

Towards Inclusive Transportation System for the Vulnerable Populations in Cameroon: A Focus on Commuters between Yaounde and Its Satellite Towns

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Abstract

In a time of burgeoning population growth, high urbanization, and sprawling with a population that is attached to its city centre by pull factors, the stakeholders in Cameroon have not succeeded in providing an inclusive transportation system to its vulnerable population. Whereas, leaving no one behind is crucial in meeting the SDGs. Based on the Universal Design Theory and the Five As framework, this study investigates the characteristics of the transport system and appraisal by the vulnerable population regarding the mobility challenges linked to availability, accessibility, affordability, safety/security, comfort/adaptability based on 25 indicators. To accomplish this, both secondary and primary data were exploited to attain the research objectives. Data was collected from several Ministerial Departments, Institutions and the major stakeholders in charge of transportation services. Meanwhile, 125 questionnaires were administered, and geospatial data collected and spatially analysed using SDG target 11.2 guidelines in measuring inclusiveness. Findings illustrate limited routes in poor state with outdated modes that are not convenient for people with special needs. The population appraisal reveals a very minimum mean score classified on a one to five-point Likert scale, which highlights that the major challenges are linked to affordability (1.2) followed by accessibility (1.5), then comfort/adaptability (1.6), safety/security (1.9) and availability (2.2). Considering equal weighting in all dimensions, Mfou commuters face more mobility challenges as their rating resulted to a lowest overall mean of 1.68 followed by Mbankomo with 1.69 and then Soa with 1.75. This result thus appraises and informs the prioritization of transport investment proposals for the stakeholders in providing an inclusive transport system for the vulnerable segment of road users.

Keywords

Inclusive Transportation System, Vulnerable Population, Geospatial Analysis, SDG 11, Universal Design Theory

1. Introduction

In times when most developing countries are on the march to become emergent and developed to be able to render livelihoods and wellbeing to their citizens, the transportation sector is one of those sectors that deserves keen attention in order to harness the growth of all other sectors as it plays a key role in interconnecting all other anthropogenic activities. Unfortunately, this is not the case because most often-too little attention is given to this sector, especially in most developing countries [1]. As a consequence, it does not only result in slow economic development [1] but strongly affects its population socially [2] and economically [3], who are bound to rely on it practically on a daily basis to reach places of opportunities and leisure but who are rather often neglected.

In most Sub-Saharan African countries, interconnected elements infuse in to worsen the transportation challenges. First is the fact that the world's population has been on a non-stop increase since the ignition of industrialization with urban areas is the core centres of this accelerated growth. According to the UN Habitat, amongst the 1.2 billion people who live in African cities representing 47% of the continent's population and projections illustrate that it will leap to 70% by 2050. Each year urban Africa grows by an estimated 20 million people and, by 2040, that number will be more than 30 million every year [4]. Secondly, the spillover effect of this urbanization results in sprawling and the spurring of peripheral towns often called peri-urban or satellite towns [5] due to centrality of functions which rely to the host city for diverse socio-economic, political and cultural reasons [6]. In most developing countries, the expansion of these towns which were not well planned from their conception [7] has resulted to population increase outpacing corresponding transport infrastructural development [8], a prior necessity for the commuters.

In this mix, the challenges faced by the commuting population are overwhelming. What then of the vulnerable population who faces mobility limitations? Sadly, the vulnerable populations are continuously being neglected as their challenges remain largely unaddressed [9]. The capital city and metropolitan town of Cameroon Yaounde and its connected satellite towns is a characteristic example of this context where their vulnerable population finds it challenging to navigate smoothly across the transport system. Pregnant women, aged over 70 and the physically impaired as defined by SDG 11 are the targeted vulnerable population of this study. Using the Universal Design Theory as base theory and Five A's framework, the objective of this study is to understand the availability, adaptability, accessibility, affordability and safety challenges based on observation, spatial data and

most especially the vulnerable commuter's appraisal of the transport system. Meanwhile for this study and as defined by several other studies, inclusive transportation system refers to that system which is designed to accommodate all population segments irrespective of their abilities.

The findings of this study provide an evidence base for policymakers, urban planners, and funding agencies to guide transport policy reforms and strategic redirection of financial resources. The objective is for these stakeholders to establish a sustainable transportation system that accommodates the needs of the entire population, including the old, pregnant and those with physical limitations. By blending short-term with long-term systemic reforms, they can accelerate the development of a fully inclusive mobility infrastructure. This will also contribute to meeting with global SDG 11 in making cities and communities' inclusive, safe and sustainable with the general objective of leaving no one behind.

2. Literature Review

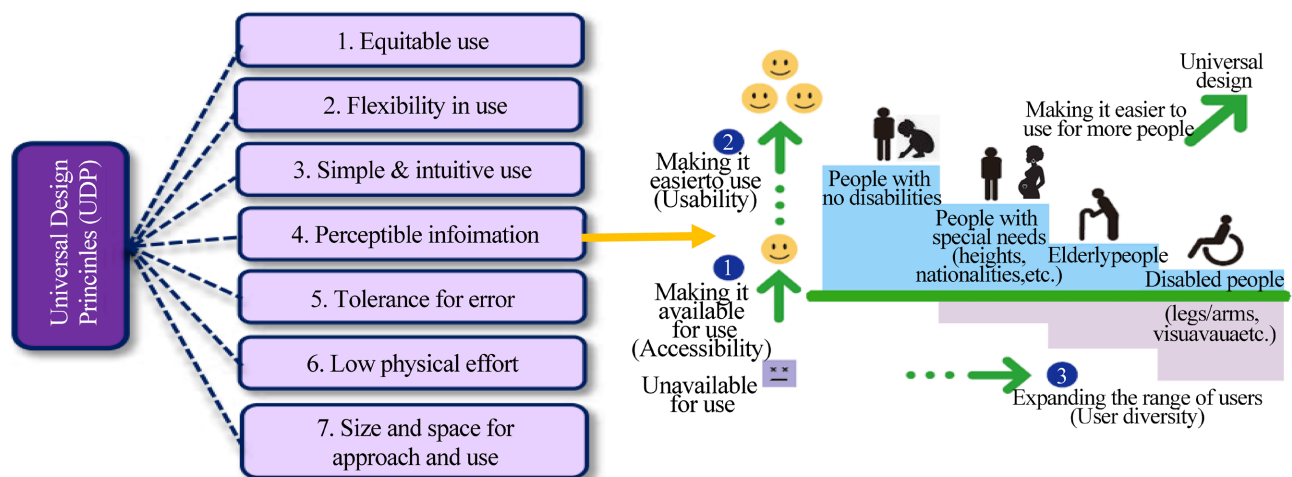
The vulnerable population, due to their limited mobility capacity, faces many transportation barriers all over the world except in countries where total inclusiveness has been integrated into its transport system like the case of Japan and Denmark. Several studies have demonstrated that the vulnerable population encounters several barriers that reduce their mobility options [10]-[12]. Though these barriers are numerous a major focused is that of physical properties of the built environment [10] [13] [14]. Conversely other researchers have attributed this to the spatial coverage of the transport system services [12] [15]-[17] related to availability. However, getting a transport mode or network is one thing, and being able to use it is another. This is the situation encountered by this group with special needs as they rely on specialised transportation services, such as para-transit or accessible taxis, which may not always be available [18]. Moreover, most public transportation systems often do not make provisions for accessible transport features, especially for those with mobility impairments which makes it challenging for them to use these important services [18]. A study in Cambodia using the journey access tool identified numerous obstacles for persons with disabilities in accessing the formal bus system, including difficulties boarding buses and a lack of designated spaces for wheelchairs [19]. In a similar study in Peshawar, Pakistan, before implementing the Zu Peshawar system, high-floored vehicles completely excluded individuals with disabilities from using public transportation [20]. In the case of most African countries, the physically impaired especially the blind and handicap relies entirely on the assistance of family members for mobility. Due to the absence of a descent public transport with priority seats for this population category, they are usually affected by long uncomfortable traveling distances. The high cost of transportation also constitutes a significant barrier for vulnerable populations [18] [21]. These varied availability, accessibility and cost challenges which hinders transportation negatively affect the vulnerable populations as it significantly affects their well-being through the barrier to have access to places of

opportunities like employment opportunities, as well as healthcare services, and social activities, which through social exclusion and isolation affects their quality of life [12]. Studies have shown that individuals with disabilities who have limited access to transportation are more likely to experience health disparities and face barriers to employment [22] [23]. Additionally, the lack of transportation options can contribute to social exclusion and decreased community participation among vulnerable populations [24]-[26].

Whereas many studies have highlighted the benefits of universal design in putting in place inclusive transport systems in improving participation and benefiting of transportation systems by all individuals regardless of their differential needs. Integrating such a design will go a long way in addressing these problems in Cameroon and in many Sub-Saharan African countries share similar context in challenges.

3. Historical Origin of the Universal Design Theory

In recent years, there has been a growing recognition of the importance of inclusive transportation systems that can cater for the needs of all individuals regardless of age, ability or socio-economic status. Following these criteria, Universal Design Theory offers a valuable framework for understanding, designing, and implementing transportation systems that are inclusive for all users. Looking into its history, the term universal design was conceptualized in the middle of the 1980s by the American architect, Ronald L. Mace. The father of this theory, with a working group of architects, product designers, engineers, and environmental design researchers, create the 7 principles of universal design (Figure 1) to help guide the design process of environments, products, and communications [27] which many other fields like education and social sciences have adapted to social barrier issues as is the case with transportation. Below are the principles outlined for creating inclusive transport for diverse population groups (Figure 1).

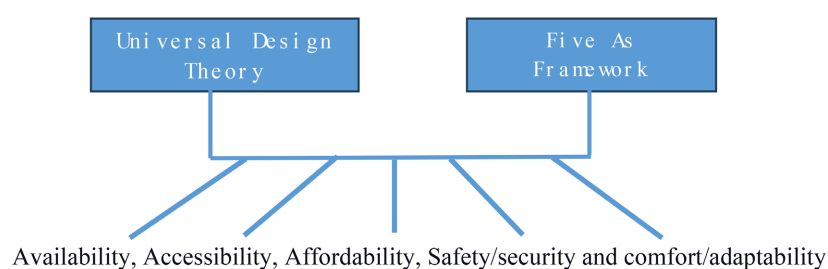


Source: Adapted from Mace Universal design theory, 1980.

Figure 1. Seven universal design principles design for diverse population groups.

4. Four A's Framework

Addressing transport issues related to availability, accessibility, affordability, adaptability and acceptability of mobility services, collectively known as the Four A's builds a transport system that is environmentally friendly and inclusive focuses on delivering the transport needs of everyone, particularly those who are already marginalized. It also stresses that in designing future transport systems, it is important to recognise and take an intersectional approach, moving beyond thinking about equality issues singularly and considering the overlaps of a person's identity (gender, race, income, geography) [28]. To derive a comprehensive set of dimensions for assessing mobility inclusiveness, this study integrated the universal design theory and four As framework as demonstrated in (Figure 2).



Source: Authors, 2025.

Figure 2. Blended UDT and Four A's framework.

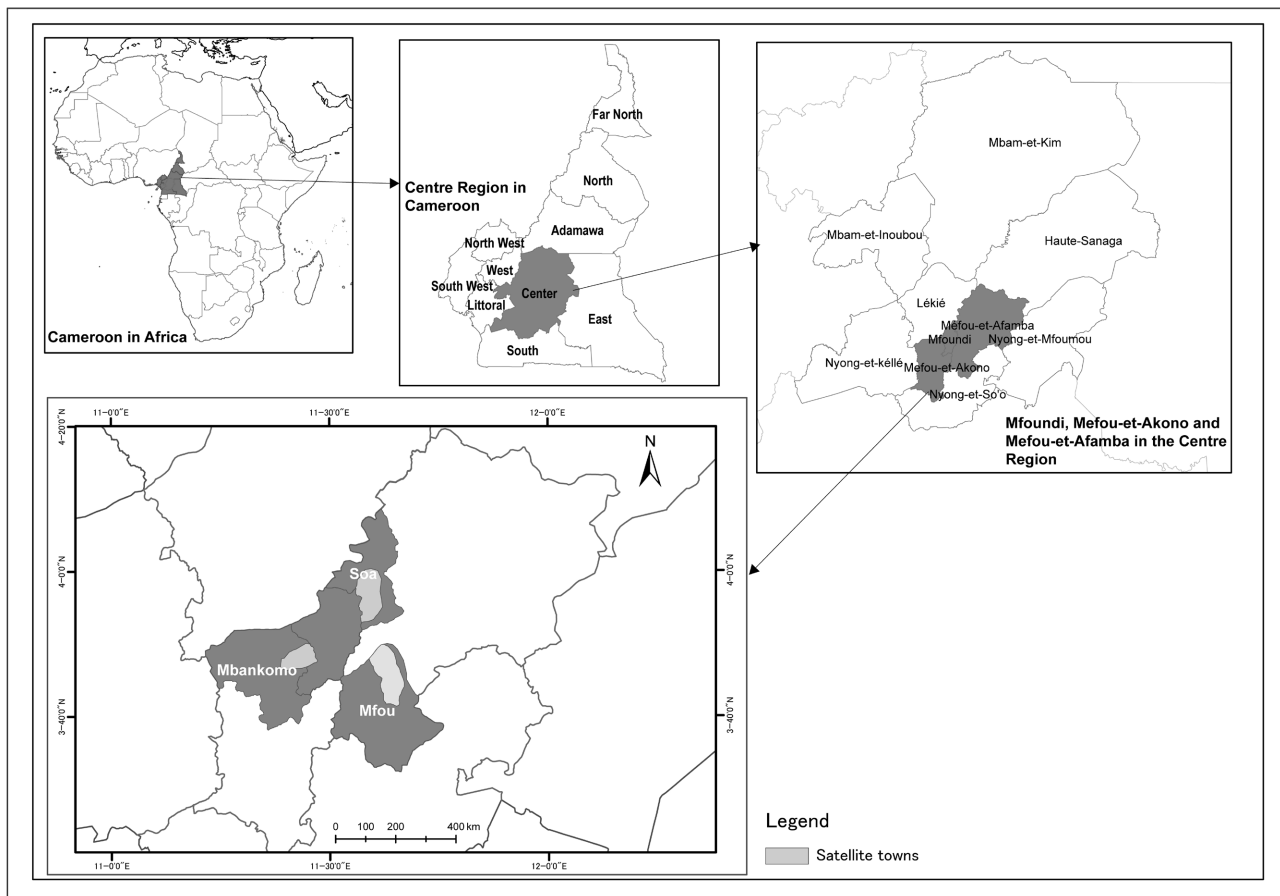
5. Materials and Methods

The satellite towns of Yaounde; Mbankomo, Mfou and Soa are located in the Centre Region of Cameroon. Amongst the ten Divisions of this region, Soa and Mfou are located in the Mefou-et-Afamba division while Mbankomo is part of Mefou-et-Akono Division. These three satellite towns are located between latitude 3°33'50" to 4°8'30" North of the equator and between longitudes 11°13'10" to 11°44'35" East of the Greenwich meridian (Figure 3).

Yaoundé's geographical location and the configuration of its transport infrastructure is considered as a mobility hotspot because of the central role it plays in national and international transportation in linking up many other regions usually described as a Carrefour (junction). Yaounde is the starting point or transit point for the main roads, in particular the national highways linking surrounding towns, regions and other countries in the Sub-Region. Whereas the development of the city of Yaounde has led to the expansion beyond its known boundaries. The city is no longer limited to the Mfoundi Division, but extends into the Mefou-et-Akono, Mefou-et-Afamba and the Lékié Divisions. Unfortunately, this speedy growth is not advancing commensurately with the transport system as transport demand increases yearly, resulting in transportation provision that is not inclusive. The reasons for selecting these three satellite towns are; firstly, because through mere observation the transport system looks deplorable and secondly because of the multiples limitations and negative impacts that are strongly high-

lighted in the Council Development Plans of each of the three satellite towns.

They constitute a population of 56,582 (2011), 61,597 (2015) and 69,084 (2015) for Mbankomo, Mfou and Soa respectively (Table 1). The principal mode for commuting is via road transport and due to the absence of well organised public transportation, the population depends on clando taxis, yellow taxis and mini-buses (locally called cargo for the Mercedes brand and HIACE for the Toyota brand).



Source: Authors, 2025.

Figure 3. Location of study area.

Table 1. Population data.

Town	Population	Male	Female	Date
Mbankomo	56,582	25,533	31,049	2011
Mfou	61,597	18,565	20,212	2015
Soa	69,084	31,942	37,142	2015

Source: Council development Plans of Mbankomo, Mfou and Soa.

Data Collection and Analysis

For the purpose of this work, both primary and secondary data was collected to

cover every aspect of the study. Secondary data, considered as one of the first stages of our research, was collected from previous works related to our topic. Thus, we consulted documents of the works of best scholars all over the world we could lay hands on. This armed us with a better understanding of the literature drawn from the theories, concepts, principal ideas and results of these scholars. This was sourced from the internet and University libraries in Cameroon. Government Ministries and Agencies including the Ministry of Public works, Ministry of Transport, Ministry of Urban Development and Housing and Central Bureau of Census and Population Studies (BUCREP) for census results and other vital records for this study. The National Institute of Cartography provided the village dictionary and topographic maps of 1:50,000 scale of Cameroon. Meanwhile data on road network of the study area was gotten from the Ministry of Public works and from respective councils.

The primary data was collected via qualitative or quantitative investigation. As part of primary data collection, direct observation, questionnaires and interviews constituted part of the investigation. The target population of this study are the vulnerable population who live in Mbankomo, Mfou and Soa who commute to Yaounde. Amongst this targeted population, 125 questionnaires were distributed in all three communities (**Table 2**) and 4 interviews conducted with the stakeholders in charge through which important data and information were gathered. Amongst the other information we gathered was the role they play in the transport system development and the difficulties they face in making the transport system more inclusive so that no one is left behind. The distributed questionnaire was centred on transport infrastructural and modal system which characterises inclusivity grouped under availability, accessibility, affordability, security/safety and Comfort/adaptability for the vulnerable commuter's appraisal. For a proper and facilitated data collection process, snowball sampling was employed where a commuter was used to locate another commuter particularly for people with physical impairment. For the other segments, random sampling was employed. GPS was also used in the field to collect spatial data of minibus and clando-taxi stations. A buffer zone of 500 m wide was applied to major road networks and stations as described by the SDGs goals target 11.2 regarding access to a light duty transport stop or road network. SPSS was exploited for statistical data analysis and Arc GIS 10.8 for spatial analysis.

Table 2. Repartition of questionnaires.

Satellite town	Investigation size	Percentage investigated per town
Mbankomo	49	39.2
Mfou	28	22.4
Soa	48	38.4
Total	125	100

Source: Fieldwork (July 2025).

6. Results

The main aim of this study was to pinpoint areas of challenges faced by the vulnerable road users (pregnant, old and handicap) in particular and the transport sector as a whole based on commuters rating of the transport system, with descriptive and geospatial analysis. To have a better appraisal of this phenomenon, a well-structured questionnaire was administered to 125 vulnerable settlers of Mbankomo, Mfou and Soa all three satellite towns around the vicinity of Yaounde. The questionnaire was structured on availability, accessibility, affordability, safety/security and comfort/adaptability with a total of 25 indicators (**Table 3**). The questionnaire was built with five responses mainly, poor, fair, good, very good and excellent represented within a 1 - 5 scale of which the respondents used in rating each indicator.

Table 3. Transport inclusive Indicators.

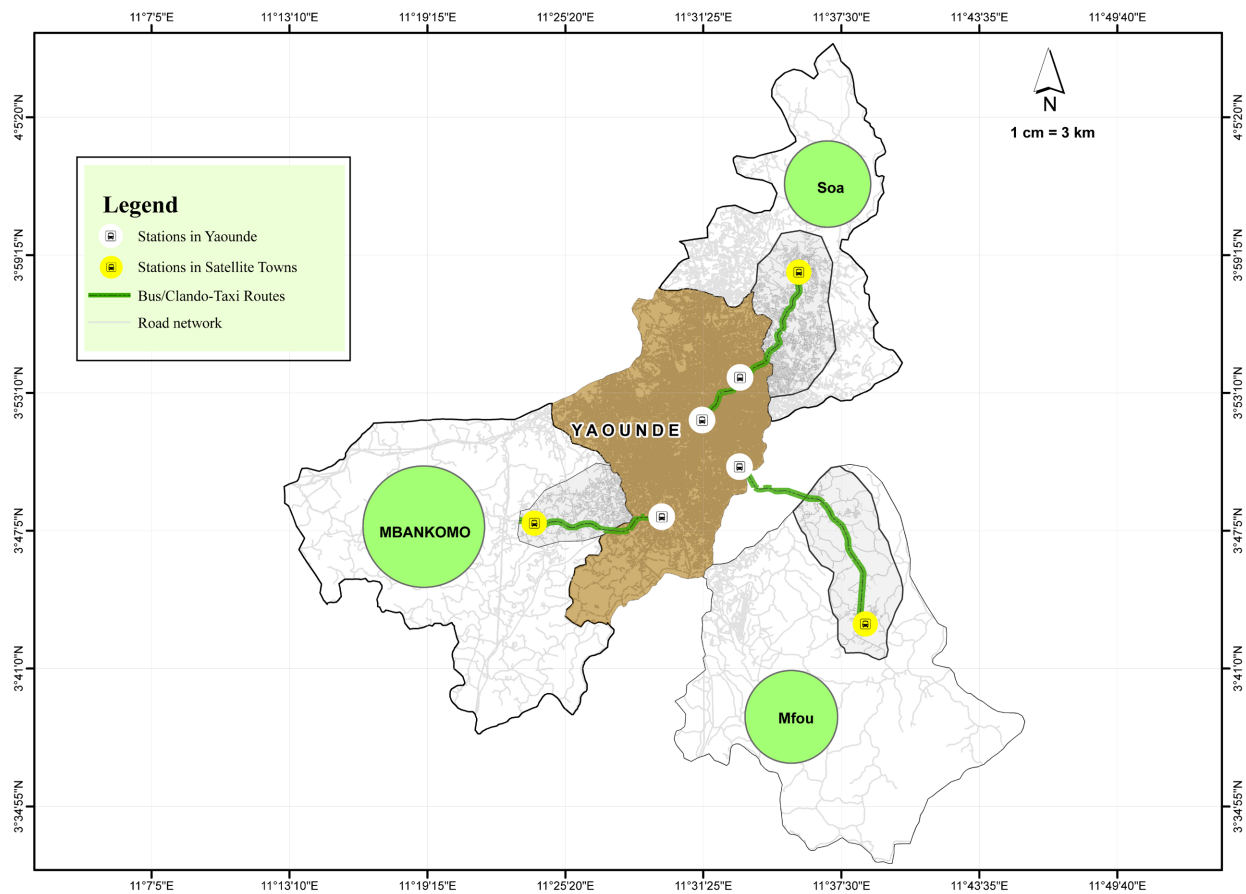
Variables	Indicators
Availability	Intermodality
	Shared transport network coverage
	Waiting time at stations and along the road network
	Operational hours and frequency
Proper functioning of the shared transport without breakdown	
Accessibility	Pedestrian accessibility (Sidewalks, zebra crossings, road signals) to bus stops
	Commuting time (In vehicle travelling time)
	Distance between stops
	Accommodation of modes for vulnerable population needs (boarding and alighting, priority seats)
	Provision of information
Communication in multiple languages	
Affordability	Transport fares
	Subsidized Transport fare for vulnerable populations (old & Handicap)
	Transport fare collection type
Safety/ Security	Safety of road infrastructure (road reflectors, streetlights, bypass)
	Security at the stations
	On board safety
	On board security
Drivers' driving behaviour	
Comfort/ adaptability	Adaptation of road infrastructure (tarred, untarred, potholes)
	Attitudes of drivers towards road users
	Ease in boarding and exiting vehicles
	Comfort of the vehicle's interior (Onboard travelling conditions (overloading, tight seats))
	Cleanliness of vehicle interior
Cleanliness of Pedestrian environment	

Source: Authors, 2025.

To grasp with clarity, the findings of this study is presented in two stages; Firstly, we carried out a comparison analysis across the three satellite towns based on the dimensions, and secondly, we zoomed into the mean ratings of the individual indicators to visualise with better granularity and clarity on the elements where the transport challenges specifically lie.

6.1. Availability Challenges

Availability presents to be one of the most important elements in evaluating transport inclusiveness as it sets the baseline in demonstrating if the transport infrastructure, modes and services are sufficiently provided in the first place as well as the provision of alternative options.



Source: Authors, 2025.

Figure 4. Limited routes for shared transport.

Multiple commuting routes which create viable mobility options are necessary as it ensures that commuters can have access to varied destinations or places of interest. It also promotes the use of public transport, provides alternatives during road closures, allows for speedy evacuations and access for emergency services and at times reduces congestion. In this regard, an evaluation of the current state of the transport system shows that the routes or lines leading to the Yaounde CBD

are generally inadequate from all the three corners of the satellite towns. As seen in **Figure 4** the commuters who uses shared transport system, which is of interest in this study, depends solely on one commuting route from their respective satellite towns to get to Yaounde. Whereas splitting distance especially for the vulnerable is quite challenging.

As evidenced from **Table 4**, a majority of the respondents are of the fact that transport infrastructure is poor and fair. Out of 125 participants who answered this question, 59.2% in Mbankomo, 82.1% in Mfou and 64.6% in Soa rated availability of transport infrastructure, mode and services as fair. In a whole, only 26.5% respondents in Mbankomo and 10.4% in Soa mentioned that it is good.

Table 4. Perception of transport availability by the vulnerable population.

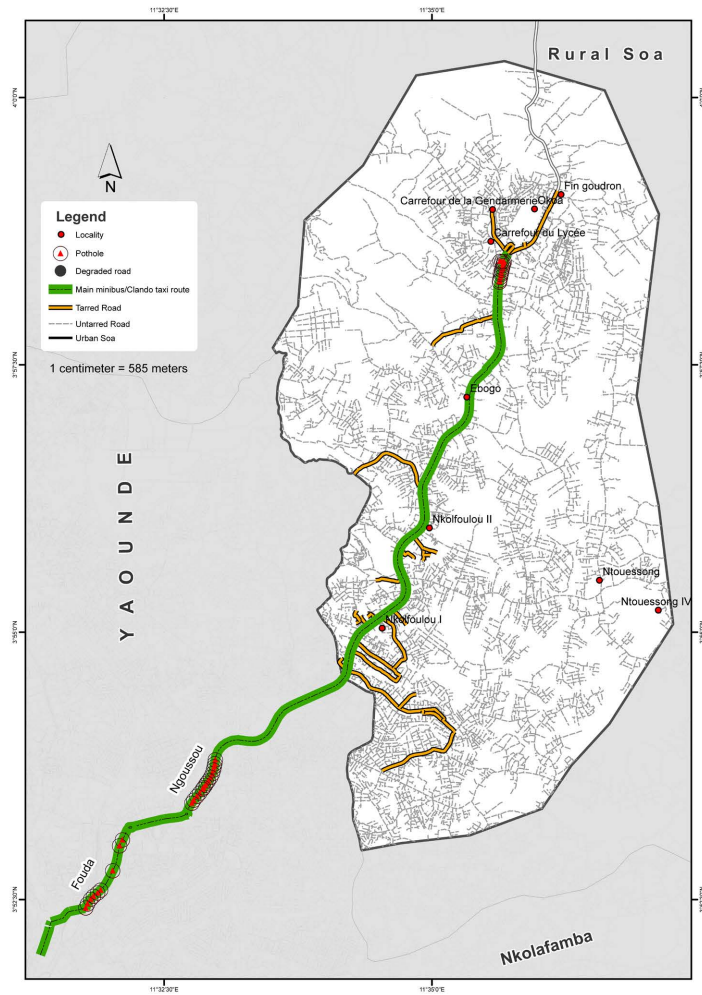
Town	1	2	3	4	5	Total
Mbankomo	7	29	13	0	0	49
%	14.3	59.2	26.5	0	0	100
Mfou	5	23	0	0	0	28
%	17.9	82.1	0	0	0	100
Soa	12	31	5	0	0	48
%	25	64.6	10.4	0	0	100
Total	24	83	18	0	0	125
%	19.2	66.4	14.4	0	0	100

Source: Authors, 2025.

6.2. Adaptability Challenges

For the transport network or modes to efficiently serve the community at all times, its infrastructure has to be adapted and comfortable if it portrays any form of degradation, safety and environmental concerns as failure to do this will obviously lead to negative consequences. This makes adaptation a key element much needed in either restoring the transport system the way it was or shaping it into a better one in meeting its users' needs. This goes beyond availability and takes a step deeper from what's available to how adaptable and comfortable the transport system in our case study is in relation to inclusiveness.

Most of the roads within our study area are not in good condition. Many African countries pay less interest and attention in repairing and maintaining roads [29]. These roads particularly along the Soa and Mfou lines are degraded characterised by potholes and cracks which are not adapted nor comfortable for the commuting vulnerable population. **Figure 5(b)** shows a clear view of this where along the Soa Yaounde road axis there exist about 34 potholes with sizes ranging from 0 to 2 m. Mfou also has a similar situation where before reaching Yaounde a commuting vehicle has to bounce in and out of about 46 potholes which is a huge challenge for the commuters (**Figure 5(a)** and **Figure 6**). These potholes of varied sizes which renders commuting quite stressful. However, the Mbankomo axis presents a better case though there is the absence of potholes, it only has multiple



Source: Fieldwork 2025.

Figure 6. Location of potholes along Mfou and Soa route.

Table 5. Perception of transport Comfort/adaptability by the vulnerable population.

Town	1	2	3	4	5	Total
Mbankomo	34	15	0	0	0	49
%	69.4	30.6	0	0	0	100
Mfou	18	10	0	0	0	28
%	64.3	35.7	0	0	0	100
Soa	28	20	0	0	0	48
%	58.3	41.7	0	0	0	100
Total	80	45	0	0	0	125
%	64	36	0	0	0	100

Source: Authors, 2025.

Concerning the respondent’s opinion on adaptability and comfortability, 69.4%

of Mbankomo respondents mentioned that comfort is poor. This is followed with 64.3% for Mfou with a slight drop in Soa represented by 58.3% (Table 5).

6.3. Accessibility Challenges

The globally accepted SDGs in its goal 11.2 stipulates that a road network or station can be classified accessible, when it's within a 500m walk to a light duty vehicle which is what was used in this study due to the absence of heavy-duty public transport like the rail. Unfortunately, in this assessment SDG 11 did not specify any particular accessibility indicator or exact distances to be covered for people with special needs regarding access to road networks or stations as it would have been necessary to evaluate this group using a different metric. As people with any physical limitation, it will normally take longer duration to access any point of interest when compared to the general or physically upright population.

So, accessibility challenges were accessed using a performance-based approach as stipulated by SDG target 11.2.4 combined with that of the commuter's perception since this study is a people's centric with focus on the vulnerable population.

In classifying accessibility into three categories: accessible, fairly accessible and not accessible, in Mbankomo, only 17.7% resides within the 500 m proximity threshold, 47.3% in Mfou and 31.8% in Soa. That of Mfou is higher because of linear settlement along the road and also because of a less dense population settlement which is not the case for Mbankomo and Soa which is more densely populated. As a whole, a minor portion of commuters (29.9%) is covered within 500m, with 16.8% between 500 - 1000 m (fairly accessible) and a significant portion of 53.3% covered above 1000 m radius (Not accessible) (Table 6 and Figure 7).

Table 6. Underserved proportion of population within 500m proximity to primary road network.

Communities/distance(m)	1 - 500	>500 - 1000	> 1000	Total
Mbankomo buildings	3055	2128	12047	17,230
Estimated population	15,275	10,640	60,235	86,150
%	17.7	12.4	69.9	100
Mfou buildings	4707	2170	3074	9951
Estimated population	23,535	10,850	15,370	49,755
%	47.3	21.8	30.9	100
Soa buildings	5797	3345	9067	18,209
Estimated population	28,985	16,725	45,335	91,045
%	31.8	18.4	49.8	100
Total buildings	13,559	7643	24,188	45,390
Total estimated population	67,795	38,215	120,940	226,950
%	29.9	16.8	53.3	100

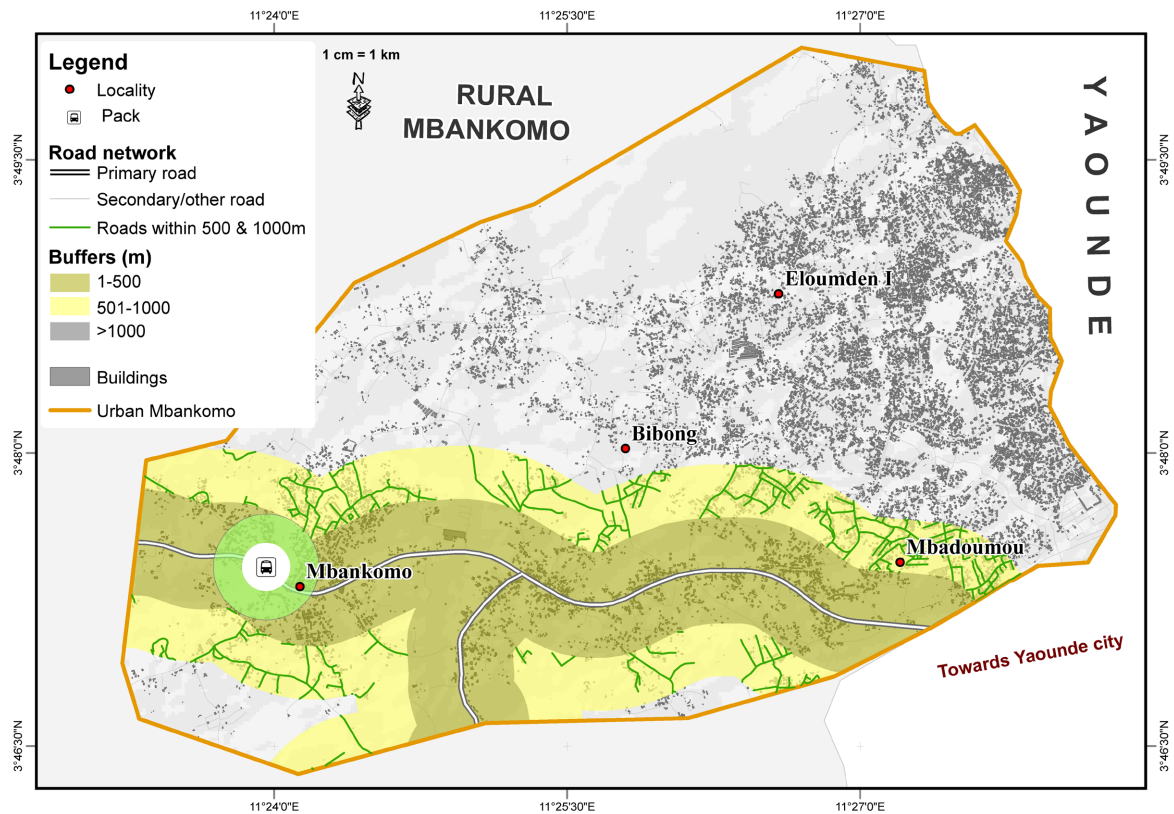
Source: Authors, 2025.

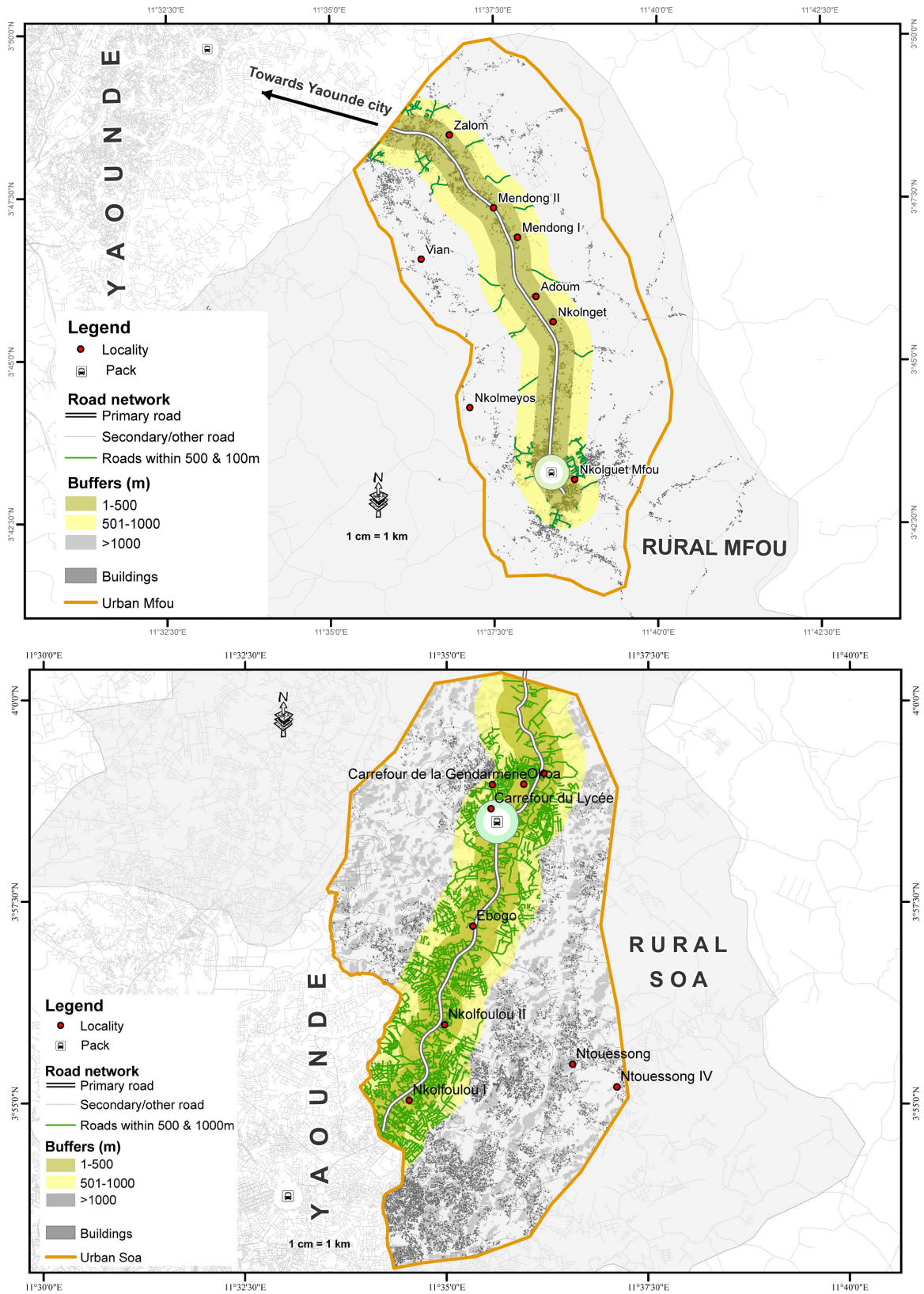
Regarding the commuter’s opinion, amongst 125 vulnerable respondents who answered this question from all three satellite towns, only 15.2% stated that accessibility is fair. They fall under the group of those who explain that they have over-time adapt to the system. Whereas a majority rated accessibility as poor represented by a total of 84.8% as seen in **Table 7**. Meanwhile a greater share of the population in Mfou mentioned its poor (92.9%) followed by those of Soa (87.5%) then last by Mbankomo respondents (77.6%).

Table 7. Perception of transport accessibility by the vulnerable population.

Town	1	2	3	4	5	Total
Mbankomo	38	11	0	0	0	49
%	77.6	22.4	0	0	0	100
Mfou	26	2	0	0	0	28
%	92.9	7.1	0	0	0	100
Soa	42	6	0	0	0	48
%	87.5	12.5	0	0	0	100
Total	106	19	0	0	0	125
%	84.8	15.2	0	0	0	100

Source: Authors, 2025.





Source: Fieldwork 2025.

Figure 7. Population within 500 m access.

The commuting time to reach destination in most developing countries and Cameroon in particular is not a matter of choice and it's impossible to know the exact commuting time because real time traffic flows are not available. Research from the SAMSET project (2017) engaged in supporting Sub-Saharan Africa's municipalities with sustainable energy transition noted that many commuters in African cities experience very long travel times, often due to heavy congestion and urban sprawl [30]-[32]. This shares a similar context that is prevalent in our study area as data collected from survey revealed that it takes a long travelling time for the commuters to reach their destination. Worst is that overtime this has augmented due to population increase without corresponding modification in infrastructures and modes as necessary measures have not been undertaken to ease congestion over the years nor efficient mass public transport and other inclusive modes made available.

With respect to data collected, the mean travel time to Yaounde varies across the different towns which are intricately linked to fluctuating congestion levels especially in Mbankomo and Soa (**Figure 8**). The long time taken to travels to Mbankomo is attributed to the frequent travelling along the NR3 linking Douala and Yaounde and the narrow road network (3 * 3). Same applies for Soa which is principally related to frequent traffic congestion and due to the merging of bigger roads into smaller ones which cannot carry the heightened number of vehicles. Another reason is due to the location of the Soa station in the heart of Yaounde city though an advantage to the commuters is not supported by the limited design put in place.



Figure 8. Heavy congestion traffic along Total Ngoussou-Mobile Omnispport stretch (Soa route).

6.4. Inaccessible Modes

Another aspect that causes a huge barrier to transport inclusiveness is the usage

of prevalent modes that do not embrace inclusive design. These modes are characterised by design deficiencies that are not convenient particularly for people with special needs. This was depicted through observation as one of the methods used in this work which revealed that the transport mode is not adapted to the slightest degree of the population. To verify if this observation was true, questionnaires from commuters were used for more clarity and certainty.

As observed in **Figure 9**, most of the vehicles like the minibuses in Soa poses a real challenge for boarding and alighting as the steps and gabs are very high (25 cm) and also because the old buses being used were not designed for lowering. In addition, they do not have spacious and comfortable seating arrangements with limited space as they throw preference on carrying more passengers over comfort and there is also a complete absence of designated (priority) seats for people with special needs. As if this is not enough, they are usually poorly ventilated as most of the windows of these buses are defective. This makes commuting for the general commuters and extremely difficult for persons with mobility limitations especially the aged, pregnant women and physically handicapped. These issues are common traits of almost 65% of the 350 minibuses which run along the Soa-Yaounde stretch. There is even a more absurd practice were in Soa some of the buses are readapted to increase the number of seats rendering it more uncomfortable and inaccessible for the vulnerable groups.

These were all confirmed during the survey as both the general population and the vulnerable commuters in particular expressed the fact that none of the modes are suitable for them as the vehicles in general are not comfortable in any way.



Figure 9. A Minibus with high gab for boarding, B. Clando taxi in Mbankomo.

In Mbankomo and Mfou, with similar commuting modes, the major problem expressed by the population is that of very tight and uncomfortable seats which makes commuting quite challenging as overloading is a common practice along these routes. The normal carrying capacity of four passengers is usually exceeded by up to six or seven passengers. The clando-taxis also have their own practice of which they carry two passengers in the front seat and four behind which at times pushes some of the vulnerable people to pay for two seats, which in turn affects their overall cost.

It was also noticed that, in all three areas the modes are not suitable for wheelchair users, which will normally incur extra expenses for commuting though we did not come across any within these settlements who frequently commute to Yaounde. Nevertheless, this case is important for consideration in making provisions for a complete inclusive design.

The survey responds from the vulnerable population, revealed that most of this portion of the population do not find it easy to commute due to the challenges mentioned in accessing the minibuses and clando taxis. Whereas 25% made it clear that they have adapted overtime to the modes and find it fairly accessible. There is also Information and communication inaccessibility, due to the paucity of digital information and absence of digital payment system.

6.5. Affordability Challenge

In many towns, around the world, special attention is being paid on transport cost through different incentivised methods [33] in other to encourage the usage of public transportation. This approach demonstrates the importance of such actions for the utilisation of public transport mode. Conversely in most urban milieus of Cameroon, due to the lack of public transport options commuters are forced to rely on the prevailing options owned and ran by individuals which is certainly not inclusive in terms of transport cost [34].

The cost of transportation has increased over time due to the increase in fuel hikes and because of Covid 19 as drivers were demanded to respect social distancing. The rise in fuel prices occurred twice in 2010 and 2024 and covid 19 in 2019 which both affected transports as shown in **Table 8**. Currently, transportation varies between 350 and 500 FCFA. Mfou has the highest fare at 500 followed by Mbankomo with 400 FCFA and Soa has the lowest fare at 350. Mfou is more expensive due to the distance which separates this satellite town from the Yaounde as compared to Soa and Mbankomo.

Table 8. Temporal variation in transport fare.

Urban area/Date	1990	2010	2019	2024
Soa	200	250	300	350
Mfou	300	350	350	500
Mbankomo	300	300	400	400

Source: SYNTRAPUIRCAM (2025), Business in Cameroon (2024).

On a general assessment, the commuters had a variety of viewpoints regarding transport affordability but with a general opinion who rated it as poor with a total of 95.2% as seen in **Table 9** with a very insignificant population (4.8%) who rated it as fair. Most of the vulnerable population explained they spend more on transport because most often they only feel comfortable when sitting either in front of the vehicle or if they pay for two seats, which generally becomes very expensive for

them as they are not covered by any special pricing scheme.

Whereas during the days of the failed Le BUS and STECY all public transportation which were operational in 2005 and 2016, transport fare was affordable only at 200 fcfa, which drops to 180 fcfa for a commuter who could purchase five (05) tickets at once. This underpins the challenge that the population are currently facing due to the absence of a public transportation system.

Table 9. Perception of affordability by the vulnerable population.

Town	1	2	3	4	5	Total
Mbankomo	49	0	0	0	0	49
%	100	0	0	0	0	100
Mfou	27	1	0	0	0	28
%	96.4	3.6	0	0	0	100
Soa	43	5	0	0	0	48
%	89.6	10.4	0	0	0	100
Total	119	6	0	0	0	125
%	95.2	4.8	0	0	0	100

Source: Authors, 2025.

6.6. Safety/Security Challenge

Most OECD countries have improved road safety through the adoption of policies that take into consideration the need of different road users embedded in the universal design principles, most especially the vulnerable. Conversely, this is not the case in most developing countries as only very few have begun to follow a similar path.

In Sub-Saharan African countries like Cameroon, safety is a real challenge for its commuters. This is related to the poor state of the transport infrastructure and the increasing use of old and road unworthy vehicles. In addition, there is the situation where all sorts of modes compete in limited road space with different speeds coupled with unsafe driving practices with vehicles that do not have the slightest degree of safety measures.

As already seen with our satellite towns, from road infrastructure and modes, none provides safety measures for its users, especially the vulnerable. Most of the limited roads and pedestrian paths are also degraded with no clear demarcations. What worsens this is the high usage of second handed aged vehicles which are prone to frequent breakdowns.

Regarding safety and security, an average of the population shared the view that the transportation system is fair (50.4%). Meanwhile 49.6% mentioned that it is poor. Nevertheless, the responds from Mbankomo shows they are facing higher safety challenges than those of Mfou and Soa as a majority the respondents men-

tioned that safety and security is poor (73.5%) as illustrated in **Table 10**.

Averaging the means per dimension within all the three towns taking into consideration they all carry equal weights portrays that though they all face mobility challenges, Mfou commuters faces even greater challenges with a lowest mean of 1.68 followed by Mbankomo with 1.69 and then Soa with 1.75 as shown in **Table 11**.

Table 10. Perception of safety/security by the vulnerable population.

Town	1	2	3	4	5	Total
Mbankomo	36	13	0	0	0	49
%	73.5	26.5	0	0	0	100
Mfou	10	18	0	0	0	28
%	35.7	64.3	0	0	0	100
Soa	16	32	0	0	0	48
%	33.3	66.7	0	0	0	100
Total	62	63	0	0	0	125
%	49.6	50.4	0	0	0	100

Source: Authors, 2025.

Table 11. Perception average mean per satellite town.

Towns	Availability	Accessibility	Affordability	Safety/security	Comfort/adaptability	Mean
Mbankomo	2.42	1.59	1.15	1.7	1.63	1.69
Mfou	2.14	1.52	1.13	2	1.65	1.68
Soa	2.17	1.49	1.32	2.04	1.73	1.75

Source: Authors, 2025.

6.7. Assessment of Transport Inclusiveness across the Satellite Towns

Fusing the three satellite towns, an overall assessment indicates that affordability stands as the lowest rated dimension (1.2 mean score). It is followed by accessibility with 1.5, then comfort/adaptability with 1.67 and safety/security 1.9. Availability scored the highest (2.2) though it still falls only under the fair category.

A deep dive into the indicators illustrates with clarity the areas where stakeholders' efforts are much needed to provide an inclusive transport system for the vulnerable segment of the population. Subsidised transport fare, accommodation of modes and onboard safety reveals as areas where severe challenges lie amongst all the other elements rated as poor with the lowest means of 1, 1.02 and 1.03 respectively. Provision of information is also rated as poor with a 1.2 mean. Meanwhile, operational hours are rated good with a 3.2 mean. Onboard security and distance between stops are also fairly rated. **Table 12** shows a detail ratings of all the 25 indicators.

Table 12. Perception of inter-urban transport inclusiveness across the satellite towns.

Variables	Indicators	Min	Max	Mean	Standard deviation	Rank	Rank ²
Availability	Intermodality	1	4	1.91	0.77	8	
	Shared transport network coverage	1	3	1.58	0.67	13	
	Waiting time at stations and along the road network	1	4	1.74	0.83	10	5
	Operational hours and frequency	3	5	3.52	0.84	1	
	Proper functioning of the shared transport without breakdown	1	4	2.57	0.85	4	
				2.2			
Accessibility	Pedestrian accessibility (Sidewalks, zebra crossings, road signals) to bus stops	1	4	1.28	0.59	19	
	Commuting time (In vehicle travelling time)	1	3	1.55	0.74	15	
	Distance between stops	1	3	2.82	0.94	3	2
	Accommodation of modes for vulnerable population needs (boarding and alighting, priority seats)	1	2	1.02	0.12	24	
	Provision of information	1	2	1.26	0.44	22	
	Communication in multiple languages	1	3	1.27	0.58	21	
				1.5			
Affordability	Transport fares	1	3	1.38	0.66	17	
	Subsidized Transport fare for vulnerable populations (old & Handicap)	1	1	1	0	25	1
	Transport fare collection type	1	3	1.27	0.58	20	
				1.2			
Safety/ Security	Safety of road infrastructure (road reflectors, street-lights, bypass)	1	3	1.32	0.56	18	
	Security at the stations	1	4	2.22	0.9	5	
	On board safety	1	3	1.03	0.17	23	4
	On board security	1	5	2.85	0.95	2	
	Drivers' driving behavior	1	3	2.07	0.72	6	
				1.93			
Comfort/ adaptability	Adaptation of road infrastructure (tarred, untarred, potholes)	1	4	1.98	1.04	7	
	Attitudes of drivers towards road users	1	3	1.58	0.68	12	
	Ease in boarding and exiting vehicles	1	3	1.38	0.5	16	
	Comfort of the vehicle's interior (Onboard travelling conditions (overloading, tight seats))	1	3	1.56	0.66	14	3
	Cleanliness of vehicle interior	1	3	1.87	0.5	9	
	Cleanliness of Pedestrian environment	1	3	1.68	0.48	11	
				1.67			

Source: Authors, 2025.

7. Discussion

One of the major problems facing vulnerable populations at the backdrop of metropolitan towns is that of navigating through the transport system. This issue has been the focus of numerous research, though limited attention is paid to this particular population segment in most Sub-Saharan and developing countries. Our analysis in the case of Yaounde and its satellite towns revealed several findings. Firstly, the transport infrastructure is not adequate, and the modes are not accessible for the vulnerable population. Secondly, the Population appraisal also proved that the transport system does not satisfy the vulnerable commuters' needs concerning availability, accessibility, affordability, safety/security and Comfort/adaptability. Vulnerable population, commuter appraisal of transport systems has not been the focus of research studies so discussions here are based on related challenges faced in the context of most developing nations' transportation systems. This study is in line with the findings of [35] who studied the malfunctioning of the transport system and travel problems in Douala and found that the inadequacy and poor condition of the roads hindered access to the various districts. Since a majority of commuters relies on public transport, the Global Alliance of Accessible Environments and Technologies (GAATES) after surveying 39 countries, found that 47% of respondents with disabilities cited public transport as inaccessible [36]. It also corroborates with that of [21] in a study carried out in Southern and Eastern parts of South Africa which he underlines that settlements of isolated deep rural locations and commuters in suburbs and urban townships face the highest transport expenditure and affordability problems. Additionally, a detailed study focuses on the aged with mobility disability in the US [37] reported challenges utilizing public and private modes of transportation, related to availability, accessibility, safety, advanced planning, as well as societal attitude.

8. Conclusion

Conclusively, results of this article have demonstrated that, vulnerable segment of the commuters in the satellite towns around the vicinity of Yaounde undergoes a plethora of transport challenges owing to the lack of an inclusive transport system. These challenges which are related to availability, adaptability/comfort, accessibility, affordability and safety/security inform and guide the prioritisation of transport investment proposals which will not only improve the social connections and economic opportunities of this population but will tremendously enhance the quality of life for all individuals thus leaving no one behind as clearly underlined by the SDGs.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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