5	29,94	< 0,001
Speed	> 5	164,03	< 0,001

Source. Author, user Survey, 2023-2024

Figure 7 illustrates the distribution of user declarations concerning service quality indicators in the new minibus network (NMN), also known as AFTU, as well as in the old minibus networks (OMN), including “cars rapides”, “ndiaga ndiaye”, “sotramas” and “magbanas” in the study area. The results reveal that passengers are generally dissatisfied with travel conditions, with differences depending on the network. The OMNs are the most criticized in terms of safety and staff behaviour. Indeed, 86% of “magbanas” users, 84% of ‘sotramas’ passengers and 81% of “cars rapides” and “ndiaga ndiaye” passengers consider on-board safety to be unsatisfactory. In addition, over 70% of OMN users’ express dissatisfaction with staff behaviour, with 77% for “sotramas”, 76% for “cars rapides” and

"ndiaga ndiaye" and 68% for "magbanas". On the other hand, although the new minibus network (NMN) is better perceived on these indicators, its results are not entirely satisfactory. Only 25% of users are satisfied with safety and 39% with crew behaviour.

On the other hand, the NMN is the most criticized in terms of comfort and speed. Nearly 90% of users report arduous journeys and significant time loss on board AFTU minibuses. "Magbanas", by contrast, are better rated for speed, with 52% of users saying they don't lose too much time. This compares with more than 70% of users of "cars rapides", "ndiaga ndiaye" and "sotramas" who complain that their journeys are too long in terms of time. In regard to comfort, OMNs are still rated poorly overall, although slightly better than NMN: 87% of "sotramas", 84% of 'magbanas' and 76% of "cars rapides" and "ndiaga ndiaye" users say they are dissatisfied.

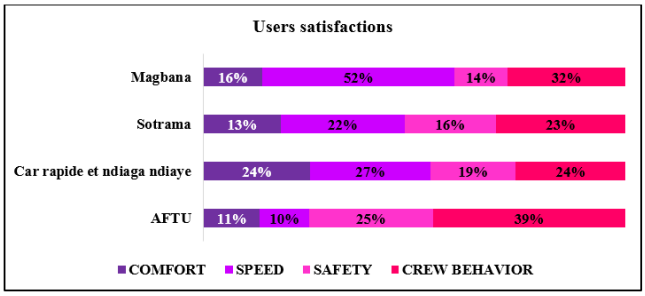

Figure 8. Distribution of users' opinions on the chosen performance criteria.

Source: Author, user survey, 2023-2024

Assessment of the commercial speed regularity of minibuses in Dakar, Bamako and Conakry

Table 7 shows the results of normality tests applied to minibus speeds in the study area, obtained from manual timing on various lines during the morning rush hour on working days. The results indicate that the speed distribution is normal for the AFTU, "sotrama" and "magbana" networks, as the p-values obtained (0.17 for AFTU, 0.18 for 'sotramas' and 0.16 for "magbanas") are above the normality threshold set at 0.05. On the other hand, for "cars rapides" and "ndiaga ndiaye", the p-value obtained ($p < 0.001$) is below this threshold, indicating an abnormal distribution of speeds in this network.

Table 7. Normality test results.

Shapiro Noramlity test	Statistics	P-Value
AFTU (Dakar)	0,9	0,168
Car rapide et Ndiaga ndiaye (Dakar)	0,7	< 0,001
Sotrama (Bamako)	0,9	0,184
Magbana (Conakry)	0,9	0,161

Source. Author, user Survey 2023-2024

Table 8 shows relatively low average speeds for all the networks studied, compared with the minimum standard of 25 km/h recommended for public transport [57]. Conakry's "magbanas" have the highest average speed, at 20 km/h, followed by "cars rapides" and "ndiaga ndiaye" at 18 km/h. The AFTU and "sotramas" networks record the lowest speeds, at 14 km/h each. On the other hand, speeds are more regular in the older minibus networks (OMN), notably for "cars rapides", "ndiaga ndiaye", 'sotramas' and "magbanas", where standard deviations of speeds around their averages remain low (6 to 8 km/h). The AFTU network, on the other hand, shows much greater dispersion, with a standard deviation of 18 km/h.

Table 8. Regularity of minibus commercial speeds

Commercial speed	Average Speed	Standard deviation	Dispersion Gap
AFTU (Dakar)	14	4	8
Car rapide et Ndiaga ndiaye (Dakar)	18	9	18
Sotrama (Bamako)	14	4	8
Magbana (Conakry)	20	3	6

Source. Author, user Survey 2023-2024

Identification of the network that contributes most to sustainable urban mobility

The comparative evaluation of the two transport networks, NMN (or AFTU) and OMN ("car rapide" and "ndiaga ndiaye", 'sotrama' and "magbana"), is based on four weighted indicators: safety (35%), speed (30%), comfort (20%) and crew behaviour (15%). The results in Table 9 show a clear superiority for NMN, which obtains an overall score of 2.625 versus 1.575 for OMN. The AFTU network particularly stands out for its performance in terms of safety (3.5 vs. 1.5), comfort (2.5 vs. 1.5) and crew behaviour (3.5 vs. 1), reflecting better reliability, a more welcoming service, and better travel conditions for users. On the other hand, OMNs outperform NMN only on the speed indicator (2 vs. 1.5), which is still insufficient to compensate for their shortcomings on the other essential aspects of service quality. As a result, NMN appears to be the network that contributes most to sustainable urban mobility.

Table 9. Summary of NMN and OMN parameter evaluations

Indicato	Rating criteria	NMN		OMN		W
		R	L	R	L	
Safety	Driver training, vehicle reliability, responsible behaviour, adapted stops	3.5	F	1.5	Lo	35%
Speed	Respect for routes, traffic management, flexibility	1.5	L	2	F	30%
Comfort	Interior layout (side doors, low floors, etc.), accessibility, seating, standing places	2.5	F	1.5	Lo	20%
Crew Behaviour	Staff training, quality of welcome, respect for users, organized ticket sales	3.5	F	1	Lo	15%
Scores		**2.625**		**1.575**		

R. = Rating, L. = Level, W. = Weight, F. = Force and Lo. = Low.

Source. Author, field observations, 2023-2024

DISCUSSIONS

Limited accessibility to business and employment areas

The results of our analysis of minibus trips in Dakar, Bamako and Conakry highlighted the pendular nature of these flows against a context of low road network density providing access to city centers and an urban form marked by topographical constraints. These results corroborate those of Dembélé (2017), which highlighted the uneven distribution of urban equipment in Bamako, with a high concentration in Commune 2 and Commune 3, which attract large numbers of people for their daily activities during the morning rush hour. Indeed, some areas are highly mobile internally, while others are more characterized by in-flow and out-flow (exchange flows) towards other localities (Dembélé, 2016; Diop, 2022; Plat et al., 2004). In the Dakar region, the department of Dakar is the main exchange pole, due to its high concentration of economic activities. Keur Massar, which recently became a department, is characterized by a high level of internal mobility, while maintaining sustained exchanges with Dakar, confirming its status as a satellite zone combining housing and employment zones. Pikine acts as an interface between the center and the periphery, while Rufisque and Guédiawaye have a predominantly residential profile (Ndiaye, 2016). In Bamako, communes 2 and 3 concentrate passenger flows, confirming their status as economic centers. Their low internal mobility suggests a predominance of economic activities over housing, as Dembélé (2017) has shown. Communes 1 and 5 are more residential, with daily trips to the city center for work. Commune 4, on the other hand, benefits from intense exchanges thanks to the establishment of major infrastructures (administrative hub, ACI 2000, new building projects, etc.), while commune 6, combines housing and jobs, generating high internal mobility. In Conakry, Kaloum, Dixinn and Matam play a central role in urban mobility. Although they are mainly centers of activity, the high volume of internal trips indicates that some users live there. A significant proportion of minibus passengers come from the outskirts, notably Dubréka and Coyah, and travel to the city center for professional reasons. Matoto

and Ratoma have a mixed dynamic, combining residential and employment centers (Plat et al., 2004, p. 30).

Furthermore, traffic management in Dakar, Bamako and Conakry remains inefficient in the context of mixed traffic. This situation leads to recurrent congestion, complicating access to city centers, especially during rush hours (Diaou et al., 2025). What's more, minibus trips are often of medium or long distance (over 10 km), which highlights the sprawl of these three cities, favoring travel by motorized modes of transport (private modes and artisanal transport) (Guézéré, 2013; Ndiaye, 2016).

Rough travel conditions on minibus networks

The analysis of minibus trips in Dakar, Bamako and Conakry reveals generally unsatisfactory travel conditions, according to users. Neither the minibuses of the old networks (OMN) nor those of the new (NMN) fully guarantee safety, comfort or speed. These results corroborate those of Dembélé et al. (2022), who point out that in Bamako, journeys of 15 to 20 km can take more than two hours due to traffic jams and deteriorating transport services. In Dakar, CETUD (2013) reported that traffic speeds were higher on the AFTU network than at present, suggesting a deterioration due to changing traffic conditions and poor traffic management. Lack of comfort also remains a major constraint. In Bamako and Conakry, minibuses are often overcrowded, and in some cases, passengers have to sit on rudimentary wooden seats in “sotramas” and “magbanas”. In Dakar, on AFTU minibuses, long-standing journeys make it difficult for passengers to get around, as pointed out by Arroyo & Kumar (2024), Kumar & Diou (2010) and IBIS (IBIS, 2008). Travel conditions can vary from city to city and from mode to mode. For example, in Aba, Nigeria, tricycles are considered faster and more comfortable than minibuses in Dakar, Bamako or Conakry (Nwaogbe et al., 2012). However, this comparison needs to be qualified, as tricycles operate over shorter distances (≤ 15 km), whereas our study focuses on journeys often exceeding 15 km.

The results highlight minibus networks that offer little guarantee of safety for users, confirming those of Guindo’s Institut (2015) who identify the NMN in Dakar as the most exposed to accident risks compared with formal public transport services, such as the Dakar Dém Dikk (DDD) company and the Little Suburban Train (PTB). Moreover, the reliability of accident data in the cities studied remains limited, making it difficult to assess road safety accurately. It should be emphasized that, despite the existence of agencies dedicated to road safety, accident data are rarely available. In Senegal and Mali, the National Road Safety Agency (ANASER) and, in Guinea, the Guinean Road Safety Agency (AGUISER) created around 2019, are still struggling to centralize and harmonize accident statistics, which are collected simultaneously by various bodies (police, fire department, health structures, civil society organizations, etc.). This fragmentation of data limits the assessment of the negative externalities of urban transport and complicates the analysis of the contribution of each mode or network to this phenomenon. Passengers' perceptions of road safety in the networks studied should ideally be corroborated by these statistics, but they remain unavailable for both old and new networks. However, the organization of the AFTU network in Dakar should have enabled better monitoring thanks to Support Center for the Profesionalization of the Tansport Sector (CAPTRANS) which provides technical support to operators in their operations. Although technical inspection centers have been set up in the cities studied to prevent road accidents, the inefficiency of certain procedures and the lack of rigour in inspections compromise their effectiveness, particularly for minibuses. In Conakry, despite the existence of two technical inspection companies (Mayelia and SOCOTAC Sa), the “magbanas” do not yet have the corresponding certificates. In Dakar, at the Motor Vehicle Inspection Center (CCTVA), and in Bamako, at the Mali Technic System (MTS), laxity in inspections enables OMN vehicles in very poor condition to obtain technical inspection certificates from the competent structures. This situation is a further factor increasing the risk of accidents on the artisanal public transport (APT) networks. Behrens et al. (2016) studying three minibus networks in East and South Africa, in particular the “daladalas” of Dar es Salam in Tanzania, the “matatus” of Nairobi in Kenya and the minibus taxis of Cape Town in South Africa, highlighted the mediocre quality of service provided by the operators of these vehicles, particularly in terms of safety and comfort. These authors support the results of our research, even though the approaches used are different.

The research findings also reveal weaknesses in urban mobility governance, particularly in Bamako, where no autonomous urban transport authority has yet been established. In Conakry, although such a body was created in 2023, its operation remains very limited, if not non-existent. Dakar, on the other hand, has a more structured institutional and regulatory framework. The creation of CETUD in 1997 enabled the implementation of key projects such as: the A1 toll freeway (2013), the Regional Express Train (TER) (2021), the Bus Rapid Transit (BRT) (operational since May 2024), the relaunch of bus transport with Dakar Dem Dikk (DDD) in 2000, following the bankruptcy of the Transport Company of Cape Verde (SOTRAC), the reform of minibuses through the financing and structuring of operators (AFTU), etc. Researchers such as Meite (2015), Kumar & Agarwal (2016, p. 15), Behrens et al. (Behrens et al., 2016), Bruun & Behrens (2016) and Tindano (2008) have emphasized the importance of transport organizing authorities (AOT) in setting up mobility systems that promote accessibility to the city's activity areas. However, the presence of such an organization does not necessarily guarantee the implementation of a sustainable transport system. For example, despite CETUD's efforts, Dakar still faces major challenges, notably due to the fragmentation of networks and the lack of any real integration of transport modes. In contrast, other cities such as Casablanca, Rabat and Tangiers in Morocco have succeeded in structuring their transport systems around mass modes without having an AOT, proving that mobility policies need to be adapted to local contexts (Le Tellier, 2005).

The network that contributes most to sustainable urban mobility

Although travel conditions on the NMN remain perfectible, this network appears to be the best, as it holds the highest score in terms of travel conditions. Diaou et al. Diaou et al. (2024) highlight the significant progress made in improving accessibility to minibus services in Dakar as a result of OMN's fleet renewal program. This reform led to the formalization of minibus operations, the professionalization of operators (through crew training), the introduction of a ticketing system, the adoption of salaried employment, and access to bank credit facilitated by the creation of the Transporter's Mutual Savings and Credit (MECTRANS) in 2006. In addition, this operation has enabled the renewal of a large proportion of the fleet of old vehicles (even if the process is slow) and the creation of the TRANSVIE mutual insurance company in 2009, which gives workers in the AFTU network the opportunity to benefit from health cover. Similar dynamics have been observed in other African contexts. Behrens et al. (2016, p. 176, 2017) highlight, through their work on the Minibus Taxi Recapitalization Program (TRP) in Cape Town (South Africa) and the minibuses of the Savings and Credit Cooperatives (SACCO's) in Nairobi (Kenya), notable advances in the organization of operators, the improvement of workers' conditions, the modernization of the vehicle fleet and the development of the automotive industry. However, these studies, compared with the present work, have not specifically addressed the impact of minibus reform on improving users' travel conditions and the accessibility of flow-generating areas in the cities studied. In all cases, these reforms are struggling to achieve some of their initial objectives, and when they do, their sustainability remains uncertain. In Dakar, for example, once the vehicles have been fully reimbursed and ownership transferred to the beneficiaries, the economic interest groupings (EIGs) in which the operators are grouped tend no longer to respect the contractual commitments linking them to the Dakar Urban Transport Authority (CETUD). Moreover, despite initial ambitions of formalizing of actors of the sector into viable companies, the majority of operators have remained organized in the form of EIGs since 2001, with no real move towards more mature entrepreneurial management. A similar situation can be observed in Cape Town, where one of the major objectives of consolidating operators into companies capable of bidding for large-scale public transport services has not been achieved (Behrens et al., 2016, p. 174-184). In the same way, the integration of this NMN into the MyCiTi system built around the Cape Town BRT, one of the main expectations of the minibus taxi reform, has not produced the expected results. It should be noted that the low contribution of NMNs to sustainable urban mobility is not only due to the internal workings of the APT networks, but also exogenous factors linked to urban transport governance. For example the time losses observed in the AFTU network during services are linked to a context of mixed traffic where traffic management remains ineffective, resulting in heavy congestion on the routes served even though the vehicles respect their itinerary. Diaou et al. (2024) and Kumar & Diou (2010) point to shortcomings on CETUD's part in fulfilling its commitments, in particular to protect the lines of the AFTU network, enabling them to operate at optimum levels, as mentioned in the concession contract.

The theoretical implications of this study highlight persistent shortcomings in the planning of the cities studied. The imbalance between residential and economic centers exacerbates travel difficulties, revealing weaknesses in land-use planning, infrastructure organization and urban sprawl management. The results show that sustainable urban mobility cannot be tackled in a fragmented way; it requires an interdisciplinary approach involving the environmental, economic, urban planning and transport dimensions (Stucki, 2015). According to Kennedy et al. (2005), four pillars are essential for sustainable mobility: a solid governance framework to coordinate transport and urban planning, a sustainable financing mechanism, the development of appropriate infrastructure, such as Bus Rapid Transit (BRT) systems, and a participatory approach involving all stakeholders. However, the harmonious integration of these elements remains a challenge in many cities, particularly in Africa, where political decisions often dominate technical considerations, limiting the necessary reforms (Kumar & Agarwal, 2016; Stucki, 2015). In addition, the lack of coordination between the various stakeholders, combined with limited financial and human resources, hinders the development of efficient mobility (Jordová & Brůhová-Foltýnová, 2021; Robinson et al., 2021). Finally, the exclusion of private actors and civil society from project design reduces also their impact and effectiveness (Boutueil et al., 2020; Jordová & Brůhová-Foltýnová, 2021). Our results highlight the complex interactions between the localities studied and the existing imbalances in terms of development, equipment and infrastructure. This phenomenon accentuates the specialization of certain urban areas, increasing pressure on road infrastructures and accentuating congestion problems. The main issue at stake in this research is the need for authorities to rethink the optimization of public transport networks. In short, urban mobility in West Africa faces structural challenges that call for reform of transport policies and urban governance. The adoption of solutions adapted to each local context and the implementation of integrated planning are essential to guarantee sustainable and inclusive mobility.

Lessons learned from the reform of artisanal public transport (APT) in Africa

This study highlights several lessons relating to minibus reform in Dakar and other African cities: (i) a clear vision of the role of artisanal public transport (APT) in the urban transport system built around mass transit must be defined right from the design phase of reform projects, in particular through the financing of minibus operators; (ii) the vehicle renewal operation should not be limited to the purely commercial aspect, at the risk of neglecting the sustainable reorganization of the sector; (iii) mobility issues cannot be dealt with in isolation, particularly in cities faced with geographical and topographical constraints and a lack of financial resources; (iv) the solution to sustainable urban mobility lies not only in the multiplication of transport services and road infrastructure, but rather in effective urban governance; (v) the minibus reform model in the Senegalese capital can be adapted to the cities of Bamako and Conakry. However, lessons from Dakar, Cape Town and Nairobi would be essential to ensuring effective and sustainable implementation in other African cities.

CONCLUSION

Research findings show that minibus travel in Dakar, Bamako and Conakry is predominantly pendular, while the radial road network remains underdeveloped and traffic management inefficient, complicating the flow of traffic. Moreover, users express general dissatisfaction with travel conditions, pointing to lack of comfort, safety problems, slow journeys and the unprofessional behavior of some crew members. However, the study reveals that, although the New Minibus Network (NMN) still has a lot of room for improvement, it is better perceived overall than the Old Minibus Networks (OMN), particularly with regard to travel conditions, as evidenced by its higher score in the multi-criteria analysis.

However, this research has certain limitations. Firstly, the contexts of the three cities studied differ, particularly in terms of urban mobility governance, which may influence the results. Secondly, the indicators used to assess users' travel conditions do not cover all possible dimensions. In addition, the sample of routes analyzed remains limited, and the manual method used to measure journey times lacks precision and sophistication.

With this in mind, future studies could focus specifically on the dynamics of urban transport governance in these three capitals. It would also be relevant to extend the panel of indicators by including, for example, gender or environmental dimensions, such as the pollution generated by minibuses. Finally, research could broaden the sample of routes studied and make use of on-board

technologies, such as GPS beacons, to automatically collect real-time data on journey times, distances and commercial vehicle speeds.

Recommendations

This study highlights that the reform of artisanal public transport (APT), and its contribution to sustainable urban mobility in Dakar, Bamako and Conakryrequires the definition of a clear strategy accompanied by concrete actions to be deployed in the short, medium and long term.

Short term

Strengthen the governance framework by creating and reinforcing the power of the urban transport organizing authority or agency (AOTU); identify and grouping (formalizing) actors into legally-recognized economic entities such as economic interest groupings (EIGs); reduce the number of interlocutors between the public authorities and the private sector by setting up an umbrella organization bringing together all minibus operators; provide appropriate funding for the renewal of operators' vehicles; formalize the operation of minibuses in schemes that complement formal transport services; provide a framework for the professionalization of informal operators; and improve traffic and parking management.

Medium-term

Develop road infrastructure, especially secondary and tertiary networks; Create local vehicle assembly units to better guarantee After-Sales Service (ASS) and adapt minibuses to local contexts; integrate of transport and urban planning in city planning; Reinforce formal transport services in the image of mass transport such as BRT systems; ransform the EIGs initially set up into genuine transport companies capable of responding to calls for tenders for the operation of main lines or feeder lines for formal transport; improve working conditions for workers in the sector through the signing of formal contracts and an increase in salaries, improve road safety.

Long term

Develop the automotive industry; ensure the long-term viability of the APT vehicle renewal program; improve the energy efficiency of retired minibuses each time they are renewed (i.e. every 10 years, for example).

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