Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1, 442-468
2026
Publisher: Learning Gate
DOI: 10.55214/2576-8484.v10i1.11620

Reform, financing, and business model of artisanal public transport in West Africa: A comparative analysis of minibus networks in Dakar, Bamako, and Conakry

Elhadji Ibrahima Diaou[1*], François Teadoum Naringué[1], Messan Vimenyo[2], Mbaye Diene[3]
[1]Regional Center of Excellence on Sustainable Cities in Africa (CERViDA-DOUNEDON), University of Lome, Lomé 01 BP1515, Togo; diaouibrahima0@gmail.com (E.I.D.).
[2]Geography Department, Research Laboratory on the Dynamics of Environments and Societies, University of Lomé, Lomé 01 BP 1515, Togo.
[3]Faculty of Economics and Management, Economics and Monetary Research Laboratory (LAREM), University Cheikh Anta Diop of Dakar, Dakar Fann BP 5683, Senegal.

Abstract: The main objective of this study is to analyze the extent to which reform based on minibus renewal improves operators' operating methods, profitability, and access to formal financing. It is based on a comparative analysis between old minibus networks (OMN), such as the "cars rapides/ndiaga ndiaye" in the Senegalese capital, the "sotramas" in Bamako, and the "magbanas" in Conakry, and a new minibus network (NMN), namely the Urban Transport Funding Association (AFTU), created as part of the minibus fleet renewal program in Dakar. The methodology adopted combines statistical analysis of data from field surveys of minibus operators and semi-directive interviews with key stakeholders in the sector. The results reveal improved structuring of reformed minibuses, which has promoted the social inclusion of actors in the AFTU network, the transformation of their business model, and the bancarization of vehicle owners, who are now able to access formal financing enabling them to invest in reliable and high-capacity rolling stock. This study highlights the decisive role that reforming paratransit financing can play in modernizing the operational practices of artisanal networks. It is a strategic lever for promoting the gradual formalization of actors into professional transport companies, in line with the objectives of sustainable urban mobility.

Keywords: *Bamako and Conakry, Dakar, Financing, Investment, Minibus, Urban transport system.*

1. Introduction

In many cities in the Global South, artisanal public transport (APT), particularly minibuses, plays a central role in people's mobility due to its high modal share compared to other modes [1-3]. This sub-sector has developed in a context of failure of formal public transport companies, thus filling a gap left by regular bus services, which are often insufficient in terms of quality and quantity [4]. However, the rapid emergence of APT has encountered major limitations, such as the dilapidated state of the fleet, the lack of formal financing, the fragmentation of ownership, and an unsustainable business model [5, 6].

The literature on urban transport financing clearly distinguishes between formal modes of transport, which receive support from public authorities, and artisanal services, which rely mainly on informal financing [7-9]. In the African context, it is common for institutional transport to receive operating subsidies from governments, financial compensation for public service obligations (PSOs), the provision of infrastructure (offices and depots), and rolling stock [10] even though they rarely account for more than 10% of the overall public transport (PT) supply, despite its leading role in urban mobility, accounting for an average of more than 50% of motorized transport in most African cities [2, 4], APT operators generally rely on their own funds, tontines, or local loans to finance their activities [11].

History: Received: 16 October 2025; Revised: 3 December 2025; Accepted: 8 December 2025; Published: 1 January 2026
* Correspondence: diaouibrahima0@gmail.com

Furthermore, these small private enterprises generally receive no financial support from public authorities [12]. This situation not only significantly limits their ability to renew or expand their fleets with reliable, high-capacity, and environmentally friendly vehicles but also prevents employers from providing a better working environment for their employees [13]. As a result, operators have to make do with revenue from ticket sales to users in order to invest in their operations [11].

In recent years, innovative financing schemes have emerged across Africa, providing minibus operators with opportunities to make significant investments in rolling stock. These schemes involve vehicle renewal operations through mechanisms whereby the state grants credit to APT operators, notably in Dakar, Senegal; Dar es Salaam, Tanzania; cities in Morocco; and Cape Town and Port Elizabeth in South Africa [14]. These reforms of public transport through financing are mainly aimed at promoting seamless collaboration between public and private actors with a view to modernizing the urban transport system with a focus on intermodality [8, 15-17]. In most cases, these projects have accompanied the implementation of Bus Rapid Transit (BRT) infrastructure in order to integrate reformed informal transport into the formal transport system [5, 14, 18, 19].

The cities of Dakar, Bamako, and Conakry face specific challenges in operating APTs, linked to a low-density road network, road congestion, mixed traffic, a lack of organization among stakeholders and funding, inefficient traffic and parking management, and a tense institutional climate [20]. Added to this, there are topographical constraints limiting infrastructure development, significant commuter traffic, and a lack of structure in public transport services [21]. These factors directly affect operators' profitability, reducing their ability to access the financing needed to modernize their fleets. However, few studies to date have comprehensively compared the business models, solvency levels, and financing mechanisms of old and new minibus networks in these West African capitals. This research attempts to answer the central question: How does the transition from OMNs to the reformed network (NMN) change the economic model of operators, particularly in terms of access to formal financing, cash flow, better working conditions for employees, and social inclusion? This study aims to analyze the financing mechanisms of minibus operators in Dakar, Bamako, and Conakry. Specifically, it seeks to: (i) analyze the business models of the old minibus networks (OMN), namely the "cars rapides/ndiaga ndiaye" in Dakar, the 'sotramas' in Bamako, and the "magbanas" in Conakry, comparing them with that of the new minibus network (NMN) in Dakar (AFTU network); (ii) assess the solvency of the operators of these different networks; (iii) examine the financing mechanisms available to the actors in these various networks.

This research distinguishes itself from previous work through its comparative approach, particularly in a context that remains under-documented in West Africa. It employs a triangulated methodology that combines both qualitative and quantitative analyses. Unlike earlier studies, which focus on identical systems for comparison, this study is based on a functional typology that differentiates between OMNs, which are present in all three cities studied, and the AFTU network, currently operational only in Dakar, serving as a reference model. The primary aim is to compare contrasting organizational approaches to identify differences, impacts, and opportunities for transferring a more structured model to other contexts. This study addresses notable gaps in the existing literature, including: (i) the scarcity of comparative studies on financing models between OMN and NMN in Dakar, Bamako, and Conakry; (ii) an integrated analysis of the economic, financial, and institutional dimensions of minibus networks in the capitals of Senegal, Mali, and Guinea; and (iii) a cross-methodological approach that combines quantitative data, such as solvency assessments and identification of financing sources, with qualitative data, including analysis of business models and financing mechanisms. Theoretically, the research enriches analytical frameworks for informal transport governance within the African urban context. Practically, it offers lessons from minibus fleet renewal programs that can be adapted to other settings. It also proposes strategies to improve access to and sustainability of financing for APT operators through more formalized mechanisms. Strategically, the

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

findings can guide public mobility policies by supporting fleet renewal initiatives based on hybrid financing arrangements, such as PPPs, revolving funds, and formal leasing, tailored to the socio-economic realities of public transport operators in Africa.

2. Tools and Methods

2.1. Data collection and sampling

The work is based on a mixed approach, combining quantitative surveys and qualitative interviews, conducted between January 2023 and February 2024 in Dakar, Bamako, and Conakry. The target population includes the main actors in artisanal public transport (APT), mainly minibus owners, drivers, and conductors, who are considered to be the keepers of information on how the sector is managed and financed [2, 5]. In the old minibus networks (OMN), such as the "cars rapides/ndiaga ndiaye," the 'sotramas' and the "magbanas," drivers and conductors generally work for the owners, according to a system of daily payments and negotiated wages [11, 14, 22]. They are directly involved in the management of operations. In contrast, in the reformed network in Dakar, financial management is essentially the responsibility of the owners and collectors, with drivers relieved of any accounting responsibilities [16]. Other contacts working in government agencies, large private companies, associations, and unions also have information about the organization and operation of micro-transport enterprises in the cities studied.

2.1.1. Quantitative Data Collection: Questionnaire Survey

Given the lack of reliable official data on the number of actors involved in the APT sub-sector in the three cities, quota sampling was used. This method was deemed appropriate due to the homogeneity of the groups of actors concerned in terms of profile, operating conditions, and organization [23, 24]. A total of 700 individuals were interviewed: 300 owners, or 75 operators per network, and 400 drivers, or 100 drivers per network, distributed between Dakar with two networks (350), Bamako (175), and Conakry (175). The selection of data collection sites was based on a preliminary identification of locations frequented by the target population, including bus stations, bus stops, and terminals, both in urban centers and peripheral areas [24]. In Dakar, the surveys were administered by students from Cheikh Anta Diop University (UCAD), who were trained on the data collection tool and questionnaires; in Bamako and Conakry, interns from the ministries responsible for transport, who were doing internships at the Directorate General of Transport (DGT) in Mali and the National Directorate of Land Transport (DNTT) in Guinea, were mobilized to collect data in the field [20].

The questionnaires were developed based on a review of scientific literature on artisanal transport in Africa [12, 25], then adjusted following exploratory missions and discussions with academics and experts in transport and urban mobility. The form used in the three cities and four networks was structured mainly into four sections: (i) the socio-economic profiles of respondents; (ii) regulatory frameworks; (iii) characteristics of economic models (operating conditions, work organization, profitability); (iv) operators' access to formal financing. The KobotoolBox tool, used by the investigators, enabled real-time, remote data collection on this digital medium, as was done by some researchers in similar work in West Africa [21, 26]. This quantitative data is supplemented by information from semi-structured interviews for in-depth analysis.

2.1.2. Qualitative Data Collection: Interview Grid

To supplement the information, a snowball sampling method was used to identify key stakeholders who were difficult to access, including certain vehicle owners or union leaders, as well as public authorities and private business leaders [27, 28]. These resource persons facilitated the identification of other relevant respondents to answer the questions. These interviews were conducted with actors directly involved in vehicle operation, including union leaders, station managers, regulators, and

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

experienced drivers. Public authorities and formal companies were interviewed during meetings. In Dakar and Bamako, meetings were organized with microfinance institutions (MFIs) to gather information on the relationships between these small banks and micro-transport enterprises [16]. In total, more than 40 individuals participated in interviews across the three cities studied. The interview grid was structured around four key themes: (i) stakeholder collaboration in managing the sub-sector, (ii) reform of artisanal public transport (APT), (iii) profitability of the activity, and (iv) access to formal financing. Table 1 below shows the different structures that responded to the questions.

Table 1.
Sample of structures and organizations surveyed.

Dakar	**Bamako**	**Conakry**
Regional Road Transport Directorate (DGTR)	Directorate General of Transport (DGT)	DNTT
Syndicate	Syndicate	Syndicate
Executive Council for Sustainable Urban Transport (CETUD)	Direction of Regulation, Traffic, and Urban Transport (DRCTU)	Conakry Urban Transport Authority (AOTUC)
National Road Safety Agency (ANASER)	ANASER	Guinean Road Safety Agency (AGUISER)
AFTU, Support Center for the Professionalization of Transport Professions (CAPTRANS)	Malian Council of Road Transporters (CMTR)	DNTT
Mutual Savings and Credit Association for Transport Operators (MECTRANS), Baobab (MFI)	BAOBAB (Microfinance Institution)	Conakry Express
Vehicle Technical Inspection Center (CCTV)	Mali Technic Systems (MTS)	Automotive Technical Inspection and Certification Company (SOCOTAC) and Mayelia
Transvie	National Observatory of Cities (ONAV)	Guinean Transport Company (SOTRAGUI)
Land Transport Development Fund (FDTT)	Malian Housing Office (OMH)	Urban Planning Department
Mobility expert	Mobility expert	Mobility expert

2.2. Analysis Methods: Stakeholder Profiles, Financing Mechanisms, and Business Models

The analysis of the data collected is based on a mixed approach, combining descriptive statistical processing, cross-comparisons, qualitative analysis, and economic performance indicators. This methodological diversity aims to rigorously understand the characteristics of minibus transport operators, their economic models, and their access to formal financing.

2.2.1. Analysis of Stakeholder Profiles and Operators' Sources of Financing

To study the socioeconomic profile of respondents, a descriptive analysis was favored, in line with the recommendations of several studies on informal transport in African cities [14, 29-32]. IBM SPSS Statistics software was used to produce cross-tabulations of age, gender, educational background, marital status, and length of service for each network [14, 21, 33]. The same approach was used to identify the sources of financing for minibus operators, but this time in the form of graphs, using PrismGraph version 10 software to visualize the results [34]. The qualitative data collected through semi-structured interviews enriched the available information and thus contributed to the final analysis of the minibus sub-sector in Dakar, Bamako, and Conakry. Emphasis was placed on regulatory dynamics, internal organizational strategies, remuneration methods, and the logic of access to or barriers to formal financing [11, 14]. This dimension enriched the statistical results and identified disparities between cities on the one hand and between networks on the other.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

2.2.2. Analysis of Economic Models

The analysis of operators' economic models combined a contextual reading inspired by previous work [1, 9, 14, 18] and an assessment of financial profitability based on empirical indicators. Unlike many studies that focus solely on operating methods, McCormick et al. [35] this research takes an operational and financial perspective. It draws in particular on the work of Tindano [9] and Arroyo-Arroyo and Kumar [15] on the evaluation of accounting results based on turnover, operating expenses, and financial profitability indicators. This approach is also used by the World Bank, particularly the SSATP, in its studies on micro-transport enterprises in Abidjan, Bamako, and Nairobi [36]. The comparative analysis between the old networks (OMN) and the reformed network (NMN) is primarily based on two indicators: net current income (NCI) and cash flow (CF). These indicators are determined based on information collected through questionnaire surveys. NCI is a financial performance indicator that measures the income generated by normal and recurring activities before accounting for exceptional items and taxes. It is calculated using the following simplified formula (1):

$$NCDI = DOR - DOE + FI + ou - EI - EPS - IT \; ; \quad \text{Where } RI, EI, EPS, IT = 0 \qquad (1)$$

NCDI: Net current daily income, DOR: Daily operating revenue, DOE: Daily operating expenses, FI: Financial income, EI: Exceptional income, EPS: Employee profit sharing (PS), IT: Income tax.

Cash flow (CF) refers to the monetary surplus generated by operations, reflecting an operator's ability to invest without borrowing [9]. It is calculated using the **formula (2)** below. In artisanal public transport networks (APT), drivers operate vehicles intensively, often for long hours and almost every day, except in the event of breakdowns, in order to maximize their income [37]. For the purposes of this study, we have used an average of 25 working days per month, taking into account five days of potential downtime due to breakdowns, as mentioned by IBIS [38] in its analysis of minibuses in Dakar. Furthermore, unlike the approach taken by Tindano [9], which uses more comprehensive indicators suited to formal transport companies, several variables are not included here in the profitability assessment, given the informal nature and simplified structure of the micro-enterprises concerned.

$$CF = NCMI + DAP - RDA + CVAS - PAD - ISTIS; \text{ où } NCMI = NCDI \times 25 \text{ et } DAP, RDA, CVAS, PAD, ISTIS = 0 \qquad (2)$$

NCMI: Net current monthly income, DAP: Depreciation, amortization, and provisions, RDA: Reversals of depreciation, amortization, CVAS: Carrying value of assets sold, PAD: Proceeds from asset disposals. ISTIS: Investment subsidies transferred to the income statement.

In this study, the mean or median was used as the central measure of profitability, depending on the normality of the data tested by the IBM SPSS Statistics tool. If the distribution is normal (p-value > 0.05), the mean is used; otherwise, the median is preferred [21, 39].

The analysis adopts a triangulated comparative approach, combining three cities (Dakar, Bamako, Conakry), two types of networks (ARM vs. NRM), and mixed methods. Unlike traditional studies, it integrates stakeholder profiles, operating data, and financial performance. The general research methodology is illustrated in Figure 1.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

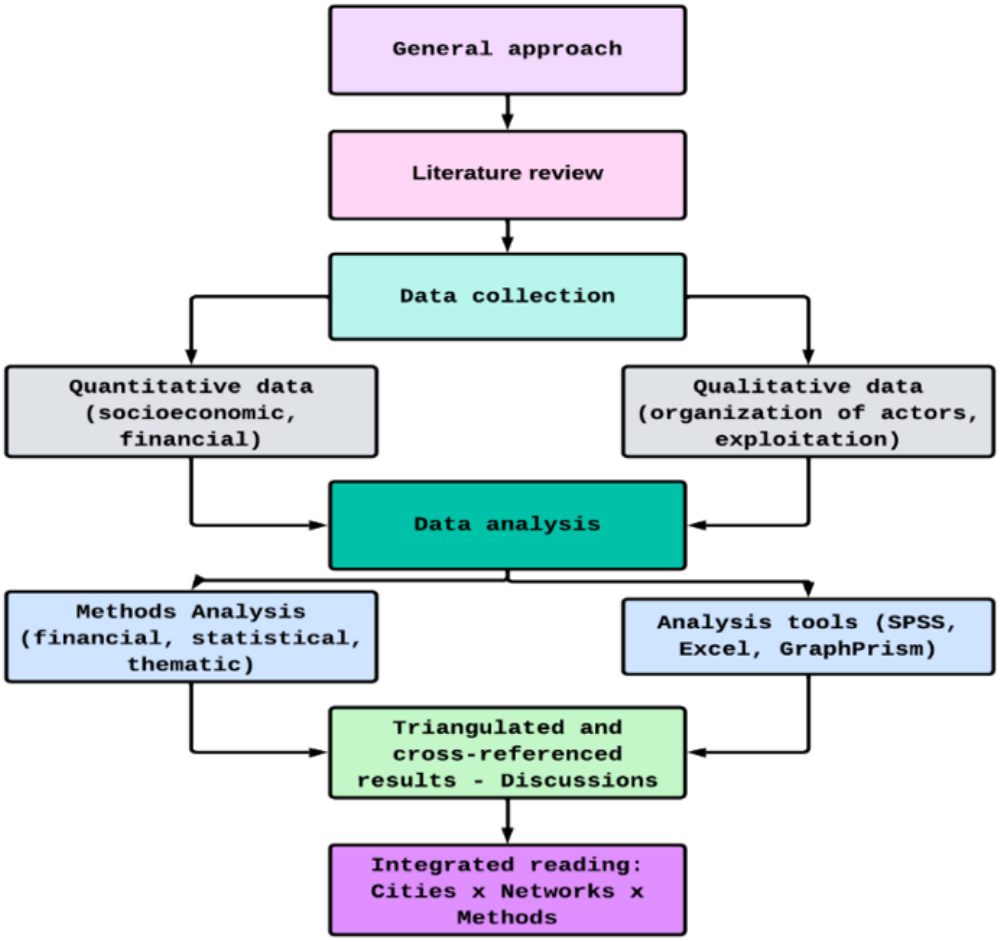

Figure 1.
Research methodology schema.

3. Results

3.1. Towards More Inclusive Public Transport: Analysis of NMN and OMN Operator Profiles

Table 2 below shows that in the reformed network (AFTU), there is a notable increase in the number of female operators: 9% of owners and 43% of conductors are women (W), unlike in artisanal networks (OMN), where operators are almost exclusively male (up to 100% for drivers and conductors in all networks, and more than 90% of owners are men (M). In terms of youth, the contrast is striking: according to surveys, 80% of AFTU minibus owners (O) are under 40 years old. These results are confirmed by a manager at the Support Center for the Professionalization of Transport Professions (CAPTRANS) during an interview, who states:

> *"Many of the older people who were initially involved in the project sold their vehicles to younger people who were more motivated to develop the network."*

He added that:

> *"There is an intergenerational conflict within the economic interest groups (IEGs), which are often led by older people whose decisions are usually criticized by young people. This has led to the emergence of a group of mostly better-educated young people who have taken advantage of the problems faced by older people to buy their own vehicles and join the AFTU network."*

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

However, in the OMN, only 1% of owners of "cars rapides/ndiaga ndiaye," 31% of owners of "sotramas," and 34% of owners of "magbanas" are under 40 years old. In terms of marital status, operators are mostly married in all networks, but the NMN shows greater diversity: 89% of drivers and 78% of owners are married (Ma), but 11% are divorced (Di), 9% are widowed (Wi), and 3% are single (Si). In the OMNs, the situation is more homogeneous, with, for example, 100% of owners married in the "sotramas" network, 99% in the OMN in Dakar, and 87% among "magbanas." Single people are more common among "magbana" drivers (25%) than among "car rapides/ndiaga ndiaye" drivers (17%) and "sotramas" drivers (17%). In terms of education level, NMN operators are more educated: 77% of owners have at least a primary school education (Pr), including 29% who have completed secondary school (Se) and 14% who have completed higher education; followed by the "sotrama" network, with 62% of owners having at least attended elementary school, including 15% who have completed secondary education. In the "car rapide/ndiaga ndiaye" networks in Dakar and the "magbana" networks in Conakry, the proportion of literate vehicle owners remains relatively low. In Dakar, 47% of owners are literate, with 17% having completed secondary school. In Bamako, this proportion is 37%, with 16% having attended middle school or high school, and only 4% having obtained a high school diploma. Thus, illiteracy is very prevalent among OMNs, particularly among "magbana" (60% of drivers and 31% of owners are uneducated - Ue). Koranic education (Ko) is particularly prevalent among owners of "cars rapides/ndiaga ndiaye" (48%) and "sotrama" drivers (33%). Finally, in terms of seniority, AFTU minibus owners are well established: 69% have more than 20 years of experience. A similar situation is observed among "cars rapides/ndiaga ndiaye" (86%), but this stability is based on an aging generation. In contrast, the "sotrama" and "magbana" networks show a more recent dynamic: 50% of "magbana" owners have less than 20 years of experience, including 18% with less than 5 years, reflecting both renewal and a certain structural precariousness.

Table 2.
Profile of TCA actors in the networks studied.

Profile	Actors	NMN	OMN		
		AFTU	Fast car/ndia nd	Sotrama	Magbana
SEX	Receiver	M: 57%; W: 43%	M: 100%	M: 100%	M: 100%
	Driver	M: 100%	M: 100%	M: 100%	M: 100%
	Owner	H: 91%; F: 9%	M: 97%; W: 3%	M: 100%	M: 90%; W: 10%
AGE	Drivers	< 40 years: 79%	< 40 years: 57%	< 40 years: 71%	< 40 years: 80%
	Owner	< 40 years: 80%	< 40 years: 1%	< 40 years: 31%	< 40 years: 66%
Marital Status	Driver	Ma: 89%; Si: 8%; Di: 3 %	Ma: 79%; Si: 17%; Di: 3%; Wi: 1%	Ma: 80%; Si: 19%; Di: 1%	Ma: 72%; Si: 25%; Di: 3%
	Owner	Ma: 78%; Di: 11%; Wi: 9%; Si: 3%	Ma: 99%; Di: 1%	Ma: 100 %	Ma: 87%; Si: 10%; Di: 1%; Wi: 1%
Education	Driver	Ko: 33%; Pr: 35%; Se: 29%; Ue: 1%	Ko: 32%; Pr: 55%; Se: 9%; Ue: 5%	Ko: 33%; Pr: 25%; Se: 15%; Ue: 27%	Ko: 18%; Pr: 11%; Se: 11%; Ue: 60%
	Owner	Ko: 21% Pr: 24%; Se: 39%; B+: 14%; Ue: 1%	Ko: 48%; Pr: 30%; Se: 17%; Ue: 5%	Ko: 26%; Pr: 29%; Se: 33%; Ue: 12%	Ko: 28%; Pr: 21%; Se: 16%; B+: 4%; Ue: 31%
Seniority	Owner	> 20 years: 69%	> 20 years: 86%	> 20 years: 65%	> 20 years: 50%

3.2. Business Model Analysis and Profitability of Minibus Operators

3.2.1. From Informal Individuals to Regulated Collectives: Forms of Organization of Informal Transport Operators in Dakar, Bamako, and Conakry

Table 3 presents the results of the economic models of the various minibus networks in Dakar, Senegal; Bamako, Mali; and Conakry, Guinea.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

3.2.1.1. AFTU, the Reformed Minibus Network in Dakar, Senegal

This network is fairly formally organized and structured into 14 economic interest groups (EIGs), which are legally recognized economic entities, all of which are members of the Urban Transport Professionals Financing Association (AFTU). The operators of the reformed network possess all the documents required to operate urban passenger transport, including accreditation, urban licenses, vehicle registration documents, insurance, and technical inspections certificates. Since operations began in 2005, AFTU has introduced approximately 2,200 new 50-seat minibuses (seated and standing) assembled in Senegal. The network's routes are approved by the Executive Council for Sustainable Urban Transport (CETUD), and their operation is regulated by concession contracts with specific requirements for service levels. The owners of "tata" minibuses (the term used to refer to the AFTU network) who responded to the questionnaires are primarily employers; however, interviews conducted in parallel revealed that there are also owner-drivers. Ninety percent of them are primarily engaged in transportation, with ownership distributed as follows: 3% own one minibus, 32% own two, 14% own between three and four, and 22% own more than five.

3.2.1.2. Cars rapides/Ndiaga Ndiaye, the old minibus network (OMN) in Dakar, Senegal

The old minibus network (OMN) in Dakar, which is continuing its reform with a view to eventually being absorbed by the AFTU network, shows that, according to the results in Table 4 below, 70% of vehicle owners are affiliated with economic interest groups (EIGs), which is a mandatory condition for benefiting from the fleet renewal program. At the same time, they are also active in other forms of groupings, notably trade unions, to which 51% belong, and associations, with 28% membership, compared to 21% who do not belong to any grouping. They continue to operate their vehicles informally, with self-defined routes that are not officially validated, a fleet of fewer than 300 minibuses with urban licenses (generally "cars rapides" with 23 to 25 seats) supplemented by vehicles with interurban licenses (most often "ndiaga ndiaye" with 35 to 45 seats), and the average age of the fleet exceeds 30 years. Most owners are transport operators (73%), with the following breakdown: 18% have one minibus, 27% have two, 38% have between three and four vehicles, and 17% have five or more minibuses. Operations are individual, with 92% being owner-employers and 8% being driver-owners.

3.2.1.3. Sotramas, the OMN in Bamako, Mali

Surveys conducted among network operators show that 97% of "sotrama" owners are affiliated with a union, an organization that is not recognized as a legal economic entity. The operators of these minibuses comply with current regulations, which require professionals to hold a transport card, insurance, a vignette, and a technical inspection certificate. Unlike the OMN in Dakar, sotrama routes are proposed by unions and approved by the Directorate of Regulation, Traffic, and Urban Transport (DRCTU), which is the technical department of the Bamako District City Council responsible for urban transport. The operators' fleet is outdated (>30 years old), the vehicles are small (18 to 23 seats), and the fleet is not controlled by the public authorities. Ninety-nine percent of minibuses belong to professional transport operators, with the following distribution of ownership: 75% have one minibus, 19% have two, and 6% have three vehicles. The operation is individual, with 48% of operators being owner-employers and 52% owner-drivers.

3.2.1.4. Magbanas, the OMN in Conakry, Guinea

Magbanas operators adopt an informal organization based on individual operation, with 55% of owners being employers and 45% owner-drivers. 44% of vehicle owners are not members of any group; 39% are part of syndicates; 16% have joined associations; and 1% are in cooperatives. They are not legally recognized as an economic entity; more importantly, most operators do not comply with current urban transport regulations. Very few operators possess the required documents to operate. Besides

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

registration documents held by all vehicles, only 21% of the surveyed minibuses are insured, and they did not express an opinion on obtaining urban transport authorization, such as an urban license and accreditation. Despite the existence of the Conakry Urban Transport Authority (AOTUC), the "magbanas" routes are defined without validation by the public authority. The vehicles in this network are in an advanced state of disrepair (minibuses are over 30 years old); their capacity is low (18 to 23 seats), and the fleet is uncontrolled. Ownership is fragmented, with 61% of owners having only one minibus, 24% having two, 10% having three vehicles, and 6% owning more than five minibuses.

Table 3.
Organizational structure of artisanal public transport (APT) operators.

Dimensions	NMN	OMN		
	AFTU	**Fast car / ndiaga ndiaye.**	**Sotrama**	**Magbana**
Organizational form	100% AFTU members	51% unionized, 28% association members, 21% unaffiliated	97% syndicate, 3% association	44% unaffiliated, 39% union, 16% association, 1% cooperative
Enterprise	100% EIG	70% EIG	No legal status	No legal status
Regulations	100%: approval, urban license, vehicle registration, insurance, technical inspection	100%: authorization, urban license, vehicle registration document, insurance, technical inspection certificate	100%: transport card, parking, insurance, technical inspection	100% vehicle registration, 21% insured, no technical inspection
Main activity and nature of ownership	100% private (90% transport operators, 10% merchants): 31% have 1 vehicle, 32% have 2, 14% have 3–4, 22% have ≥ 5.	100% private (73% transport operators, 11% traders, 9% workers, 7% farmers): 18% have 1, 2.38% have 2, 3.17% have 3–4, ≥ 5.	99% of transport operators, 1% of merchants: 75% have 1 minibus, 19% have 2, and 6% have 3.	The majority are transporters: 61% have 1, 2.4% have 2, 10% have 3, and 6% have ≥ 5.
Type of actor	100% owner-employers	48% owner-employers, 52% owner-drivers	48% employer-owners, 52% owner-drivers	55% owner-employers, 45% owner-drivers
State of fleet	Approximately 2,200 minibuses, < 20 years old, 50-seat capacity, renewal in 2024	< 300 urban minibuses, often > 30 years old, capacity 23–45 seats	Uncontrolled fleet, >30 years old, capacity 18–23 seats	Uncontrolled fleet, >30 years old, capacity 18–23 seats
Operation	Concession to GIE, compliance with specifications; GIE proposal, CETUD approval, concession contract.	Individual operation; proposal by operators/unions, without validation by the authorities	Individual operation; proposal from operators/unions, approval by DRCTU	Individual operation; proposal from operators/unions, without validation by the authorities

3.2.2. Profitability Analysis of Minibus Operators

3.2.2.1. Revenue Estimation: A Common Approach and a Differentiated Logic Between OMN And NMN

In both categories of networks (NMN and OMN), revenues are estimated based on the number of daily trips (one-way), vehicle occupancy rates, and the fare applied. Although the calculation method is identical, revenue management differs significantly. In the AFTU network, revenue from the activity is collected by a salaried conductor who covers daily expenses before transferring the balance to the owner. Thanks to the ticketing system in place, the owner and the project promoters (AFTU and CETUD) benefit from greater visibility of the financial flows related to operations. In contrast, in the OMNs, cash management is mainly the responsibility of the driver, assisted by a collector commonly referred to as an "apprenti." The latter collects revenue on board, but it is the driver who covers daily expenses before paying the agreed lump sum to the owner, keeping the rest as surplus. This operating

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

mode limits transparency and deprives the owner of a clear view of the real revenue generated by his business.

Table 4 illustrates the differences in productivity between the networks. The median number of trips for AFTU minibuses is three round-trip per day, or six trips, compared to medians of five for "cars rapides/ndiaga ndiaye" and four for 'sotramas' and "magbanas," which are equivalent to 10 and 8 trips, respectively. In terms of fares, the median values are 250 CFA francs in the NMN, 200 CFA francs for "cars rapides/ndiaga ndiaye," 250 CFA francs for "sotramas," and 500 CFA francs for "magbanas." The capacity of the rolling stock also varies, ranging from 50 seats (standing and seated) for NMN minibuses to a median of 32 for "cars rapides/ndiaga ndiaye," a median of 20 for "sotramas," and a median of 18 for "magbanas." There are different practices for daily payments. In the NMN and for magbanas, the amounts paid are not fixed and vary according to daily income. The entire profit margin is paid to the vehicle owners. In Conakry, drivers work on Sundays for their wages in addition to a modest amount given to them by their employer at the end of each month. On the other hand, in networks such as the "cars rapides/ndiaga ndiaye" and "sotramas," a lump sum daily fee, generally around 15,000 CFA francs, is imposed, except on Sundays. Vehicle occupancy rates generally exceed 100% due to passengers boarding throughout the journey. The formalization of operations in the reformed network allows for a more rational allocation of vehicles on the routes served. Conversely, OMNs operate according to a self-organized logic, often dependent on unions or the individual decisions of operators. This organization, based on local practices, encourages an irrational distribution of minibuses on routes, intensifying competition between operators. Finally, the lengths of the routes served vary according to the network: the median is 26 km for the AFTU, 13 km for the "cars rapides/ndiaga ndiaye," 24 km for the "magbanas," and 22 km for the "sotramas."

Table 4.
Elements for estimating operating revenue.

Dimensions	Networks	ddl	Shapiro-Wilk	Normality	Observations	Results
Daily payment (FCFA)	AFTU	101	0,001<0,05	Abnormal	Median	45 000
	Fast car / ndiaga ndiaye.	101	> 0,05	Normal	Average	15 000
	Sotrama	100	> 0,05	Normal	Average	15 000
	Magbana	101	0,000<0,05	Abnormal	Median	14 000
Fare (FCFA)	AFTU	101	0,001<0,05	Abnormal	Median	250
	Fast car / ndiaga ndiaye.	101	0,001<0,05	Abnormal	Median	200
	Sotrama	100	0,001<0,05	Abnormal	Median	250
	Magbana	101	0,001<0,05	Abnormal	Median	500
Rotation	AFTU	101	0,001<0,05	Abnormal	Median	3
	Fast car / ndiaga ndiaye.	101	0,001<0,05	Abnormal	Median	5
	Sotrama	100	0,001<0,05	Abnormal	Median	4
	Magbana	101	0,001<0,05	Abnormal	Median	4
Load rate	AFTU	101	> 0,05	Normal	Average	1
	Fast car / ndiaga ndiaye.	101	> 0,05	Normal	Average	1
	Sotrama	100	> 0,05	Normal	Average	1
	Magbana	101	> 0,05	Normal	Average	1
Length of routes (km)	AFTU	101	0,001<0,05	Abnormal	Median	26
	Fast car / ndiaga ndiaye.	101	0,001<0,05	Abnormal	Median	13
	Sotrama	100	0,001<0,05	Abnormal	Median	22
	Magbana	101	0,001<0,05	Abnormal	Median	24
Vehicle capacity (number of seats)	AFTU	101	> 0,05	Normal	Average	50
	Fast car / ndiaga ndiaye.	101	0,001<0,05	Abnormal	Median	32
	Sotrama	100	0,001<0,05	Abnormal	Median	20
	Magbana	101	0,001<0,05	Abnormal	Median	18

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

3.2.3. Current Operating Expenses: Contrasting Approaches Between NMN And OMN

Current expenses in the new minibus network (NMN) mainly concern fuel, contributions for the management of support staff under the responsibility of CAPTRANS (i.e., 1,200 CFA francs per minibus per day), and various costs related to daily operations. In contrast, the OMN has a different expenditure structure that includes union dues, vehicle loading costs (to pay "coksers," station managers, and members of unions who work daily in the field), as well as solidarity contributions for social events, unofficial expenses in the event of infractions, and the remuneration of the "apprenti" (conductor). Minibus operators from both networks also incur costs for washing and guarding vehicles. Table 5 below shows that the median amounts of other minibus operating costs are 1,640 CFA francs for the AFTU network, 1,600 CFA francs for the OMN in Dakar, 1,183 CFA francs for the Bamako network, and 1,000 CFA francs for the Conakry minibus network. Fuel, which represents the main expense, is estimated at an average of 39,000 CFA francs per day in the AFTU network, compared to 22,000 CFA francs for the old minibuses in Dakar, 20,000 CFA francs for those in Bamako, and 24,900 CFA francs for those in Conakry. The driver's daily surplus is estimated at 7,000 CFA francs for the old minibus networks (OMN) in Dakar and Conakry, and at 4,000 CFA francs for the Bamako network. In addition, in all networks, crews receive a daily allowance estimated at 5,000 CFA francs in the NMN, 4,000 CFA francs in the OMN in Dakar, 3,000 CFA francs in the "sotramas" network, and 2,000 CFA francs in the "magbanas" network.

Table 5.
Elements for estimating operating expenses.

Charges	Networks	**ddl**	**Shapiro-Wilk**	**Normality**	**Observations**	**Results**
Other Expenses (FCFA)	AFTU	101	> 0,05	Normal	Average	1 640
	Fast car / ndiaga ndiaye.	101	0,001<0,05	Abnormal	Median	1 600
	Sotrama	100	0,001<0,05	Abnormal	Median	1 183
	Magbana	101	0,001<0,05	Abnormal	Median	1 000
Daily fuel consumption (FCFA)	AFTU	101	0,001<0,05	Abnormal	Median	39 000
	Fast car / ndiaga ndiaye.	101	0,008<0,05	Abnormal	Median	22 000
	Sotrama	100	0,001<0,05	Abnormal	Median	20 000
	Magbana	101	0,001<0,05	Abnormal	Median	24 900
Daily allowance (FCFA)	AFTU	101	0,001<0,05	Abnormal	Median	5 000
	Fast car / ndiaga ndiaye.	101	0,001<0,05	Abnormal	Median	4 000
	Sotrama	100	0,001<0,05	Abnormal	Median	3 000
	Magbana	101	0,001<0,05	Abnormal	Median	2 000
Road fees (FCFA)	AFTU	101	Not exist	Not exist	Not exist	0
	Fast car / ndiaga ndiaye.	101	0,001<0,05	Abnormal	Median	5 000
	Sotrama	100	0,001<0,05	Abnormal	Median	2 000
	Magbana	101	0,001<0,05	Abnormal	Median	1 400
Load fees (FCFA)	AFTU	101	Not exist	Not exist	Not exist	0
	Fast car / ndiaga ndiaye.	101	0,001<0,05	Abnormal	Median	1 000
	Sotrama	100	0,001<0,05	Abnormal	Median	100
	Magbana	101	0,001<0,05	Abnormal	Median	900
Receiver remuneration (FCFA)	AFTU	101	Not exist	Not exist	Not exist	0
	Fast car / ndiaga ndiaye.	101	0,000<0,05	Abnormal	Median	5 000
	Sotrama	100	0,000<0,05	Abnormal	Median	2 000
	Magbana	100	0,000<0,05	Abnormal	Median	2 500
Driver's Surplus (FCFA)	AFTU	101	Not exist	Not exist	Not exist	0
	Fast car / ndiaga ndiaye.	101	0,000<0,05	Abnormal	Median	7 000
	Sotrama	100	0,000<0,05	Abnormal	Median	4 000
	Magbana	101	0,001<0,05	Abnormal	Median	7 000

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

3.2.4. Non-Recurring Expenses Managed Differently Between NMN And OMN

3.2.4.1. Maintenance, Repairs, and Administrative Costs

Table 6 illustrates how non-recurring expenses are managed in minibus networks in the cities studied and the normality tests used to choose between the median and the average for measuring profitability. In the NMN, certain expenses, such as insurance, are contracted directly between AFTU and insurance companies, thereby relieving operators of these costs. The commercial contract between AFTU and SENBUS (minibus supplier) has enabled the establishment of an after-sales service (ASS) mechanism. Ongoing maintenance of the minibuses is provided in the workshops of UNITECH, a professional entity with expertise in this domain, set up by the supplier to support the program. It ensures the availability of spare parts and guarantees the gearbox, chassis, engine, and rear axle during the lease term (5 years). The after-sales service is criticized by most operators, who find minibus maintenance expensive but also point out the unavailability of original spare parts in UNITECH's workshops, which means that vehicles can be immobilized for days without being operated. A manager at the minibus assembly company (SENBUS) confirms these shortcomings, stating:

> *"Yes, I admit that there are deficiencies in after-sales service due to a lack of financial resources to ensure an adequate supply of spare parts".*

The arrival of the Mutual Savings and Credit for Transport Workers (MECTRANS) has made it easier for operators to access credit to repair vehicles in the event of major breakdowns. Conversely, the maintenance of OMN rolling stock is carried out by informal mechanics, often with non-compliant parts, and the costs are borne directly by the owners individually, without mutualization. Furthermore, in Dakar and Bamako, minibuses are required to undergo technical inspections twice a year (every six months), at a cost of 12,000 CFA francs and 15,000 CFA francs, respectively. In Conakry, although Ministerial Decree A/2023/1093 of March 27, 2023, made these inspections mandatory as of May 2, 2023, the "magbanas" still do not have technical inspection certificates.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

Table 6.
Estimates of non-recurring costs to be borne by the minibus owner.

Charges	Networks	ddl	Shapiro-Wilk	Normality	Observations	Results
Number of breakdowns per month	AFTU	101	0,000<0,05	Abnormal	Median	3
	Fast car/ndiaga ndiaye	101	0,000<0,05	Abnormal	Median	2
	Sotrama	100	0,000<0,05	Abnormal	Median	3
	Magbana	100	0,000<0,05	Abnormal	Median	AA*
Cost of a breakdown	AFTU	101	0,000<0,05	Abnormal	Median	25 000
	Fast car/ndiaga ndiaye	101	0,000<0,05	Abnormal	Median	15 000
	Sotrama	100	0,000<0,05	Abnormal	Median	20 250
	Magbana	100	0,000<0,05	Abnormal	Median	AA
Number of oil changes per month	AFTU	101	>0,05	Normal	Median	1
	Fast car/ndiaga ndiaye	101	>0,05	Normal	Median	1
	Sotrama	100	0,000<0,05	Abnormal	Median	1
	Magbana	100	0,000<0,05	Abnormal	Median	AA
Cost of oil changes per month	AFTU	101	>0,05	Normal	Average	135 000
	Fast car/ndiaga ndiaye	101	0,000<0,05	Abnormal	Median	20 000
	Sotrama	100	0,000<0,05	Abnormal	Median	27 500
	Magbana	100	0,000<0,05	Abnormal	Median	AA
Number of technical inspections per year	AFTU	101	>0,05	Normal	Average	2
	Fast car/ndiaga ndiaye	101	>0,05	Normal	Average	2
	Sotrama	100	>0,05	Normal	Average	2
Cost of technical inspection	AFTU	101	>0,05	Normal	Average	12 000
	Fast car/ndiaga ndiaye	101	>0,05	Normal	Average	12 000
	Sotrama	100	>0,05	Normal	Average	15 000
Insurance/month	Fast car/ndiaga ndiaye	101	0,000<0,05	Abnormal	Median	35 000
	Sotrama	100	0,000<0,05	Abnormal	Median	21 600
Vignette or tax	Fast car/ndiaga ndiaye	101	>0,05	Normal	Average	5 000
	Sotrama	100	>0,05	Normal	Average	9 583
Transport card	Sotrama	100	>0,05	Normal	Average	10 000

Note: *Any Answer.

3.2.4.2. Staff Remuneration: Different Remuneration Methods between NMN and OMN

In both types of networks, employers pay monthly remuneration to rolling personnel. However, the terms and amounts vary greatly. In the NMN, drivers and conductors are employed under a structured salary system, with a fixed monthly salary generally exceeding 100,000 CFA francs for drivers and 60,000 CFA francs for conductors, in addition to performance bonuses. This system reflects a desire for professionalization and formalization. In contrast, in the OMNs, wages are significantly lower and more precarious: drivers of "cars rapides/ndiaga ndiaye" receive 50,000 CFA francs per month, those of 'sotramas' receive around 30,000 CFA francs, and "magbanas" barely 21,000 CFA francs. It should be noted that in the event of missing payments, the owner deducts the shortfall from the monthly salary. On this subject, a "car rapide" driver in Dakar says:

> *"Not only are the salaries low, but when we don't have the money to pay, they deduct it from our monthly salary, which means we end up with almost nothing at the end of the month."*

Due to the unreliability of some drivers in the informal transport network, this statement should be taken with a grain of salt for two main reasons. The first is that drivers have a daily surplus and generally keep all the profit margin from Sundays worked. The second reason is that the vehicle owner has no control over the cash flow generated by the activity.

In terms of working conditions, NMN employees benefit from a more structured framework. They generally work no more than 22 days per month. They are organized in pairs of drivers (regular and substitute) and conductors, with fixed teams assigned to each vehicle in accordance with the quality charter signed between CETUD, AFTU, and the operators. In contrast, in the OMNs, drivers provide

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

service almost every day of the week if the vehicle is operational. Conductors, meanwhile, are paid on a day-to-day basis, with no job security or stability. All staff observed in both networks work without a formal contract. However, only the AFTU network has implemented support measures, such as TRANSVIE, a mutual health insurance scheme for transport operators, demonstrating an effort to improve social protection. Table 7 shows that the duration of collaboration between drivers and employers varies across network categories: in the AFTU network, 80% of drivers have been working with the same owner for more than five years. Conversely, relationships in OMN are more unstable: over 90% of drivers have been working with their employers for less than five years, with a significant proportion (53% on average) having been recruited less than a year ago. This reflects the precarious nature of these relationships, low employee loyalty, and the dynamics between these actors. The surveys also revealed that 94% of AFTU minibus drivers are trained in professional and safe driving, as well as first aid and customer management, unlike OMN workers, who lack training.

Table 7.
Duration of collaboration between employees and employers.

Durée	AFTU	Fast car/ndiaga ndiaye	Sotrama	Magbana
Less than a year	–	31%	67%	60%
Between 1 to 2 years	–	12%	18%	9%
Between 2 to 5 years	11%	36%	10%	12%
Between 6 months and 1 year	*2 (included in <5 years*	–	–	–
More than 5 years	80%	9%	5%	9%
Less than 5 years	20%	91%	95%	91%

3.2.4.3. Profitability, Expenses, and Self-Financing: A Structural Advantage for AFTU

The AFTU network performs significantly better economically than the OMNs (**Table 8**). With a capacity of 50 seats, a median fare of 250 CFA francs, and six trips per day, minibuses generate daily operating revenue estimated at 82,500 CFA francs, compared to 57,600 CFA francs for "cars rapides/ndiaga ndiaye," 44,000 CFA francs for "sotramas," and 50,400 CFA francs for "magbanas." Despite higher operating costs of 45,640 CFA francs, the NMN maintains a daily operating profit of 36,860 CFA francs, which is nearly double or more than the OMN's 19,000 CFA francs for the "car rapide/ndiaga ndiaye" network, 15,717 CFA francs for the "sotramas," and 17,700 CFA francs for the "magbanas." The monthly income generated by the owner in the NMN reaches 711,500 CFA francs after deduction of current and non-current expenses (excluding salaries), compared to 208,000 CFA francs for the "car rapide/ndiaga ndiaye," 170,159 CFA francs for "sotramas," and 179,250 CFA francs for "magbanas." This difference can be explained by higher productivity linked to the size of the vehicles and the organization of operations within the EIGs. Despite a higher frequency of trips, OMNs remain at a disadvantage due to the low capacity of their minibuses, their individual management, the proportionally higher costs, and their informal structuring. The NMN also stands out for its formalized employment practices, with regular salaries for drivers and conductors, which increases costs (to 250,000 CFA francs). Finally, the NMN's self-financing capacity (monthly CAF of 471,500 CFA francs) is three times higher than that of old minibus networks, which strengthens its economic viability.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

Table 8.
Solvency results for minibus operators.

Designations	NMN	OMN		
	AFTU	Fast car/ndiaga ndiaye	Sotrama	Magbana
Number of trips	6	9	8	8
Vehicle capacity	50	32	20	18
Load rate	1	1	1	1
Fare	250	200	275	350
Operating Income	82 500	57 600	44 000	50 400
Fuel	39 000	22 000	20 000	24 900
Other expenses	1 640	1 600	1 183	1 000
Road fees		5 000	2 000	1 400
Load fees		1 000	100	900
Daily allowance	5 000	4 000	3 000	2 000
Remuneration conductor		5 000	2 000	2 500
Operating expenses	45 640	38 600	28 283	32 700
Daily operating result	36 860	19 000	15 717	17 700
Surplus		7 000	4 000	7 000
Daily owner income	36 860	12 000	11 717	10 700
Monthly owner income	921 500	300 000	292 925	267 500
Insurance	-	35 000	21 600	-
Vehicle maintenance (Vidange)	135 000	20 000	27 500	27 500
Breakdown	75 000	30 000	60 750	60 750
Technical Inspection	-	2 000	2 500	-
Other monthly expenses	-	5 000	10 416	-
Non-recurring expenses	210 000	92 000	122 766	88 250
Monthly income from the activity	711 500	208 000	170 159	179 250
Regular driver's remuneration	100 000	50 000	30 000	21 000
Regular conductor's remuneration	60 000			
Substitute driver's remuneration	50 000			
Substitute the conductor's remuneration	30 000			
Monthly current income or CAF	471 500	158 000	140 159	158 250

Table 9 indicates that the AFTU network demonstrates superior control over operating costs, which account for only 55% of revenue, compared to 67% for "cars rapides/ndiaga ndiaye," 64% for "sotramas," and 65% for "magbanas." This efficiency allows the NMN to generate a daily operating profit of 45% of revenue, the highest among all networks, whereas OMNs have lower margins: 33% for "cars rapides/ndiaga ndiaye," 36% for "sotramas," and 35% for "magbanas." Fuel costs are the primary expense across all networks but are proportionally better managed in the NMN (47% of revenue) than in "magbanas" (49%) or "sotramas" (45%). Additional costs, such as daily allowances (6% in the NMN versus 7% in OMNs) and daily conductor remuneration (0% in the NMN, 9% in Dakar OMN, and 5% in "sotramas" and "magbanas"), impose a greater burden on artisanal networks. Road fees (unofficial expenses) follow a similar trend, at 9% in Dakar OMN, 5% in Sotramas, and 3% in , whereas these fees are absent in the NMN. In summary, the reformed minibus network benefits from a more integrated and streamlined model, reducing variable costs and enhancing profitability, while OMNs, being more fragmented and exposed to multiple direct costs, experience diminished economic performance due to a less controlled and dispersed cost structure.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

Table 9.
Distribution of operating revenues between income and expenses.

Designations	NMN	OMN		
	AFTU	Fast car/ndiaga ndiaye	Sotrama	Magbana
Operating Income	100%	100%	100%	100%
Fuel	47%	38%	45%	49%
Other expenses	2%	3%	3%	2%
Road fees (unofficial expenses)	0%	9%	5%	3%
Load fess	0%	2%	0%	2%
Daily allowance	6%	7%	7%	4%
Conductor's daily remuneration	0%	9%	5%	5%
Operating expenses	55%	67%	64%	65%
Daily operating result	45%	33%	36%	35%

Table 10 below illustrates a more balanced financial situation in the reformed network, despite specific costs associated with formalization (maintenance, wages, etc.). Non-recurring costs represent 23% of monthly income, compared to 31% for "cars rapides/ndiaga ndiaye," 42% for "sotramas," and 33% for "magbanas." These costs weigh particularly heavily on OMNs, where breakdown costs are highest (21% for "sotramas" and 23% for "magbanas") compared to only 8% in the NMN, revealing more frequent mechanical deterioration linked to the age of the fleet. The net monthly income from the activity, after deduction of these expenses, is also higher in the AFTU network, at 77% of the monthly gross margin, compared to 69% for "cars rapides/ndiaga ndiaye," 58% for "sotramas," and 67% for "magbanas." In terms of salaries, the NMN devotes a significant portion to staff remuneration, i.e., 26% of gross monthly income, divided between regular drivers (11%), regular conductors (7%), substitute drivers (5%), and substitute conductors (3%). Conversely, OMNs often outsource or minimize these expenses, with only the regular driver being paid (17% among "cars rapides/ndiaga ndiaye," 10% among "sotramas," 8% among "magbanas"), which reduces salary costs but also reflects a lower level of formalization and difficult working conditions. Finally, self-financing capacity (CAF), which reflects monthly operating income, remains broadly comparable across networks: 51% for NMN, 53% for "cars rapides/ndiaga ndiaye," 48% for "sotramas," and 59% for "magbanas." However, this similarity masks structural differences: the NMN achieves this result despite a more formal wage bill, whereas the OMNs achieve it at the cost of underpaying staff or increased job insecurity. In summary, the AFTU network combines better control of technical costs (breakdowns, maintenance) and investment in the formalization of work, while maintaining a good level of net income, whereas the OMNs show uneven performance, often compromised by the dilapidated state of the fleet and the lack of a structured wage system.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

Table 10.
Owners' monthly income distribution.

Designations	NMN	OMNM		
	AFTU	Fast car/ndiaga ndiaye	Sotrama	Magbana
Monthly income Owner	100%	100%	100%	100%
Insurance	0%	12%	7%	0%
Maintenance (Oil change)	15%	7%	9%	10%
Breakdown	8%	10%	21%	23%
Technical Inspection	0%	1%	1%	0%
Other monthly expenses	0%	2%	4%	0%
Non-recurring expenses	23%	31%	42%	33%
Monthly income from the business	77%	69%	58%	67%
Regular driver's salary	11%	17%	10%	8%
Regular conductor's salary	7%	0%	0%	0%
Substitute the driver's salary	5%	0%	0%	0%
Substitute the conductor's salary	3%	0%	0%	0%
Cash-flow	51%	53%	48%	59%

3.3. Analysis of Minibus Operator Financing Mechanisms: The NMN as a More Viable Model

3.3.1. Access To Financing in the APT: A Comparative Analysis of Investment Practices

Figure 2 below shows that there are marked differences between the reformed network (NMN) and artisanal networks (OMN) in terms of vehicle acquisition methods. For the first vehicle, AFTU owners all invested exclusively with their own funds (100%), while OMN operators made greater use of formal credit (24% for "cars rapides/ndiaga ndiaye" and 7% for 'magbanas') or informal credit (up to 9% for "sotramas"). Thus, OMNs show a diversity of initial financing sources, although equity capital remains the majority (between 72% and 91%). On the other hand, for the acquisition of the last vehicle, the contrast is reversed: 100% of AFTU operators used formal loans, marking a transition to modern financial structuring. In revanche, OMNs continue to rely mainly on equity capital (88% among "sotramas," 82% among 'magbanas'), with little use of bank credit (only 3% for "sotramas," 10% for "magbanas"). These differences show that the NMN has better access to structured financing, probably facilitated by collective guarantees (EIGs) and public partnerships. OMNs remain more self-financed and dependent on informal sources, limiting their ability to renew their fleets on a large scale.

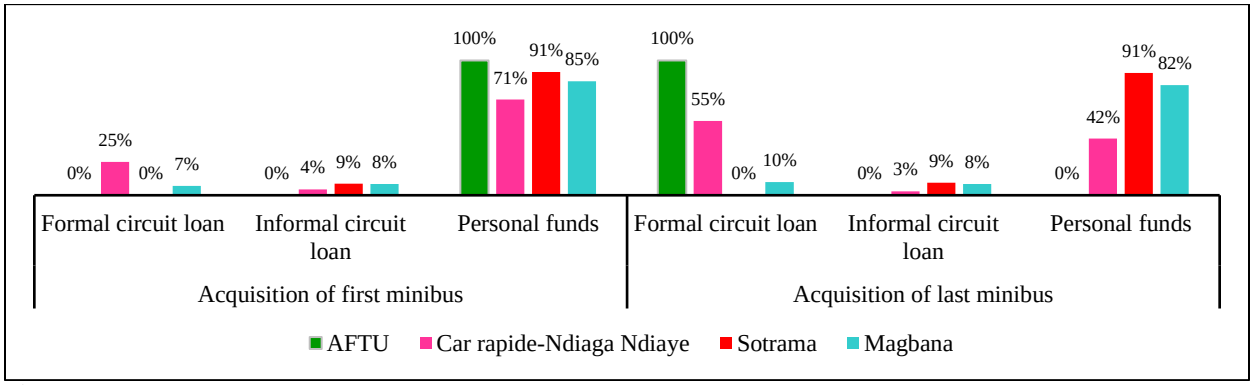

Figure 2.
Sources of financing for APT operators in Dakar, Bamako, and Conakry.

With regard to initial investments in the acquisition of OMN minibuses, interviews with union leaders in the three cities show that vehicles can cost between 3 and 6 million CFA francs, depending on their condition. The head of the Lat Dior urban station in Dakar states:

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

"Vehicles in poor condition cost between 4 and 4.5 million CFA francs, and this price includes the purchase of the urban license that allows the owner to benefit from the renewal program. In the meantime, the owner repairs the vehicle so that it can be put into service."

He adds:

"Vehicles in good condition can cost up to 6 million CFA francs, including the cost of the urban license."

A manager at Parking Vox in Bamako states:

"Sotrams in good condition can cost up to 4 million CFA francs, and those in poor condition 2.5 million. However, it will require significant investment to repair the sotrama before it can be put into service.

Even if these operators find the prices of these vehicles expensive, these amounts do not allow them to invest in reliable, high-capacity, environmentally friendly rolling stock.

3.3.2. Between Banking and Precariousness: Analysis of Financing Mechanisms in Reformed and Artisanal Networks

The amounts available in the formal sector, the number of loans, repayments, and borrowing conditions are shown in Table 11 below. The results highlight a clear contrast between the reformed network and artisanal networks (OMN) in terms of access to formal credit, amounts borrowed, and repayment terms. In the NMN, 100% of operators took out a formal loan (leasing) to purchase their second vehicle, with a high amount ranging from 21 to 33 million CFA francs and monthly repayments of 300,000 to 700,000 CFA francs. These loans are systematically backed by strict conditions, including a personal contribution (25%) and a joint guarantee (member of an EIG), reflecting a structured and secure system. Conversely, in OMN networks, access to formal financing remains largely marginal: between 87% of respondents among the "magbana" and 91% among the "sotrama" say they have never taken out a formal loan. When available, the amounts are low (less than 4 million CFA francs), with modest repayments (often less than 200,000 CFA francs). Guarantees are mainly based on individual assets, sometimes combined with a personal contribution, but in more than 85% of cases, operators say they are not concerned by credit facilities. This contrast reflects a formal and professional financing structure in the NMN, compared with a predominance of self-financing and informal financing in the OMNs, limiting their capacity for investment and fleet renewal.

Table 11.
Financing conditions for minibus operators.

Financing	**OMN**	**OMN**		
	AFTU	**Fast car/ndiaga ndiaye**	**Sotrama**	**Magbana**
Access to formal loans	100% available	63% available	9% available	13% available
Loan (million CFA francs)	21–33: 100%	< 4: 63%	< 4: 9%	< 4: 13 %
Repayment (thousand CFA francs)	300–700: 100 %	50–200: 58%	≤ 200: 9% P	≤ 200: 13%
Number of loans	One time: 100%	+ one time: 63%	One time: 9%	One time: 10%
Conditions du prêt	Contribution + joint guarantee (100 %)	Property warranty (100 %)	Warranty + contribution (3 %)	Single or mixed contribution (6 %)
Loan conditions	0 %	37 %	91 %	87 %

Interviews conducted with microfinance bank managers in Bamako and Dakar, notably Baobab, show that the amounts available to OMN operators and the loan terms are favorable to operators because they are sure to be solvent. However, due to their behavior and bad faith, banks do not trust them. In the Malian capital, the branch manager of ACI 2000 states:

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

"We are interested in working with them because we know that their business allows them to repay the sums they borrow here. There are even 'sotrama' owners who always borrow from the bank and meet their repayment schedules. On the other hand, we have worked with others who have still not repaid the sums borrowed because of their bad faith. When they are new, they pay, but for their second or third loan, they no longer meet their payments. That is why we are now very selective with this target group."

As for the question of collaboration within a public-private partnership (PPP) framework for the renewal of "sotramas," he states:

"Yes, we are interested in these kinds of initiatives because the framework can allow for good collaboration and effective monitoring."

In Dakar, a loan officer from the same bank states:

"At first, we granted loans to small-scale transport operators, but since the loan conditions required a vehicle registration certificate, some operators went so far as to provide documents for vehicles that were not operational in order to qualify for loans. This led to unhealthy loans in our loan portfolio, which is why we are now working with them cautiously. However, it must be recognized that their activity allows them to honor their commitments, but they are unpredictable."

These statements continue to highlight the shortcomings of the informal management system of micro-transport enterprises, which, due to their individual management, the inefficiency of the forms of organization they adopt, and their clumsy behavior, limit their access to formal credit.

4. Discussions

4.1. Gender at the Heart of the Economic Model of Reformed Minibuses in AFTU

The results show that women are integrated into artisanal public transport (APT) activities in the networks studied, particularly in the NMN, where almost 9% of owners and nearly 43% of conductors are women, unlike in the OMN, where almost all driving personnel are male. These results are consistent with those of Vakaramoko and Koffié-Bikpo [40], who show that the drivers of live produce at the big market of Bouaké, Ivory Coast, are all male. On the other hand, Diaou et al. [16] point out that in South Africa, women are increasingly being recruited as drivers of heavy goods vehicles. Through their work on new minibuses in Dakar, these authors show that out of a sample of 232 actors surveyed, 28% were women exclusively from groups of owners and receivers, with the rest being male drivers [16]. This represents a notable break with tradition in a historically male-dominated sector, linked to the formalization of the informal transport sector, which lowers barriers to access to productive resources and welcomes different profiles [41]. An important aspect of the reformed network is its inclusive nature, particularly in terms of generational renewal, with more than 80% of young owners (aged < 40) and 53% of entrepreneurs having at least a secondary education, 14% of whom possess a high school diploma or higher. In contrast, in the OMNs, apart from the receivers who are young, drivers and owners are generally over 40 years old and have very low levels of education. Diaou et al. [16] found similar results in their research on the reformed network in the Senegalese capital, with more than 46% of actors having at least a high school or college (secondary) education and more than 70% being young people under the age of 40 Asimeng and Asabere [42] confirmed the advanced age of OMN vehicle owners, which can be explained by the fact that they are first drivers at the age of 25, for example in Senegal (the age required to obtain a public transport license), before acquiring their own vehicle. Godard [22] makes a similar point, revealing that the average age of gbaka owners in Abidjan was 45, with 32% over the age of 50, and the youngest being 31 years old. However, the renewal program was supposed to target this category of older operators with low levels of education. But we are seeing an intergenerational shift in the reformed network, explained by the fact that the older people who initially benefited from the project sold their minibuses to younger, better-

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

educated operators after paying off their debts to AFTU. Following internal management problems within the economic interest groups (EIGs), the new owners of the minibuses took advantage of this situation to join the network. Other new entrants preferred to buy old minibuses with their urban licenses, which gave them the opportunity to become part of the program's target group. The departure of the operators initially targeted by the project after the end of the lease agreement demonstrates the shortcomings of the model, which means that once ownership of the vehicle is definitively transferred to the beneficiary, it is difficult to monitor and enforce the terms of the concession agreement with the operators, despite the presence of CAPTRANS, which has this responsibility [21]. We conclude that the reform of the OMN can act as a lever for generational inclusion, paving the way for new socio-economic profiles that are better educated, more flexible, and more innovative in the artisanal public transport (APT) subsector. The social diversity observed in the AFTU network attests to the openness and inclusiveness that reform projects can bring. This contrasts with the situation in the old minibus networks, which are often locked into community and family networks [22]. In short, the NMN is not just a technical or economic change, but a restructuring of social relations in the sector, favoring the participation of women, young people, and traditionally marginalized groups.

4.2. Organizational Duality and Contrasting Governance between NMN and OMN

The results of this research reveal a clear duality between the reformed network in Dakar (AFTU) and traditional artisanal networks (OMN) such as the "cars rapides/ndiaga ndiaye," "sotramas," and "magbanas." In organizational terms, the NMN is based on a more or less formal structure around economic interest groups (EIGs), which are legally recognized by the OHADA Uniform Act. This flexible legal form for informal operators who do not have an entrepreneurial culture was intended to enable them to evolve into more solid companies with a more professional management structure. However, this form of organization has not only reduced the dispersion of actors and decreased the number of intermediaries between the public authorities and the owners, but above all has enabled them to pool their resources while maintaining the individual responsibility of the operators. Arroyo-Arroyo and Kumar [15] and Diaou et al. [16] point out that, in addition to an urban license, membership in one of the 14 AFTU economic interest groups (EIGs) is mandatory in order to benefit from the program. Operation is governed by concession contracts signed with the organizing authority (CETUD), which sets the guidelines, supervises performance, and imposes specifications. The climate between the public authorities and the actors in the reformed network seems favorable, as until 2022, when CETUD's statutes changed, AFTU had two representatives in the plenary assembly, CETUD's supreme body [17]. On the other hand, OMNs are characterized by fragmented and informal organization, with little legal recognition of operators, associative or union management, and a lack of contractual agreements with public authorities. The vehicle fleet is old and poorly standardized, and routes are often operated without formal approval from public authorities, which hinders the regulation of supply and encourages unbridled competition. On this subject, Godard [2] highlights the individual form of organization, the atomization of vehicle ownership, and the self-regulation of the artisanal transport sector in African cities. According to this author, the choice of OMN routes is based on the profitability of the itinerary. Salazar Ferro [5] highlights the fragmentation of the sector but draws attention to the fact that artisanal transport is not subject to any regulation or benefits from an ineffective regulatory framework and insufficient enforcement by the authorities. Authors such as Behrens et al. [14] and Kumar and Barrett [3] refer to individual exploitation, lack of service planning, limited regulation, wide dispersion of actors, and the use of informal non-profit organizations such as unions or associations, without formal economic recognition of OMN actors in African cities. However, even if their organization, regulation, and services may appear inefficient, many authors recognize the important role played by this mode of transport, which provides transportation for thousands of people who often live outside city centers and are generally middle- and low-income individuals living in areas

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

poorly served by road infrastructure and regular public transport services [35, 43]. Thus, the NMN embodies a more structured management approach, while the OMN is fragmented in terms of organization and informality, limiting any possibility of coherent management of the sector [5, 13, 14, 44, 45]. The results of this study highlight the theoretical implications of a possible transition from the informal sector to a more structured organization, thanks to flexible legal forms such as EIGs. It also shows, on a practical level, the importance of public oversight and contracting in improving the governance of APT networks.

However, the resilience and social reach of OMNs underscore their essential role in serving marginalized areas. These networks will not disappear completely, despite the government's desire to transform the sector. Paratransit reform policies will therefore need to be rethought in order to reconcile the reformed network with informal transport. Although this research has highlighted the differences between old and new minibus networks in terms of organization and governance, it has certain limitations, particularly with regard to the spatial and temporal dimensions of the analysis. Indeed, restricting the scope of the study to three capitals and a recent period does not allow for a comprehensive understanding of the dynamics at the national level or over time.

4.3. A More Structured and Viable Business Model in the NMN

The results on the business model of minibus operators in Dakar, Bamako, and Conakry reveal a sharp contrast between OMN and NMN. Indeed, the reformed minibus network operates according to a generalized ticketing system, with more organized revenue management and strict control of expenses (maintenance, fuel, salaries), ensuring transparency and efficient management of income and expenses related to the activity. In this study, the cost savings achieved by the reformed network are estimated at 10% of total daily expenses. The work of IBIS [38] and Kumar and Diou [17] reveals a 20% reduction in unofficial operating expenses in the AFTU network compared to the old network. These are expenses generally related to breakdowns due to vehicle reliability and road fees due to the involvement of control agents (police and gendarmerie) in the project from the outset. At the start of the operation, these officers benefited from free transport on the network. This made it possible to increase vehicle speeds, as minibuses did not lose time at roadside checks. Now that the loans have been fully repaid and free transportation for law enforcement officers has been revoked, minibus drivers are often checked by traffic police. It should be noted that a large proportion of the vehicles are now more than 10 years old and therefore more or less dilapidated. These various factors may explain the results of our study, which estimates a 10% reduction in costs, contrary to the findings of IBIS [38] and Kumar and Diou [17].

In terms of working conditions, NMN employees enjoy a better working environment, even though they have not yet signed formal employment contracts, and most are demanding better pay. Drivers and conductors have substitutes (four crew members in each vehicle according to the quality charter), which allows them to reduce their working days per month, but during their services, they spend long hours in the vehicles. However, they receive a fixed salary at the end of each month and performance bonuses. On the subject of the working environment in the reformed network, Diaou et al. [16] find similar results, with 90% of workers receiving a salary, 100% of crew members exceeding the legal daily working hours (more than 12 hours per day), and no employee currently having a formal employment contract. IBIS [38] shows that the minibus renewal program in Dakar has changed the contractual arrangements between employers and employees in paratransit networks. The introduction of a wage system and performance bonuses has helped to strengthen the network's drive towards professionalization, especially when one considers the satellite structures set up by AFTU, namely CAPTRANS, MECTRANS, and TRANSVIE, which provide operators with technical support on modern urban transport management, access to formal financial services, and health coverage for stakeholders. This working environment promotes good collaboration between employers and employees, helping to retain workers, as shown by the results of this study, with a large proportion of crew members having worked

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

for the same minibus owner for more than five years. Unlike OMNs, where cash flow management is individual and informal, daily revenues are opaque, operating costs are scattered, relationships between actors are unsustainable (job instability), financial information is not transparent, and the method of remuneration for precarious workers is unclear. These factors have a negative impact on the operating methods and profitability of these micro urban transport enterprises. Behrens et al. [14] show that minibus operators in Africa have a low investment capacity due to the size of their vehicles, their dilapidated condition, and above all, their unsustainable business model. Salazar Ferro [5] illustrates the unreliability of the economic model of OMN operators, which he considers risky even though he acknowledges that the activity is profitable. The author points out that these operators operate on a daily revenue basis, with no provision for vehicle renewal. The profitability of the routes remains unstable, depending on the conditions of the day. Nevertheless, their experience and knowledge of fares enable them to target the most lucrative routes, often close to those of formal public transport. Even though the income earned by drivers in this network appears to be higher than that of NMN drivers, as pointed out by IBIS [38], jobs are precarious, with employees rarely staying for more than two years, paid by the job, without social security coverage, and dependent on daily performance, which undermines job stability and the quality of service provided [22]. Ultimately, the NMN is distinguished by a more sophisticated economic structure, more modernized operations, and greater technical viability [17, 38]. Conversely, OMNs remain locked into a subsistence mode of operation that is difficult to reconcile with the requirements of sustainable urban transport [5, 43]. From a theoretical perspective, this study highlights the relevance of a structured business model to enhance the efficiency and sustainability of the public transport sector. On a practical level, it emphasizes that the centralization and transparency of revenues, rigorous control of costs, and skills development contribute to the economic strength of reformed networks, unlike OMNs, which are still weakened by informality and professional instability. However, the results obtained have certain limitations that may influence the analyses. In particular, sensitive data relating to income or debt may have been underreported due to mistrust on the part of those working in the informal sector.

4.4. The Reformed AFTU Network: A Lever for Banking Inclusion and Modernization of Minibus Networks

In financial terms, the contrast is just as striking. The NMN was financed exclusively by formal credit: 100% of the vehicles were acquired through loans from AFTU, which benefited from an exemption from the Senegalese government to engage in leasing. The amounts available are significant, ranging from 21 to 33 million CFA francs, which include interest (8 to 9%) and vehicle insurance. Monthly repayments (or vehicle rental) can be as high as 700,000 CFA francs. This banking system is made possible by self-monitoring within the EIGs and a policy of balancing operating revenues, which consists of CETUD allocating several routes to a group (EIG) and allowing vehicles to operate on both the most profitable and the least profitable routes. Diaou et al. [16] indicate that, thanks to this pooling of revenues, the program beneficiaries were able to meet their commitments to AFTU without any major problems. Arroyo-Arroyo and Kumar [15] highlight the electronic ticketing system introduced in the reformed network, which promotes transparency in financial information. This operating model demonstrates the network's banking capacity due to its strong self-financing ability compared to OMNs. Even if the latter appear to be profitable, the precariousness of their system, the lack of long-term vision, the lack of control over financial information by vehicle owners, the lack of reliability, and the size of the minibuses mean that the profits generated make it difficult to invest in renewing or increasing their fleet, while they have little or no access to formal financing. Self-financing (own funds) remains their main source of investment, with up to 91% of sotrama owners using this method, while even those who have already taken out formal loans rarely exceed 4 million CFA francs over repayment periods of less than two years. Godard [22] illustrated the accounting model of minibus operators in Abidjan. He shows that drivers say they keep accounts of their operating activities in a journal they

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

keep, representing 52% of the drivers surveyed. However, he points out that these accounts are kept by the drivers themselves and that 83% of drivers say they deposit money into a bank account on a daily basis, while one in 10 continue to keep their money at home. The author goes on to indicate that these savings are generally intended for family expenses and that operators rarely obtain loans. Thus, the lack of institutional structure is a real obstacle for OMN operators in accessing appropriate financial products, thereby exacerbating their technical and economic precariousness. Hallgrimsson [11] showed in Bamako, for example, that the union committees (syndicates) managing the stations (heads or terminals) are more visible at all levels of the operating chain. Meanwhile, the public authorities responsible for issuing operating licenses to the profession often have tense relations with operators, thus limiting any oversight of this sub-sector.

Comparing the two types of networks in terms of access to formal financing, it should be noted that the reformed network creates a virtuous circle combining investment capacity, reliable and high-capacity vehicles, improved profitability, and solvency, enabling them to obtain new formal loans. This mechanism ensures the sustainability of financing, the development of the automotive industry (evolution from vehicle assembly to manufacturing), and the achievement of climate objectives by improving energy efficiency each time these reformed vehicles are replaced. On the other hand, OMNs are caught in a vicious circle of underinvestment, an aging fleet, low vehicle capacity, low margins, and an inability to finance the renewal or expansion of their fleet. Thus, the organizational structure through economic interest groups (EIGs), the traceability of financial flows, and supervision through a fairly comprehensive institutional framework enable better access to banking services for minibus owners in the reformed network, which is a prerequisite for the sustainable modernization of the artisanal public transport (APT) subsector.

4.5. Lessons Learned from the NMN and Implications for Research

Analysis of the NMN highlights a structured, professionalized, and economically viable model that contrasts sharply with artisanal networks (OMNs). Several lessons can be learned from this experience. (i) At the organizational level, the use of legally recognized economic interest groups (EIGs) under OHADA, supervision by the transport organizing authority (CETUD) through concession contracts, and centralized regulation of routes ensure clear institutional governance. This structure facilitates access to bank credit and the sustainability of AFTU's leasing activities (e.g., the revolving fund that currently finances minibus purchases), thanks to collective guarantee mechanisms, enabling massive investment in a young and standardized fleet. (ii) Socio-economically, the NMN stands out for the involvement of women in the operation of artisanal transport vehicles, a younger and more educated profile of operators, which makes it easier to promote sustainable mobility projects, greater social diversity, and formalization of employment (salaries, social protection). (iii) Economically, it is more profitable thanks to centralized ticketing, the pooling of operating costs and revenues, and control of operating costs, with a monthly cash flow three times higher than that of OMNs.

The results of this study have several theoretical implications. They confirm that the formalization of informal transport, when based on a clear institutional framework and appropriate financial tools, can lead to a sustainable transformation of urban services [1, 46]. Professionalization does not result solely from regulation, but from the articulation between governance, structured financing, and social inclusion, challenging traditional approaches to the marginality of the informal sector. On a practical level, they guide public policy toward active support for paratransit operators: legal structuring (economic interest groups, cooperatives), access to financing (tailored loans, guarantee funds), and contracting with transport authorities. The success of the NMN highlights the importance of shared governance between public, private, and financial actors, based on a viable business model that integrates performance, equity, and sustainability.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

Furthermore, the gender and financing dynamics observed within the AFTU network illustrate its driving role in the transformation of the artisanal public transport (APT). By promoting the integration of women and young people, as well as access to formal credit, the NMN acts as a catalyst for social, economic, and generational change. In contrast, OMNs remain locked into informal and exclusionary practices. These findings reinforce the need for increased public support to assist the transition to more structured, equitable, and sustainable public transport in West Africa.

5. Conclusion

This comparative research on reformed artisanal public transport networks (NMN-AFTU) and traditional artisanal networks (OMN: "cars rapides/ndiaga ndiaye," "sotramas," and "magbana") in Dakar, Bamako, and Conakry highlights the profound transformations that a structured formalization approach can bring about. The AFTU model, structured around legally recognized economic interest groups (EIGs), concession contracts, and strong institutional oversight, offers better economic performance, a more inclusive social organization (young people, women), and more robust financing capacity. It is establishing itself as a credible lever for the modernization of urban transport in West Africa, combining economic efficiency, professionalization of actors, and improved service quality. Conversely, OMNs remain confined to an informal logic, marked by fragmented ownership, precarious incomes, low banking penetration, and outdated fleets. Despite often high service frequency, their profitability is undermined by poorly controlled costs, limited supervision, and a low capacity for rolling stock renewal.

This research contributes to a better understanding of the economic models and financing mechanisms of artisanal public transport (APT) in West Africa, while highlighting the challenges of transitioning to the formal sector. Although there are some limitations, there are research avenues worth exploring. First, it would be useful to extend the scope of the study to other African cities to test the transferability of the NMN model and analyze the contextual factors that influence the formalization of artisanal transport. A longitudinal approach would provide a better understanding of the dynamics of operator evolution and the sustainability of reforms. In addition, an in-depth analysis of institutional mechanisms and modes of regulation, particularly the role of transport authorities, could shed light on the conditions for successful public policy. Finally, studying financial mechanisms, including credit terms, guarantees, and risks, would provide a better understanding of the barriers to OMN banking. These insights pave the way for a more integrated, inclusive, and interdisciplinary analysis of the public transport sector in African cities.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

Acknowledgment:

This work is supported by the Regional Center of Excellence on Sustainable Cities of Africa (CERViDA-DOUNEDON), the Association of African Universities (AAU), and the World Bank, which provides the necessary funding that facilitated our research work leading to these results (IDA 5360 TG). Xavier Godard, Alioune Thiam, and Jean Charles Crochet contributed useful comments to this work.

References
[1] E. Bruun and R. Behrens, *Paratransit in Sub-Saharan African cities: Improving and integrating informal services. In Paratransit: Shaping the flexible transport future*. Bingley, UK: Emerald Group Publishing Limited, 2016.

[2] X. Godard, "Small-scale transport: An outline of the assessment for sustainable mobility," in *Proceedings of the 13th CODATU Conference, CODATU XIII, Hô Chi Minh City, Vietnam, 10 pp. INRETS / CODATU*, 2008.

[3] A. Kumar and F. Barrett, *Stuck in traffic: Urban transport in Africa (Africa Infrastructure Country Diagnostic Background Paper No. 44980)*. Washington, DC, USA: The World Bank / Sub-Saharan Transport Policy Program (SSATP), 2008.

[4] S. Baffi, J. P. Lannes, C. Musil, and P. Bogey, *Understanding informal transport: A global overview and diagnosis of local challenges (MobiliseYourCity Report)*. Brussels, Belgium: MobiliseYourCity Secretariat, 2023.

[5] P. Salazar Ferro, *Paratransit: A key element in a dual system*. Paris, France: Agence Française de Développement (AFD) & CODATU, 2015.

[6] H. Schalekamp, "Lessons from building paratransit operators' capacity to be partners in Cape Town's public transport reform process," *Transportation Research Part A: Policy and Practice*, vol. 104, pp. 58-66, 2017. https://doi.org/10.1016/j.tra.2017.08.002

[7] AFD & CODATU, *Who pays for what in urban transport? A guide to good practices (2014 edition)*. Paris, France: Agence Française de Développement (AFD) & CODATU, 2014.

[8] L. Mwesigwa, M. Kilani, and M. Siemiatycki, *Road transport pricing and financing in Africa. In A. Tirachini, D. Hörcher, & E. T. Verhoef (Eds.), Handbook on Transport Pricing and Financing*. Cheltenham, UK: Edward Elgar Publishing, 2023.

[9] K. Tindano, "Conditions for the viability of urban public transport companies in sub-Saharan Africa: Analysis of the experiences of Cotonou, Lomé and Ouagadougou," Doctoral Thesis, Université de la Méditerranée – Aix-Marseille II, Marseille, France, 2008.

[10] D. K. Dowui and C. I. Ndiaye, "The difficulties related to financing mobility in Lomé and Dakar," *Les Cahiers Scientifiques du Transport-Scientific Papers in Transportation*, vol. 83, p. 12343, 2025. https://doi.org/10.46298/cst.12343

[11] S. Hallgrimsson, *Regional study on the organization, financing and profitability of urban transport micro-enterprises in sub-Saharan Africa: Volume II — The case of Bamako (SSATP/WB Working Paper No. 27303)*. Washington, DC, USA: World Bank & Sub-Saharan Africa Transport Policy Program (SSATP), 2000.

[12] G. Lesteven and V. Boutueil, "Is paratransit a key asset for a sustainable urban mobility system? Insights from three African cities," in *97th Annual Meeting Transportation Research Board, Jan 2018, Washington, United States. 2018 TRB Annual Meeting: Compendium of Papers*, 2018.

[13] A. H. Berga, "Informal transport: A review of paratransit across Sub-Saharan Africa," Master's Thesis, Utrecht University, The Netherlands, 2024.

[14] R. Behrens, D. McCormick, and D. Mfinanga, *Paratransit in African cities: Operations, regulation and reform*, 1st ed. London & New York: Routledge, Taylor & Francis Group, 2016.

[15] F. Arroyo-Arroyo and A. Kumar, "The Senegal Bus Renewal program: From 2005 until 2023. Sub-Saharan Africa Transport Policy Program (SSATP) / World Bank," 2024. https://www.ssatp.org/sites/default/files/publication/senegal_Minibus_web_single.pdf

[16] E. Diaou, M. Vimenyo, M. Diene, and L. Kussu, "Review of paratransit financing and formalization process in Sub-Saharan Africa: Case of the Association de Financement des Professionnels du Transport Urbain (AFTU) in Dakar," *Journal of Infrastructure, Policy and Development*, vol. 8, no. 10, p. 8875, 2024. https://doi.org/10.24294/jipd.v8i10.8875

[17] A. Kumar and C. Diou, *The Dakar Bus Renewal scheme: Before and after (Sub-Saharan Africa Transport Policy Program Discussion Paper No. 11)*. Washington, DC, USA: World Bank & Sub-Saharan Africa Transport Policy Program (SSATP), 2010.

[18] H. Schalekamp, D. Mfinanga, P. Wilkinson, and R. Behrens, "An international review of paratransit regulation and integration experiences: Lessons for public transport system rationalisation and improvement in African cities," presented at the 4th International Conference on Future Urban Transport: Access and Mobility for the Cities of Tomorrow, Göteborg, Sweden, 2009.

[19] H. Schalekamp, R. Behrens, and P. Wilkinson, "Regulating minibus-taxis: A critical review of progress and a possible way forward," presented at the Conference Paper, p. 14, 2010.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620

[20] E. I. Diaou, F. T. Naringué, M. Diene, J. K. S. Aboudou, and M. Vimenyo, "Contribution of paratransit reform to sustainable urban mobility in Africa: Case study of minibuses in Dakar, Bamako and Conakry," *Pakistan Journal of Life and Social Sciences*, vol. 23, no. 2, pp. 25–43, 2025.

[21] E. I. Diaou, M. Vimenyo, M. Diene, and A. Agbogan, "Paratransit reform and quality of services in West Africa cities: The case of minibuses in Dakar, Bamako and Conakry," *International Journal of Transport Development and Integration*, vol. 9, no. 1, pp. 81–92, 2025. https://doi.org/10.18280/ijtdi.090108

[22] X. Godard, *Transport and the city in sub-Saharan Africa: A time of resourcefulness and inventive disorder*. Paris & Arcueil, France: Karthala ; INRETS, 2002.

[23] L. Gerville-Réache and V. Couallier, *Representative sample (of a finite population): Statistical definition and properties (Preprint No. HAL-00655566)*. Bordeaux, France: Institut de Mathématiques de Bordeaux (IMB), 2011.

[24] O. Sigué and A. Nikiema, "The proliferation of informal taxis in Ouagadougou: Is it a demand for transport or a specific characteristic of the activity?," *GARI : Recherches et débats sur les villes africaines*, vol. 2, no. 1, pp. 61–88, 2022. https://doi.org/10.46711/gari.2022.2.1.4

[25] M. Stucki, *Policies for sustainable accessibility and mobility in urban areas of Africa (SSATP Working Paper No. 106)*. Washington, DC, USA: World Bank & Sub-Saharan Africa Transport Policy Program (SSATP), 2015.

[26] A. Nikiema and E. Bonnet, "Helmet use in traffic in Ouagadougou and Bobo-Dioulasso: a major public health issue," *Revue Espace, Territoires, Sociétés et Santé*, vol. 4, no. 8, pp. 121-129, 2021. https://doi.org/10.46711/gari.2022.2.1.4

[27] L. Mokoma and C. Venter, "Pathways to integrating paratransit and formal public transport: Case studies from Tshwane, South Africa," *Research in Transportation Economics*, vol. 102, p. 101356, 2023. https://doi.org/10.1016/j.retrec.2023.101356

[28] M. Naderifar, H. Goli, and F. Ghaljaie, "Snowball sampling: A purposeful method of sampling in qualitative research," *Strides in Development of Medical Education*, vol. 14, no. 3, pp. 1-6, 2017.

[29] G. Dumedah, K. A. Otchere, P. Azong, E. Dzisi, and H. Bwire, "Evaluating perceived accessibility to workplace and shopping destinations in informal urban communities in Ghana and Tanzania," *African Transport Studies*, vol. 3, p. 100031, 2025. https://doi.org/10.1016/j.aftran.2025.100031

[30] A. F. Msangi, A. C. Lucian, P. Mwandepa, G. Mbatta, and B. Kutela, "Safety evaluation of Dar Es Salaam Bus Rapid Transit facilities in accommodating non-motorists: A behavior study," *African Transport Studies*, vol. 3, p. 100029, 2025. https://doi.org/10.1016/j.aftran.2025.100029

[31] D. A. Obeng, J. B. Koranteng-Yorke, and E. Dzisi, "Prospects of Ghana's inland water transport development: An informal transport services delivery perspective," *African Transport Studies*, vol. 3, p. 100038, 2025. https://doi.org/10.1016/j.aftran.2025.100038

[32] J. P. Tuffour, J. Adu-Mensah, T. Morrison, and R. O. Berchie, "Accessibility planning: Overlooked or absent by design in medium-term development plans? A catalog of the policy orientations for 52 diverse municipalities in Ghana," *African Transport Studies*, vol. 3, p. 100015, 2025. https://doi.org/10.1016/j.aftran.2024.100015

[33] O. R. Nwaogbe, C. Ibe, and S. Ukaegbu, "Quality of the paratransit service (tricycle) and its operation in Aba, Nigeria: An analysis of customers' opinions," *Journal of Transport and Supply Chain Management*, vol. 6, no. 1, pp. 262-276, 2012. https://doi.org/10.4102/jtscm.v6i1.64

[34] M. Sanogo, "Evaluation of entomological parameters of malaria transmission in three ecoclimatic zones in Mali," Thèse de médecine, Université des Sciences, des Techniques et des Technologies de Bamako, Mali Disponible en ligne: , 2025.

[35] D. McCormick, R. Orero, R. Behrens, and M. Ommeh, "Cooperatives as a means of paratransit reform: Case studies of inter-city matatu savings and credit cooperatives in Kenya," in *Southern African Transport Conference*, 2015.

[36] SSATP, "Rentabilité et financement des micro-entreprises de transport collectif en Afrique Subsaharienne," World Bank, Abidjan, Bamako, Harare et Nairobi, Rapport de synthèses 54F, 2001. https://documents1.worldbank.org/curated/en/242491468767426413/pdf/273070PAPER0FR1es0micro1entreprises.pdf

[37] D. Faye, "Urbanization and the dynamics of "informal" transport and mobility in secondary Senegalese cities: The cases of Touba, Thiès and Saint Louis," Doctoral Dissertation, Université Michel de Montaigne-Bordeaux III, 2013.

[38] IBIS, "Dakar bus financing study", world bank, dakar, final report," Disponible Sur, 2008. https://documents1.worldbank.org/curated/en/570861468203679076/pdf/697120ESW0P10400Final0Report0June08.pdf

[39] M. Wielechowski, K. Czech, and Ł. Grzęda, "Decline in mobility: Public transport in poland in the time of the COVID-19 pandemic," *Economies*, vol. 8, no. 4, p. 78, 2020. https://doi.org/10.3390/economies8040078

[40] B. Vakaramoko and C. Y. Koffié-Bikpo, "Actors in the transport of food products to the wholesale market in Bouaké (Ivory Coast)," *European Scientific Journal*, vol. 15, no. 2, pp. 169–183, 2019.

[41] C. C. Williams and S. Nadin, "Entrepreneurship and the informal economy: An overview," *Journal of Developmental Entrepreneurship*, vol. 15, no. 04, pp. 361-378, 2010. https://doi.org/10.1142/S1084946710001683

[42] E. T. Asimeng and S. B. Asabere, "Factors that determine paratransit drivers' willingness to participate in formal bus services in an African city," *Case Studies on Transport Policy*, vol. 10, no. 2, pp. 1343-1352, 2022. https://doi.org/10.1016/j.cstp.2022.04.015

[43] K. Gwilliam, *Africa's transport infrastructure: Mainstreaming maintenance and management*. Washington DC: The World Bank, , 2011.

[44] F. Arroyo-Arroyo, B. Finn, and P. van Ryneveld, "Embracing informal transport: A new paradigm for urban mobility (SSATP technical report). Sub-Saharan Africa transport policy program (SSATP)," World Bank, 2025. https://www.ssatp.org/sites/default/files/publication/Embracing-IPT.pdf

[45] G. Pirie, "Sustainable urban mobility in 'Anglophone'sub-Saharan Africa," in "Global Report on Human Settlements. Un-Habitat," 2013. https://unhabitat.org/sites/default/files/2013/06/GRHS.2013.Regional.Anglophone.Africa.pdf

[46] M. Rizzo and M. Atzeni, "Workers' power in resisting precarity: Comparing transport workers in Buenos Aires and Dar es Salaam," *Work, Employment and Society*, vol. 34, no. 6, pp. 1114-1130, 2020. https://doi.org/10.1177/0950017020928248

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 1: 442-468, 2026
DOI: 10.55214/2576-8484.v10i1.11620