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Estimating the Supply of Public Transport in Calabar

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ABSTRACT
The weak regulatory framework that informal public transport service operates within most African cities, coupled with systemic corruption and other factors, makes figures of the supply of public transport vehicles unreliable. This study sought to estimate the supply of public transport vehicles using official figures of vehicle licenses together with estimates of unregistered vehicles. It further evaluates the level of supply in off peak periods of the day. The study used secondary data from vehicle registration/licensing and semi structured interviews. Key stakeholders were interviewed and rough estimates of the amount of unregistered vehicle from their opinions were used to increase official numbers of vehicle operating in the city. Opinions of the stakeholders about vehicle supply across the day was also used to determine supply in off-peak period. From official records, there are over 4200 vehicles comprising taxis, tricycles and minibuses with the minibuses being the greatest in numbers. Incorporating illegal operators, the supply comes to around 6100 vehicles. The interviews conducted indicates no marked drop in supply in off-peak period. The study estimates that about 80% of supply is still available in these periods of low demand.

Keywords— *Informal public transport, paratransit, vehicle fleet, Calabar, unregistered vehicles.*

I. INTRODUCTION

Public transport is a vital component of urban mobility, providing affordable and shared services for populations without access to private vehicles. It is generally defined as transportation made available to the public for a fare using vehicles that carry multiple passengers. In many developing countries, this definition goes beyond government-run services to include informal modes such as minibuses, shared taxis, tricycles, and motorcycles. These informal systems, often referred to as paratransit, are indispensable because they operate with flexibility and adaptability in contexts where formal transport services are inadequate [1]. Paratransit in many African cities are the mainstay in moving people daily

accounting for about 58-98% of passenger trips [2], thus underscoring its importance.

The supply of public transport vehicle is a critical information that has implications beyond just transport planning. In the transport planning domain, it helps to efficiently plan movement of people in order to reduce delays and congestion. Available supply is very important in operation of public transport services. It determines how frequently the supply can serve the demand and is a key component of the operational cost of running a service. This knowledge is critical in effectively connecting people to opportunities. Since transport is an enabler of economic activities, knowing the supply of public transport compared to demand can help determine what level of investment is needed in the fleet size to meet certain economic goals. Furthermore, a knowledge of the fleet size is important in combatting congestion and emissions level. Too many vehicles in excess of the demand becomes detrimental to the environment as there more noise and air pollution than is necessary.

Since paratransit operate within a weakly regulated framework in many African cities [3], most estimates of the supply of the vehicles come from records kept by regulatory authorities who issue operating licenses and other forms of permits to the operators. Agents of these authorities are known to receive bribes from paratransit operators who wish to offer services without complying with the necessary fees. Also, many operators are proxies of powerful politicians who use their influence to shield their surrogates from complying fully with regulatory requirements. These and several other reasons make the records kept by regulatory agents not reflect an accurate picture of the supply.

Furthermore, temporal fluctuations in the supply across the day means any estimate of supply is not available for use in all time periods of the day. There is therefore a need to evolve an approach that not only gives an estimate of supply that caters for unregistered operators (called floaters in some domains), but further estimates the supply in off peak periods of the day as well. These gaps are the focus of the current study. The paper aims at estimating the supply of public transport vehicles in Calabar metropolis taking into consideration the activities of floaters in the system as well as an estimate in off-peak periods. The rest of the paper is structured into the following sections: A brief review of the literature is followed by the methodology section where the study area and the nature of public transport in Calabar is described. The approach used is also detailed in the section. The result and discussion segment follows and the paper ends with a concluding section.

II. Literature Review

A. The nature of informal public transport services (paratransit)

Public transit in most countries in the global south is done by informal or semi-formal means that may be motorized or non-motorized [4]. This mode of public transit that fits some broad features has been generally referred to as paratransit. Salazar [5] put forward several elements to broadly define and describe paratransit services based on descriptions from other researchers. These elements include the regulatory framework, vehicle capacity, flexibility of service, and internal organization.

Paratransit services generally fall into an inefficient regulatory framework, and they are weakly regulated, informal, or even illegal, as is the case in many SSA cities [12]. They have this characteristic of informality because they have primarily emerged organically to fill public transport needs due to the failure of government-owned public transport services [6]. The types and capacities of paratransit vehicles vary by locality and range from motorized to non-motorized means. The motorized vehicles are of different types and have varying carrying capacities that range from 2-4 passengers (motorcycles and rickshaws), minibuses (10–15 passengers), and midibuses (20–40 passengers). In terms of service, while they largely have fixed origins and destinations, the routes are flexible with no schedule or fixed frequencies [7], [8]. Finally, they are primarily organized internally by private operators, driver associations, and unions.

Efforts have been made within the literature to understand how paratransit services operate with a view to optimizing and improving the service. Earlier studies have used self-reported, qualitative, and secondary data to gain insight and understanding into the nature and operations of paratransit. These studies have focused on financing, policy and regulation, organization, daily operations and practices, complementarity, etc. [3] conducted a detailed study for sub-Saharan Africa with three case study cities. They argue that while there is usually a broad policy covering public transport in the region, these

documents are generally not specific about paratransit, and rules are made top-down without adequate consultations. Cevero [4] and Salazar [5] express this weak institutional framework. This has weakened the ability of law enforcement at all levels to enforce regulations, and in many cases, enforcement agencies have been accused of extortion and working against the law.

While they may be weakly regulated externally, paratransit services are well organized internally. Their business structure spans from individual ownership to companies and cooperatives depending on the locality and is collectively organized into route associations, trade unions, and welfare groups [3]. Paratransit service providers operate an unreliable business model that is risky yet profitable, according to Salazar [5] . This is supported by the profitability index calculated by [9]. The initial investment for the business is borne by the owner either directly or with family and friends, with almost secluded access to credit facilities. Operating costs are covered daily by a driver who rents the vehicle from the owner and pays an agreed sum either weekly or monthly. Remuneration for the driver is based on revenue generated daily, sometimes from an agreed commission [3]. This makes the business inherently competitive as drivers scramble to earn more, often adopting dangerous practices on the route. Fares may or may not be regulated. Shimazaki and Rahman [10] reported three classes of fares in Asia: fixed, metered, and negotiated, similar to the experience in sub-Saharan Africa. In Cape Town, for instance, fares are not regulated; the government plays no role in setting the fare. Where fares are regulated, local authorities or the owners themselves, organized into route associations, set the fares.

Daily, drivers or driver-owners operate the vehicle out of a rank or station controlled by some owner association they are registered with, although many unregistered paratransit services take advantage of the weak regulatory framework to operate out of these dedicated terminals. One local source estimated that about half of the vehicles operating in the system might be unregistered [11]. A rank serves several routes daily. Drivers queue on any route of their choice and advance as the vehicles ahead depart. Paratransit operates a fill-and-go system where cars head out when filled. Booysen, Andersen and Zeeman [8] described in detail the activities at the station and on the route. Fares are collected at the station or a little while into the journey by a "conductor." Stops are frequent on a typical trip, as the driver stops almost anywhere for boarding or alighting passengers. Since daily revenue is the focus, observing long "hold-back" times waiting for passengers is not unusual.

B. Supply of informal paratransit fleets in African cities

The fleet sizes of paratransit vehicles in many African cities are reported in various sources; however, literature is scarce as to how the figures quoted were arrived at. These sources reference some government reports that are often not available. For instance [12] quote vehicle fleet sizes for Dar es Salaam, Nairobi and Capetown to be around 7000, 9000 and 7500 vehicles respectively. These vehicles are a combination of various types including minibuses and shared taxis. In another report, Durant et al [13] gives a comparison of fleet sizes and other characteristics of paratransit in several African cities as shown in Figure 1. The report however does not detail how the fleet sizes were arrived at.

Paratransit services operate a weakly regulated framework. Operators have to get some kind of license after undergoing some form of registration. These registration figures usually kept by government source are usually quoted in official documents. The weak regulatory framework that paratransit operates in, suggest that illegal or unregistered vehicles would prosper in such a setup. This assertion is collaborated by the submission of Saddier et al [11] who quoted a local source that reported that about half of the vehicles operating in the system might be unregistered.

Furthermore, the corruption and interference of powerful politician in the governance and regulatory framework of paratransit services enhances the prosperity of unregistered operators who in many cases are proxies of these influential government officials. These factors combined, render figures being supplied from official government sources to be unreliable. There is need for studies to set out an approach for incorporating the supply from unregistered sources as well as estimate the level of fluctuation in supply in various time periods of the day.

Type of organisation	Accra, Ghana	Kumasi, Ghana	Freetown, Sierra Leone	Cape Town, South Africa	Maputo, Mozambique (MC & MMA total²)
City population	4.6 million	3.35 million	1.2 million	4.62 million	MC: 1.1 million MMA: 2.6million
City IPT fleet estimates	~11,000 trotros ~22,000 sedan vehicles	~9 000 trotros	~5 500 poda-poda	~14 200 minibus-taxis	MC: ~ 972 Chapas MMA: ~2.554 Chapas
City IPT modal share estimates	62%	50%	55%	19%	32.9% for Chapas including walking 60,7% for Chapas without walking
City IPT number of routes estimates	315 – originating from Accra Metropolitan Assembly only	437 – both intra and intercity operations	124	792	MC: 38 routes MMA: 158 routes
IPT vehicles (involved in study)	***Trotro*** Mercedes-Benz Sprinter (cargo van converted for passenger use) Age – around 15 years	***Trotro*** Seven models Age – estimated 15 to 25 years	***Poda-poda*** Six models: Mercedes-Benz Sprinter, Toyota Hiace, Mazda L100, Mitsubishi L300, Renault Traffic, Ford Transit Age – difficult to establish	***Mini-bus Taxi*** Toyota Quantum (also known as Hiace) Age – 0 to 7 years	***Chapas*** Toyota Hiace predominant, plus other models (15-26 seats) Age – 15 to 25 years
CO2 emissions/ km (lower order)	-	-	319gCO2/km	686gCO2/km	404gCO2/km
Average distances travelled (weekdays)	150-175km	150-190km	150-190km	260-300km	MC: 156 Km MMA: 206 Km

FIGURE 1: COMPARISON OF PARATRANSIT FLEET SIZES AND OTHER CHARACTERISTICS IN SEVERAL AFRICAN COUNTRIES.

III. METHODOLOGY

A qualitative approach using secondary data and interviews was used to estimate the supply of public transport in Calabar. This section describes the study area and details the nature of public transport in the city of Calabar. The approach it employs in collecting the data and the analysis carried out are also outlined.

A. Study Area

Calabar lies on longitude 08°20'18"E and latitude 04°58'36"N. Calabar is the capital of Cross River State in the south-south geopolitical zone of Nigeria. It is made up of two local government areas, Calabar Municipal, and Calabar South local government area. It shares boundaries with Odukpani local government area in the northwest, Akamkpa in the east, and Akpabuyo in the south. Calabar has a land area of 406 square kilometers and an estimated population of 685,000 in 2024 [14]. Calabar is often considered a civil service state with few industries. The majority of its occupants work for the government, leaving other present occupations like fishing, local and large-scale agricultural production, craftsmanship, lumbering, etc. with a minor part of its occupants.

In Calabar, a large part of transportation needs is met by the informal transportation system which comprises tricycles (keke napep), buses, shared taxis, and motorcycles (Okada). Transportation modes like tricycles and motorcycles are limited to minor roads. These modes do not operate on major roads and the Murtala Mohammed highway. Generally, roads in Calabar are paved, leaving few unpaved. See Figure 2 to view the map of Calabar.

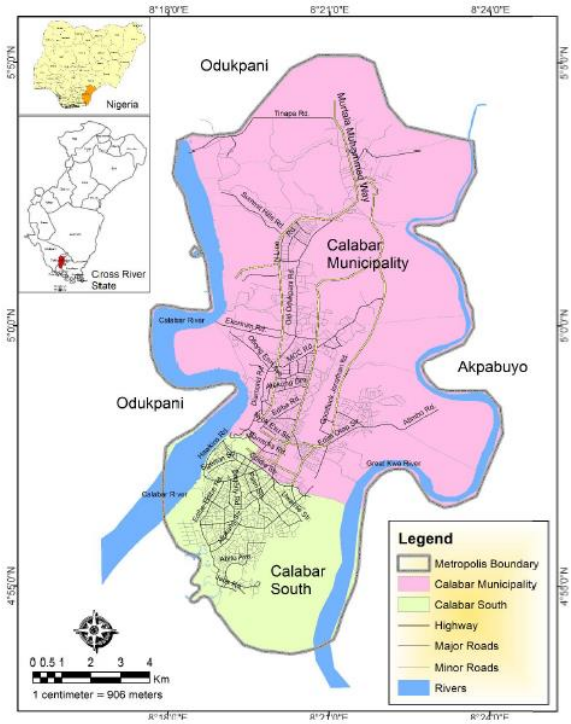

FIGURE 2: MAP OF CALABAR METROPOLIS [15].

Ukam and Etika [16] investigated the setup, administration, and operations of public transport in Calabar. Key highlights of the nature of the minibuses are summarized as follows:

i. Owner and owner-driver models

Buses are owned by private individuals who drive the vehicles themselves on a daily basis (owner-driver) or by owners who give out the vehicle to a driver for daily operations. In the later arrangements, drivers enter into a daily payment schedule or hire purchase system. In the daily payment schedule, a fixed amount is remitted daily to the owner, while in the hire purchase system, an agreed amount is remitted weekly until the full value of the vehicle is remitted and the driver takes ownership.

ii. *Comprehensive registration process and visible enforcement*

The registration process is clearly spelled out and is known to all potential owners or drivers. Regulatory authorities enforce compliance through the use of marshals that are stationed at different locations on the road.

iii. Flexible Fare System

The fare system in Calabar's informal transportation sector is primarily determined by operators and their units, based on factors such as fuel prices, distance, and the cost of spare parts. Policymakers do not regulate fares, with drivers adjusting prices in response to fuel price fluctuations and unit decisions.

iv. Fixed and Unfixed Route Model

The fixed routes here are those in which one or both ends of the trip have a station in which vehicles observe a queue with the fill-and-go system that is popular in many of the reported studies. In the fixed-route model, vehicles can deviate from a route but usually end up at the stated destination. The vast majority of drivers in Calabar do not operate on fixed routes. They originate or end their trips at a public transport terminating point (A known location beyond which minibuses do not ply) and go in a given direction with or without certainty as to the next terminating point. The final destinations of trips are mostly determined by demand along the route and other factors. It is not uncommon for trips to come to an abrupt end without reaching another terminating point. This model is regarded here as the unfixed route model.

B. Data collection

Secondary data was collected from the Commercial Transport Regulatory Agency (CTRA). The CTRA is the agency empowered to give permits for the operation of public transport vehicles in Calabar metropolis. It issues yearly licences to the operators and issue a sticker. Registration begins in January every year. The record of registration numbers was gotten for the period from January to September 2025. This number serves as the primary estimate of the supply.

As registration with the CTRA is valid for twelve months and must be renewed annually, the January–September 2025 figures represent the stock of vehicles holding a valid registration at the time of data collection, comprising both new registrations issued within the period and prior registrations still within their twelve-month validity window, rather than new registrations alone. Vehicles whose registration had lapsed before the review period and had not been renewed would not appear in this count; such vehicles, if still in operation, are captured instead within the study's estimate of unregistered vehicles.

To estimate the number of unregistered operators and the supply in off peak periods, key stakeholders were interviewed to get their insight on the operation of floaters and services in off peak periods. Stakeholders interviewed included staff of CTRA, the chairman of the minibus taxi union (UNIFIED), and some selected drivers/operators of the public transport vehicles interviewed. Interviewee were asked questions around the existence of unregistered operators, daily operations of public transport vehicles, operations during offpeak periods of the day etc. in order to quantify unregistered operators and supply during period of lower demands, interviewees were asked the following key questions

i. From a random selection of ten (10) public transport operators, how many are operating illegally (unregistered)?

ii. Amongst ten (10) randomly selected operators of public transport vehicle, how many do not offer services in off peak period of the day?

A total of eleven (11) stakeholders were interviewed for this study. Table 1 summarises the composition of the interviewees by category.

TABLE 1: SUMMARY OF INTERVIEW PARTICIPANTS

Stakeholder Category	Number Interviewed
CTRA officials	2
Union representative (chairman, minibus taxi union)	1
Tricycle drivers/operators	4
Minibus drivers/operators	4
Total	**11**

C. Data Analysis

Thematic analysis was employed in this study as the main technique for analyzing interview data. It is a flexible method that enables researchers to identify, organize, and interpret recurring patterns of meaning within a dataset. Through this approach, the interview transcripts were carefully read and re-read to gain familiarity with their content, and meaningful codes were developed to capture significant ideas. These codes were further refined into themes that represented the views and experiences of operators, union leaders, and regulators. Thematic analysis was particularly useful because it allowed the study to move beyond surface-level responses, providing a deeper

understanding of the supply of public transport in Calabar.

The rough estimate of the responses to the above stated key questions in the interviews were used with available data from the secondary sources to estimate the supply of unregistered elements and at off peak periods.

IV. Results and Discussions

Estimating the overall supply of public transport in Calabar including estimates for unregistered operators and an estimate for periods of downtime was the consideration of the paper. This section outlines findings from secondary data collected as well as interview of critical stakeholders.

A. Operator Registration

The study shows that operator registration in Calabar is carried out by the Commercial Transport Regulatory Agency (CTRA) in collaboration with the FRSC, VIO, Ministry of Transport, and the transport unions. Registration is conducted on a yearly basis, with January to March identified as the peak registration period. Once registered, operators have twelve months before renewal is required, and failure to renew often leads to arrests and impoundment of vehicles. Officials also stressed that registration goes beyond revenue collection and serves as a security measure by generating data that can be used to monitor operators and track vehicles involved in crime.

"After March, when registration is carried out, operators are given twelve good months to renew, and when they fail to renew, they are arrested and their vehicles impounded. We discovered that most minibuses and tricycles are sometimes used in kidnapping incidents, which is why the agency collects names, photographs, vehicle numbers, and security numbers during registration" (CTRA 1).

"The agency is backed by law and public sensitization is carried out through radio announcements to ensure operators are aware of the need to register. Failure to comply attracts penalties" (CTRA 2).

From the perspective of operators, registration begins with acquiring a vehicle, registering with the union, and then completing the CTRA registration. Some also mentioned that vehicles must be sprayed in state colors, stickers acquired, and daily tickets purchased.

"Before becoming a rider, a person must first have a tricycle, spray it to the state color, then register with the union by paying for the sticker and state emblem, and finally obtain a driver's license before starting operation" (Tricycle operator 4).

Union leaders noted that they work hand-in-hand with CTRA, highlighting that part of the process includes branding vehicles and assigning commercial plate numbers (red plate)

"You get your vehicle re-branded, after re-branding you pay and register that car, and that car is a yearly based thing, subject to renewal. It's a yearly routine that you have to make sure vehicles are being renewed" (Union leader).

Operator registration in Calabar is a structured process involving several steps and multiple agencies. It begins with acquiring a vehicle and continues through union registration, CTRA registration, and vehicle branding. The process is renewed annually and serves both as a compliance requirement and as a tool for security monitoring in Calabar. This finding conforms to other studies that highlight multi-layered registration systems in developing countries. For example, [17] reported that in Nigerian cities, registration was tied to compulsory union membership and inspections, while [12] showed that matatu operators in Kenya also undergo layered registration processes. Similarly, [18] observed in South Africa that registration often serves more as a mechanism of control and monitoring than as a tool for efficient transport planning.

B. Estimated Number of Registered Vehicles

Findings from the interviews show that respondents had varying estimates of the total number of registered vehicles operating in Calabar. Officials and operators generally agreed that large numbers of vehicles are in the system, but they differed on the exact figures.

"At any point in time, one cannot give a particular figure, but we can look at 5,000 minibuses that ply between Calabar and nearby areas." (CTRA 1)

"In Calabar Metropolis, we have about 1,000 people that operate, with about 800 Keke in use." (CTRA 2)

Operators also gave different figures depending on their experiences and areas of operation. Some placed the number of tricycles in certain neighborhoods at over 1,000, while others estimated about 500. A union leader similarly noted that while around 1,000 drivers may be formally registered, not all of them are active daily due to breakdowns, illness, or other personal circumstances.

"Yes, in Calabar South alone, we have over 1,000 tricycles in use, but not all of them are on the road every day." (Tricycle operator 1)

While respondents provided differing estimates of the number of vehicles in operation, the official record from the Commercial Transport Regulatory Agency (CTRA) offers a consolidated picture of registrations within the city. Table 2 presents the number of registered public transport vehicles in Calabar between January and September 2025.

TABLE 2: REGISTERED PUBLIC TRANSPORT VEHICLES IN CALABAR METROPOLIS (CTRA VEHICLE REGISTRATION REPORT 1ST JANUARY – 9TH SEPTEMBER, 2025)

Vehicle Type	Number of Registration
Taxi	29
Minibus	3152
Passenger Tricycle	1113
Total	**4294**

The registration report shows that as of September 2025, a total of 4,294 public transport vehicles—comprising 29 taxis, 3,152 minibuses, and 1,113 passenger tricycles—were officially documented in Calabar. Other vehicle categories such as main buses, motorcycles, delivery vans, and cargo carriers were excluded from this count, since the study focuses specifically on the informal public transport modes that dominate mobility in the city. This figure provides a more reliable benchmark for assessing Calabar's transport supply, addressing the uncertainty that previously arose from respondents' estimates. The registration serves as a license for all vehicle operating in the given year and includes new vehicles entering into the market and older vehicles who wish to operate their vehicles in the current year.

C. Investigation of the Extent of Involvement of Unregistered Operators in Calabar Metropolis

Alongside registered operators, a significant number of drivers operate without formal registration in Calabar. These unregistered operators, often referred to as floaters, contribute to the overall supply of transport services but remain outside government regulation. Understanding their presence and the extent of their participation is important for assessing the full scale of public transport provision in the city.

Respondents revealed that there are still many drivers operating without proper registration in Calabar, though respondents differed widely in their estimates. Some operators explained that unregistered drivers are visible on the roads, sometimes linked to groups that evade regulation, and often continue to operate despite government awareness.

"There are so many people that have not registered, they are still driving ooh. They call themselves cultist and whatsoever… Some people are registering; some people are not. Even some people are buying tickets, and some people are not." (Tricycle operator 2)

Other operators also confirmed that while registration is mandatory, some drivers continue to evade it, either by riding under someone else or by simply refusing to comply.

"Yes, there are people that do not register but they are still riding… it is a necessity that you register before starting public driving. But there are people that have not registered but they are still driving." (Tricycle operator 4)

In contrast, some respondents perceived that only a small fraction of drivers remain unregistered, suggesting that enforcement measures have reduced the problem.

"Because of the friendly aspect of the agency, now we can say one or two… those who do not comply can be maybe two or three." (CTRA 1)

"I would say a random of 10 people, I think 9 is registered. 9 would be registered." (Tricycle operator 3)

However, others gave much higher estimates, with suggestions that unregistered drivers could make up nearly half of those operating in the metropolis.

"I would do it 50-50. I think five will register, five will not register." (Minibus operator).

Respondents gave varying estimates of unregistered drivers in Calabar, ranging from as low as one in ten to as high as five in ten. On average, the responses suggest that about three out of every ten drivers operate without proper registration.

To estimate the total number of public transport vehicles in operation (registered and unregistered), the respondents' average of three unregistered vehicles for every ten vehicles in operation was applied to the official registry. In other words, if approximately 30% of vehicles operating in Calabar are unregistered, then the 4,294 registered vehicles represent the remaining 70% of the total fleet. With 4,294 registered vehicles, the calculation is as follows:

4,294 ÷ 0.7 = 6,134 (total estimated fleet, registered and unregistered)

Subtracting the registered vehicles from this total gives the estimated number of unregistered vehicles:

6,134 - 4,294 = 1,840 (estimated unregistered vehicles)

Thus, while 4,294 vehicles were officially documented, an estimated 1,840 remain unregistered, bringing the total number of public transport vehicles operating in Calabar to approximately 6,134.

Unregistered operators are present across Calabar, though there is no consensus on their exact proportion. While official sources tend to minimize their presence and some operators believe they are few, others suggested they constitute a large share of daily operations. Based on respondents' estimates, approximately 1,840 unregistered vehicles are currently in operation, in addition to the 4,294 registered vehicles, bringing the total fleet to about 6,134. This points to gaps in enforcement and reflects the wide variations in perception among different stakeholders. Because this figure rests on stakeholder perception rather than a direct count, it should be read as an indicative estimate rather than an exact value, and Table 3 presents a sensitivity analysis showing how the total estimated fleet would change under different assumed proportions of unregistered vehicles.

TABLE 3: SENSITIVITY OF THE ESTIMATED TOTAL FLEET TO THE ASSUMED PROPORTION OF UNREGISTERED VEHICLES (REGISTERED VEHICLES = 4,294)

Assumed Unregistered Proportion	**Estimated Total Fleet**	**Estimated Unregistered Vehicles**
10%	4,771	477
20%	5,368	1,074
30% (adopted)	6,134	1,840
40%	7,157	2,863
50%	8,588	4,294

Table 3 shows that the total estimated fleet ranges from approximately 4,771 vehicles if only 10% of operators are unregistered, to approximately 8,588 vehicles if as many as 50% are unregistered, reflecting the wide range of estimates given by respondents (from one in ten to five in ten). The study adopts the respondents' average figure of 30% for its headline estimate, but this range illustrates that the unregistered fleet estimate is sensitive to the assumed proportion and should be interpreted with appropriate caution rather than as a precise count.

D. Assessment of the Supply of Public Transport Across Time Periods in Calabar Metropolis

The supply of public transport services in Calabar does not strictly follow defined peak and non-peak periods. While some operators adjust their work hours based on demand, others remain on the road throughout the day. Exploring these variations helps to understand the extent of vehicle availability at different times and how operators manage their daily schedules to meet passenger needs.

The responses highlight that daily operations among drivers in Calabar vary significantly depending on individual circumstances, financial needs, and personal schedules. Some drivers work all through the day, while others prefer shorter shifts or operate only at specific times. A number of respondents explained that it is common for one driver to work part of the day and hand over to another person to continue.

"Actually, no. Yes, there are some people that drive from morning till 12, they hand over to another person. While there are some people that can drive all through the day. But personally, I drive all through the day." (Tricycle operator 1)

Ticketing regulations and operating permits also influence the hours drivers choose to work. For instance, some respondents explained that drivers purchase passes that extend their operating hours beyond normal restrictions, allowing them to work into the evening.

"I operate, like you mean, from morning to night. You know, they have extended the time now… we do buy, say, pass, so you buy 500 Naira ticket… plus that 500 Naira that they call pass, that would be like your permit to drive till 8 o'clock." (Tricycle operator 2)

Other drivers emphasized that work schedules are largely flexible, depending on individual commitments and preferences.

"Yes, some drivers like to come to work… they operate normally from 9 o'clock to 2 o'clock. Some do operate from morning to 12, while some can come depending on their schedules." (Tricycle operator 4)

There is no uniform pattern for daily operations among drivers in Calabar. While some drivers operate throughout the day, others limit their hours based on personal convenience, financial strategy, or availability of extended permits. This finding conforms with prior research showing operator autonomy in determining service hours. Shimazaki and Rahman [10] showed that paratransit operators in Asian cities often adjusted their schedules flexibly to match demand.

E. Variations Across Demand Periods

From the interviews, it was observed that drivers in Calabar generally continue to operate regardless of whether there is high or low passenger demand. Many operators explained that their livelihood depends on daily operations, so they remain active on the road even when passenger flow is low. One operator emphasized that in the South, drivers often work regardless of demand because they must meet financial obligations such as daily returns on their vehicles.

"*Here in South, we don't care whether demands or not, we are always there." (Tricycle operator 1)*

Similarly, another respondent explained that most drivers cannot afford to remain idle when passengers are available.

"If there are passengers on the road, nothing I will go back to the house and do." (Tricycle operator 2)

This highlights the economic necessity driving operators to work through both peak and off-peak hours. However, some respondents suggested that not all drivers remain active. For instance, one operator estimated that only a portion of drivers continue working during low demand periods.

"All the drivers will work. I would say 6 can work. 6 can work. Okay. Out of the 10." (Minibus operator)

Operators generally reported that most drivers continue working regardless of demand, though one respondent estimated that only six out of ten would remain active. Balancing these perspectives, an average of 80% participation was adopted for estimation.

80% of 6,134 vehicles= 80÷100 ×6,134 = 4,907.2 ~ 4,907

This means that out of the total fleet of 6,134 vehicles (registered and unregistered), about 4,907 vehicles are likely to continue operating during low demand periods. While demand influences operational intensity to some extent, economic necessity ensures that most drivers remain in operation during both peak and non-peak periods in Calabar. Based on interview responses, it is estimated that about 80% of the city's 6,134 public transport vehicles—approximately 4,907—continue operating even during low-demand periods. This 80% figure is drawn mainly from the perspectives of a small number of respondents rather than direct vehicle counts, and should therefore be treated as an approximate stakeholder estimate rather than a precise measurement of off-peak supply.

V. CONCLUSIONS

The study advanced an approach for incorporating unregistered public transport operators and fluctuations in the supply of public transport vehicles in varying time periods into the mix when estimating the supply of informal public transport vehicle in SSA. This approach provides a better estimate than figures gotten only from records kept by regulatory agencies. The study used a qualitative approach to estimate floaters that operates within the system. The approach using the perception of key stakeholders about unregistered operators and supply in offpeak periods is limited as it is subject to each individual opinion. Further studies that use quantitative data may give more reliable estimates. One approach might be to compare vehicular counts at strategic locations in various periods of the day and use that to work out how much drop in supply there is within the day. That evaluation can then be used to make an assessment of the supply of vehicles in various time periods of the day.

AI DISCLOSURE STATEMENT.

The authors wish to declare that AI tool AudioConvert was used in transcribing recorded interviews into text and in processing the transcribed text into themes. Care has been taken to ensure that the final output was vetted to ensure integrity.

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