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Assessment of Sustainable Mobility Patterns of University Students: Case of Cameroon

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Abstract: The transition to sustainable mobility is a recognized socio-economic and environmental challenge, particularly among young adults. In addressing the gap in the literature on young adults' travel behaviors, especially in Cameroon, this paper investigates the transport mode choices, influencing factors, and barriers to sustainable mobility of students at the National Advanced School of Public Works, Yaoundé (NASPW). Data were collected through online questionnaires with 360 valid responses. Findings revealed that most students used multiple modes of transport for commuting, with moto-taxis being the most common. Accessibility, vehicle speed, and flexibility appeared as the most important reasons for the preferred transport modes, while driver's license possession, safety perceptions, speed, and proximity were significant predictors for mode choice. Demographic factors were found to influence transport preferences, with distinct clusters prioritizing different aspects. Barriers to public transport were primarily long waiting times and congestion, while active mobility was hindered by distance, infrastructure, and weather. The usage of public transportation was encouraged by its affordability and reduced travel time, whilst active options were preferred due to cost savings and health benefits. To promote sustainable mobility for campus travel, it is crucial to encourage active modes, develop mass transport systems, and raise awareness through symposia and conferences among students and staff.

Keywords: mobility; travel choices; active modes; public transport; low- and middle-income countries

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1. Introduction

The concentration of population in cities is the cause of several health and environmental problems. One of the main problems is linked to the intensive use of private cars to travel short distances [1]. Environmentally, around 40% of carbon dioxide (CO_2) and up to 70% of other pollutants are linked to the intensive use of cars [2].

Sustainable urban mobility gathers all the means of transport that have the lowest negative effects on the environment. It implies planning the development of mobility of cities considering sustainability goals, thus rendering trips safer. Public transport and active mobility are key constituents of sustainable mobility.

A large number of trips are generated to access different facilities and amenities, such as shops, offices, leisure, and public services, including universities. Universities around the world are increasingly concerned with creating more sustainable environments for students and adopting measures to encourage people to travel by active modes and public

transport [3]. Meanwhile, Hopkins D. believes that the mobility of young adults is still understudied [4], especially in low- and middle-income countries. Moreover, the choice of transport mode is an individual, rational, and complex decision process, and in the specific case of mobility to a university campus it involves several criteria including, among others, distance, travel time, cost of travel, weather conditions, and, of course, individual preferences. For this, it is therefore essential to understand individual behavior in terms of travel and modal choices to promote the development of effective and equitable transport planning and management policies. For university students, understanding their travel preferences enables the analysis of route efficiency that facilitates student movement. It also helps identify factors or conditions that, if altered, could encourage students to opt for more sustainable travel modes [5].

Recognizing the necessity for sustainable transportation solutions for students, research into the commuting behaviors of university students has been gaining interest, including both high-income countries (HICs) [3,6–9] and low- and middle-income countries (LMICs) [10–13]. A recent investigation involving 28 LMICs, which examined adolescent active travel to schools, identified considerable diversity and heterogeneity among the LMICs studied, highlighting the need for context-specific research within these countries. Hence, it is important to note that the findings from LMIC studies (but more strongly from HICs) may have limited applicability or generalizability in LMIC contexts, unless there are cultural parallels. This gives prominence to the need for additional research that is customized to particular countries or regions with analogous cultural attributes. For example, evidence suggests that most university students in some HICs, like countries in Europe, travel to school using public transport and engage in more active modes of travel such as cycling [6,8,14]. Nonetheless, such insights may not be pertinent to some LMICs, such as Cameroon, where the infrastructure for public transport and cycling lanes is virtually non-existent.

In the context of Cameroon, there is a dearth of research on travel behavior and commuter mode preferences. To this point, only two pertinent studies have been identified: one encompassing a household travel survey conducted in the city of Douala over two decades ago [13] and a more recent study that addressed travel behavior and barriers to active travel among adults in the city of Yaoundé [12]. There has been no investigation into the mobility patterns of students or the factors that could foster the adoption of sustainable transportation modes among this social group. This information gap deprives transportation planners in Cameroon of the critical data required to devise effective transportation policies, including the management of sustainable transport-related indicators such as road safety and emissions [15], which have been depleting for the country, especially road safety [16]. To bridge this gap, it is essential to understand mobility patterns through research results collected from targeted societal groups like universities.

Therefore, this research aims to investigate the mobility patterns of students at the National Advanced School of Public Works in Yaoundé (NASPW) as a case study. The objectives are to understand their mode choices, reasons for modal choice, identify barriers to adopting public transport and active modes, and explore factors that could facilitate their adoption.

This study is highly significant for the university administration, city planners, and urban municipalities in Yaoundé, as it provides useful information on travel patterns and barriers to sustainable transport modes. It also contributes to the limited body of research that exists in Cameroon and similar contexts on this topic.

2. Materials and Methods

2.1. Questionnaire Design

This work consisted of collecting data and analyzing it to identify trends and determine the relationships between various mobility pattern-based parameters. The tool which made it possible to collect data on the mobility patterns of the student community of the NASPW was an online questionnaire that was complemented by in-person survey. The Survey Monkey web platform (https://fr.surveymonkey.com/r/8DV5FWQ, accessed on 20 August 2023) was used for this purpose—it is a commonly used platform to implement mobility-related questionnaires [3,17,18].

The questionnaire was developed in advance and tested with a sample of students to ensure clarity, and any inconsistencies or errors were corrected. The final questionnaire, which was based on several styles, consisted of 30 questions organized into five (5) sections. The first section (questions 1 to 14) included general questions on gender, age, place of residence, average income, campus attendance, and status in the university (student, teacher/researcher, or staff member), among other information. The second part (questions 15 to 22) focused on the characteristics of home-to-campus and campus-to-home travel, the use of existing modes of transport, and the predominant modes of transport. Nine options were offered for the choice of modes of transport: private car, private motorcycle, bus, mini-bus, taxi, carpooling, cycling, walking, and carpooling services such as Yango and ONGO.

Questions 23 and 24, forming the third section, inquired about the reasons behind participants' choice of their most frequently used mode of transport, considering factors such as cost, flexibility, accessibility, and comfort. The final two sections invited participants to discuss their openness to change transportation modes and to evaluate the challenges/barriers associated with using active travel modes and public transportation, as well as the incentives that could promote the adoption of these modes.

For questions with the variables to be assessed, the relative relevance of each variable was determined using a five-point Likert scale. For example, in question 15 concerning the evaluation of the use of transport modes, the levels were (1) not used; (2) little used; (3) moderately used; (4) used; and (5) widely used. Details on the design for each question can be assessed from https://fr.surveymonkey.com/r/8DV5FWQ.

2.2. Sample Size Determination

Sample size testing was performed to estimate and determine the representative sample proportion of the university at 95% confidence interval. This was performed using Slovin's formula, which is suitable for this purpose [19]:

$$n = \frac{N}{1 + Ne^2} \quad (1)$$

where:

N = the population size.
n = the sample proportion.
e = level of error.

Considering an error of 0.05 (at 95 confidence interval) and an estimated population (N) of NASPW at 2000, the required sample proportion (n) can be computed as follows:

$$n = \frac{2000}{1 + 2000(0.05)^2}$$

$$n = 333.3$$

Hence, an estimated population proportion of 334 is needed. The data were collected from 425 individuals, which is greater than the estimated sample proportion obtained. However, after data cleaning, a reduced sample size of 376 was deemed suitable for analysis, which still maintains statistical representativeness of the university population. The sample included both students (n = 360) and staff (n = 16). Due to the low number of staff responses, the staff data were excluded from further analysis, as they did not constitute a statistically representative sample. Therefore, the present study was delimited to the student population.

2.3. Statistical Analysis

Separate statistical analyses were conducted to examine the mobility patterns of students, utilizing both Excel, R software version 4.3.1, and the Statistical Package for Social Sciences (SPSS) Version 27. These analyses included the chi-squared test, Mann–Whitney U test, cluster analysis, and multinomial logistic regression.

Chi-squared test for association (also called chi-squared test of independence) was used to verify the association and relationship between demographic characteristics (such as age and income level) and the barriers to public transport and active mobility. The chi-squared test for association is a statistical test used to determine if there is a significant association or relationship between two categorical variables. It compares the observed frequencies of each category with the expected frequencies that would be observed if there was no association between the variables. The hypothesis testing was as follows:

The null hypothesis was H0: there is no association between age and barriers to public transport.

The alternative hypothesis was H1: there is an association between age and barriers to public transport.

p-value < 0.05 is in favor of H0; otherwise, there is association. In the analysis, the association between age groups and each identified barrier to public transport was examined independently. This means that we assessed the relationship between different age categories (e.g., "Between 20 and 25 years") and each specific barrier (e.g., "Waiting time", "lack of infrastructure", "Car ownership", etc.) separately. The test and hypotheses were also set for barriers to active mobility and also for the demographic characteristic income level.

The Mann–Whitney test was also performed, which is useful for assessing the differences between results obtained from two independent variables. Also known as the U test, the Mann–Whitney test is a non-parametric test that compares the medians of two populations that are not normally distributed. This test was used to assess if there is a significant difference in the perception of barriers to active mobility and public transport between males and females. In the U test, the null hypothesis is rejected when the p-value (significance) is lower than 0.05, indicating that there was a significant difference in the evaluation made [20].

Cluster analysis was conducted to identify distinct groups within the student population based on their transportation preferences and the factors influencing these preferences, such as age, gender, income level, driver's license status, education, and reasons for choosing their predominant mode of transportation. The analysis was necessary to uncover underlying patterns and relationships within the data that might not be apparent through simple descriptive analysis. We applied the K-means algorithm to perform cluster analysis, a widely used technique for partitioning a dataset into K distinct, non-overlapping subsets. To ascertain the optimal number of clusters, we used the elbow method, which is commonly used in statistical analysis to determine the number of clusters [21].

To investigate the factors influencing mode choice for transportation, a multinomial logistic regression model was employed. Multinomial logistic regression is an extension of binary logistic regression and is suitable for situations where the dependent variable has more than two unordered categories. In this study, the dependent variable represents the transportation mode choices, which included private car, taxi, motor-taxi, walking,

and mixed modes (greater than 2 modes). Modes with smaller sample sizes, such as bicycles, Yango, and private motorbikes, were excluded from the analysis.

The multinomial logistic regression model was used to estimate the probability of each transportation mode relative to a reference category. In this case, the reference category was "mixed modes", i.e., usage of multiple modes of transport. The logistics model determines the relationship between the dependent variable (model preference) and a set of independent variables by estimating the log-odds ratios. However, the overall aim of carrying out the logistic model in this study was not primarily to develop a model that can be used when independent variables are known, but rather to simultaneously account for those factors influencing mode choice and determine the most significant and important factors, which may be critical for informing transport policies. The deterministic share of the utility for each can be formulated as [22] follows:

$$U_{mi} = ASC_m + \beta_{m1}\gamma_{mi1} + \beta_{m2}\gamma_{mi2} + \cdots + \beta_{mk}\gamma_{mik}$$

where:

U_{mi} is the net utility function for mode m, for individual i.
ASC_m is the alternative specific constant for mode m.
$\gamma_{mi1} \ldots \gamma_{mi2}$ are k number of attributes of mode m for individual I.
$\beta_{m1} \ldots \beta_{m2}$ are k number of coefficients of mode m associated with the independent variables.

The independent variables included demographic characteristics, travel time, clusters, and attributes related to the choice of travel mode.

The coefficients were estimated using the maximum likelihood estimation method, and the statistical significance and goodness of fit were assessed using performance measures such as the likelihood ratio test, Pearson/deviance chi-squared test, and pseudo-R-squared measures, which have been applied in similar mobility studies [5,22]. The model fitting process involved a stepwise backward elimination method to select the most relevant predictors. Initially, variables that showed no statistical significance for any transport mode were removed after the analysis. Subsequently, the remaining variables that demonstrated significance in at least one transport mode were used in a further analysis, continuing to employ the backward selection method. These statistical procedures were conducted in SPSS and were used in identifying the key factors affecting modal choice.

3. Results

3.1. Descriptive Statistics of Sample

The survey yielded 360 valid responses for the student population after data cleaning, down from an initial dataset of 425. The sample was approximately 72% male and 28% female. The age distribution is heavily skewed towards younger students, with 63.9% between 20 and 25 years old, followed by 13.6% under 20 years, and 12.5% between 25 and 30 years old, suggesting that the findings of the study are most representative of the young student demographic. In terms of income, the majority (63.6%) of students were dependent (relying on their parents or guardians for income), with the remainder almost evenly split between those earning less than FCFA 50,000 (about USD 90) and above FCFA 50,000, reflecting a balance between lower and higher income levels among the economically independent participants. A significant 74.4% of the sample do not possess a driver's license, as expected. The "Cycle" feature, which represents the level of education, shows a diverse educational background among participants, with the highest frequency in the intermediate education level (25.6%), and a fairly even distribution across the other levels, indicating a range of educational attainment within the study population. In addition, this study showed an average commuting time of 36.89 min to university campus with a minimum of 4 min and a maximum of 150 min. Table 1 presents a detailed description of the sample characteristics.

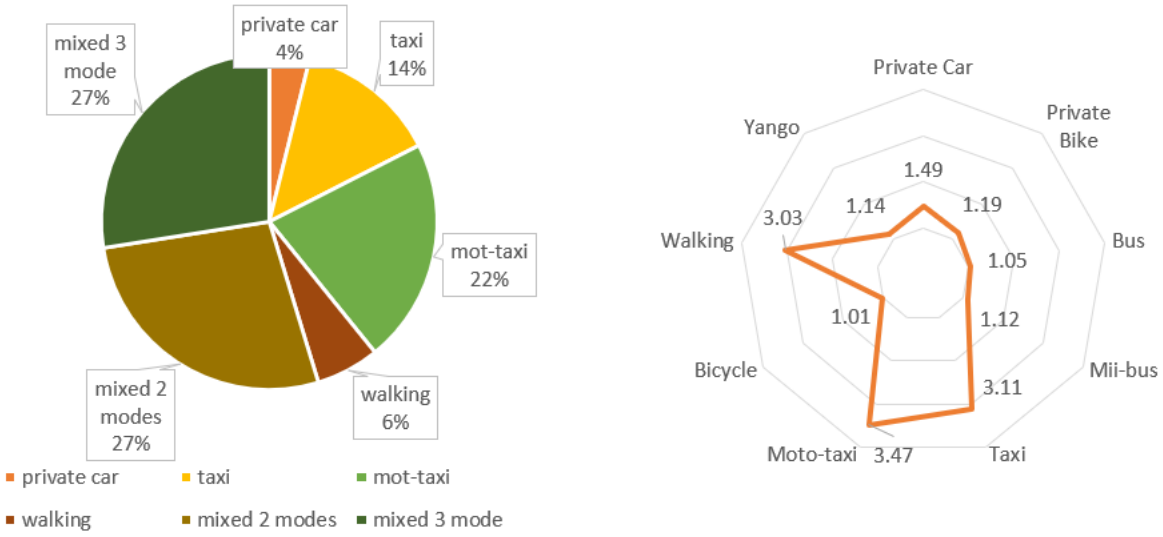
Table 1. Descriptive statistics of sample.

	Features	Frequency	Percent (%)
Gender	Male	260	72.2
	Female	100	27.8
Age	<20	49	13.6
	20 to 25	230	63.9
	25 to 30	45	12.5
	30 to 35	17	4.7
	35 to 40	11	3.1
	40 to 50	8	2.2
Income level	Dependents	229	63.6
	<50,000	66	18.3
	>50,000	65	18.1
Driver's license	No	268	74.4
	Yes	92	25.6
Cycle	Level 1	62	17.2
	Level 2	66	18.3
	Level 3	92	25.6
	Level 4	52	14.4
	Level 5	88	24.4

3.2. Modes of Transport Used and Reasons for Mode Choice

Figure 1a,b illustrate the transportation modes used by the university students for commuting between home and campus. Specifically, Figure 1a represents the most frequently used modes of transport, including both single and mixed/multiple modes, while Figure 1b reflects the average weights for each single mode of transport, given that students used more than one mode of transport from home to campus. According to the survey, buses, mini-buses, bicycles, private motorcycles, and carpooling services were scarcely used for these journeys, one reason being their limited availability. Conversely, moto-taxis, taxis, and walking were the most commonly used modes of transport. Mixed modes (which in this study refers to using several modes of travel while commuting to campus) are very common, with students often using more than two modes of transport between home and campus. Within the mixed modes category, and across all modes of transport, the high average value for moto-taxis (3.47) in Figure 1b suggests their extensive usage among students.

Table 2 shows the results regarding the reasons for the mode choice, which were assessed using a five-point Likert scale. When comparing the average importance for the various reasons, the results indicate that accessibility, speed, and flexibility were among the top factors, while security and safety were lower on the list. These findings confirm the high usage of moto-taxis among students, which are often easily accessible to them and provide a quicker means of arriving at school, in addition to offering greater flexibility.



(**a**) (**b**)

Figure 1. Modes of transport used between campus and home. Figure 1a represents the most frequently used modes of transport. Figure 1b represents the average weights for each single mode of transport.

Table 2. Reasons for using predominant modes.

Main Reason for Using Predominant Modes	Average Importance
Accessibility	3.93
Speed	3.74
Flexibility	3.31
Cost	3.17
No other choice	3.04
Proximity	2.74
Security	2.69
Safety	2.47

Disaggregated analysis showed that for home to campus travel, the majority of students (79.7%) travel directly from home to campus while the remaining (20.3%) first go to another destination before heading to campus. For campus to home travel, 40.1% leave campus for another destination before returning home, and 59.9% travel directly from campus to their homes.

The results show that 40.8% of students with an income of less than FCFA 50,000 prefer motorcycle taxis, as do 35.8% of those whose income is provided by their parents. Among those over 25 years old, motorcycle taxis are the most popular mode of transport, with 31.4% using them, followed by taxis at 27.1%, and walking at 20.7%. This mobility behavior reflects a preference for speed and availability within this age group.

Among male students, 34.19% prefer motorcycle taxis, followed by 27.2% for taxis, and 23.3% for walking. Similarly, 38.4% of young female students favor motorcycle taxis, with 33.98% preferring taxis, and 15.5% opting for walking.

3.3. The Desire to Change Modes of Transport

The study respondents were also asked about their willingness to adopt alternative modes of transportation should factors related to current transport conditions or personal considerations—such as comfort, the introduction of new infrastructure, or an enhancement in living standards (high quality of living), environmental concerns, among others—

become more favorable. Overall, about 80% of respondents expressed a willingness to change their current mode of transport. Specifically, 29.4% indicated a preference to switch to private cars for reasons of comfort and unrestricted mobility, while 18.3% were ready to opt for buses, as motivated by personal comfort and environmental protection. The overall results for the preferred transport modes and factors influencing the modal preference are shown in Table 3 and Figure 2, respectively. The values depicted in Figure 2 illustrate the relative significance of each factor. It is evident from Figure 2 that travel comfort and the aspiration for unlimited mobility (ability to travel freely without limitations or constraints) are the primary determinants of the preferred mode of travel.

Table 3. Student modal preferences under enhanced transportation conditions.

Answer Choices	Percentage (%)
Private car	29.43
Private motorbike	10.92
Bus	18.32
Mini-bus	9.75
Taxi	6.63
Moto-taxi	2.92
Bicycle	2.34
Walk (more than 300 m on foot)	4.09
Carpool (transported by an acquaintance)	8.19
Yango or ONGO	7.41

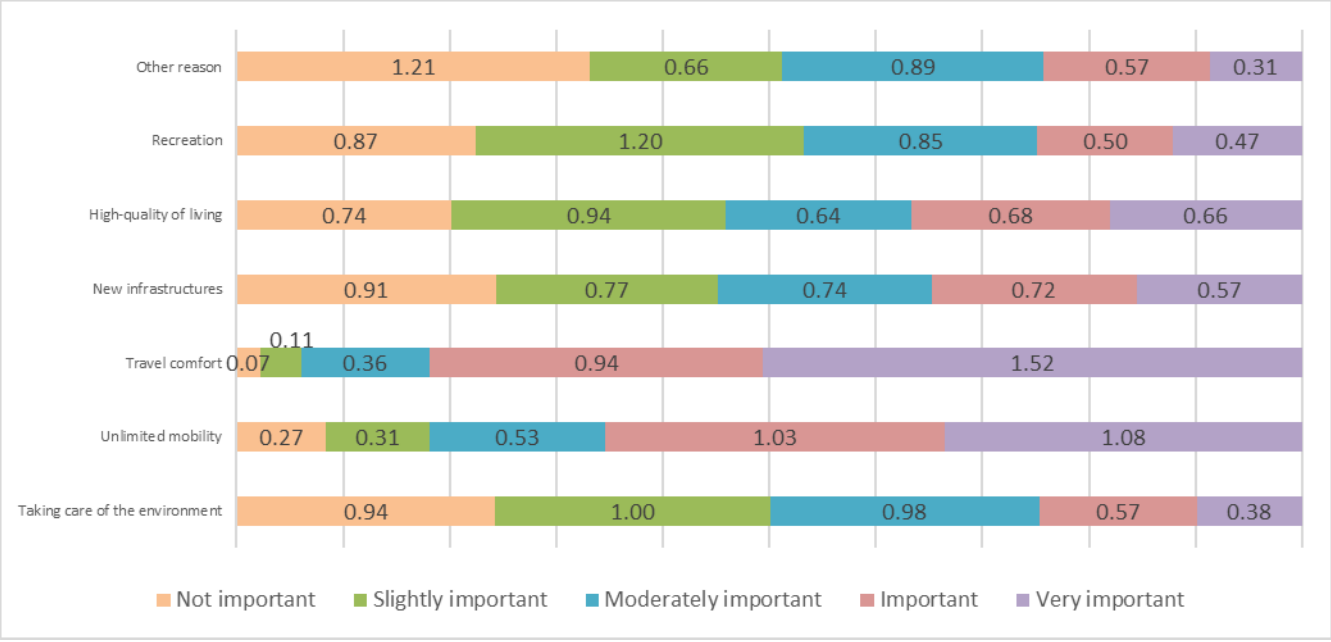


Figure 2. Factors influencing modal preference.

3.4. Barriers to Use of Public Transport and Active Modes

As outlined in the methodology, participants were asked to evaluate various barriers to using public transportation and active travel modes using a five-point Likert scale. The findings regarding these impediments are summarized in Tables 4 and 5 for public transportation and active transportation modes, respectively.

In terms of public transport, the most significant barriers identified were long waiting time and traffic congestion. Travel duration and the inconvenience of stops being located far from participants' homes were also noted as considerable hindrances. Conversely, car

ownership, weather conditions, and proximity to campus were deemed less significant barriers.

When it comes to active modes of transportation, distance emerged as the primary barrier. The likelihood of choosing active transportation decreases as the distance between home and campus grows, with individuals tending to prefer motorized transport for longer distances. The second most critical factor is the absence of suitable infrastructure, which is intrinsically linked to road safety concerns as active travelers (pedestrian or cyclist) turn to face a higher risk of road crashes when there is no suitable infrastructure. Other notable barriers include adverse weather conditions, physical effort required, risk of theft, safety concerns, and mountainous terrain. However, the latter were not seen as a major deterrent to walking or cycling to campus, as these factors received lower ratings from the respondents.

Table 4. Barriers to using public transportation modes.

Variable	Average Importance
Waiting time	3.95
Traffic congestion	3.83
Travel time	3.71
Proximity of stops	3.55
Lack of infrastructure	3.41
Car ownership	2.69
Weather	2.66
Live near campus	2.62

Table 5. Barriers to the use of active transportation modes.

Variable	Average Importance
Distance	3.70
Lack of infrastructure	3.50
Physical effort	3.41
Weather	3.39
Theft risk	3.36
Lack of safety	3.27
Topography	3.19
Vehicle ownership	2.71

3.5. Results of Statistical Test

The chi-squared test was conducted to investigate the relationship between demographic variables—namely, age and income level—and reported barriers to both public and active transportation modalities. The analysis was structured to assess the relationship between each discrete age group and each identified barrier to public transport, as well as between each income level range and the corresponding barriers to active transport. The results showed that, in all cases, the *p*-values were greater than 0.05. Consequently, within the context of our dataset, we were unable to reject the null hypothesis, leading to the preliminary conclusion that there is no statistically significant association between the demographic groups and the barriers examined. However, it is important to note that a lack of statistically significant associations does not necessarily imply that there is no relationship whatsoever between these variables in the general population. It may suggest that there are other confounding factors influencing the observed relationships.

The Mann–Whitney test was applied to determine if there were perceptual differences in barriers to active transport and public transport between females and males. The test results indicated no significant differences in the perception of barriers to active transport and public transport between the genders, as all *p*-values were above the 0.05

threshold, leading to the rejection of the null hypothesis in favor of the alternative hypothesis.

3.6. Factors in Favor of Public and Private Transport

The survey results, as detailed in Table 6, indicate that certain factors could encourage the use of public transportation. The most compelling of these factors include affordability, reduced travel times, and enhanced comfort and convenience. Specifically, the data analysis suggests that 19.8% of participants would be swayed by the affordability of public transport, 18.6% by the shorter travel times it offers, and 17% by its comfort and convenience.

Table 6. Factors in favor of public transport.

Variable	Percentage (%)
Affordable	19.78
Low travel time	18.57
Comfort and convenience	17.69
Not owning a car or motorbike	15.38
Adequate infrastructure	14.84
Reducing environmental impact	13.74

Likewise, Table 7 highlights factors that could promote the adoption of active transportation modes, with cost savings being the most influential. Other significant motivators for choosing active modes include health benefits, proximity to campus, environmental conservation, and the availability of sufficient facilities, listed in order of importance.

Table 7. Factors in favor of active modes.

Variable	Percentage (%)
Save money	23.39
Health benefits	21.69
Living near the campus	19.58
Environmental protection	18.88
Presence of suitable facilities	16.47

3.7. Results of Cluster Analysis

The cluster analysis of our study population identified five distinct groups, each with unique characteristics and transportation preferences influenced by a variety of factors including age, gender, income level, driver's license status, education, and reasons for choosing their predominant mode of transport. The distribution of the sample between clusters 1 and 5 was 71, 105, 93, 13, and 78 participants, respectively. The findings are presented in Table 8, and the following paragraphs summarize the results for each cluster.

Table 8. Cluster analysis results.

Variables		Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
		Percentages (%)				
Age	<20	4.1	20.4	26.5	0.0	49.0
	20 to 25	22.2	27.8	27.8	1.3	20.9
	25 to 30	26.7	37.8	24.4	0.0	11.1
	30 to 35	17.6	52.9	11.8	11.8	5.9
	35 to 40	18.2	27.3	18.2	36.4	0.0
	40 to 50	12.5	25.0	12.5	50.0	0.0
Gender	Male	21.2	30.0	23.1	4.6	21.2

	Female	16.0	27.0	33.0	1.0	23.0
Income level	Dependents	15.7	26.2	29.3	0.9	27.9
	<50,000	22.7	30.3	31.8	0.0	15.2
	>50,000	30.8	38.5	7.7	16.9	6.2
Driver's license	No	22.0	27.2	28.0	0.0	22.8
	Yes	13.0	34.8	19.6	14.1	18.5
Cycle	Level 1	4.8	16.1	33.9	0.0	45.2
	Level 2	9.1	25.8	28.8	3.0	33.3
	Level 3	21.7	23.9	33.7	2.2	18.5
	Level 4	28.8	30.8	19.2	5.8	15.4
	Level 5	30.7	45.5	13.6	6.8	3.4
Most used mode	Private car	0.0	0.0	0.0	85.7	14.3
	Taxi	38.8	0.0	0.0	2.0	59.2
	Moto-taxi	55.1	0.0	0.0	0.0	44.9
	Walking	40.9	0.0	4.5	0.0	54.5
	Mixed 2 modes	0.0	57.1	42.9	0.0	0.0
	Mixed 3 modes	0.0	49.5	50.5	0.0	0.0
Reason for mode choice		**Average importance**				
	Cost	3.64	3.56	3.03	2.31	2.53
	Flexibility	4.00	3.95	2.44	3.77	2.78
	Accessibility	4.46	4.37	3.43	4.42	3.40
	Safety	2.51	2.42	2.41	4.31	2.26
	Security	2.73	2.95	2.39	4.69	2.32
	Speed	4.17	4.46	2.83	4.08	3.39
	Proximity	3.90	3.10	2.02	2.54	2.10
	No other choice	2.97	2.48	3.95	2.18	2.89
	Travel Time	27.62	30.35	47.89	41.92	37.87

Cluster 1 is predominantly youthful, with 49.0% under the age of 20 and a significant proportion (30.7%) at the highest education level (level 5). This group favors motorbike taxis (55.1%) as their main mode of transport, valuing flexibility (mean score 4.00 (the mean score reflects the average importance of the rating of the factor on a scale of 1 to 5, as collected during the survey)), accessibility (4.46), and speed (4.17) highly, while showing less concern for safety (2.51). The preference for motorbike taxis may reflect a trade-off between the benefits of speed and flexibility and the risks associated with lower safety.

Cluster 2 consists of a mix of age groups, with a notable concentration of participants aged 30 to 35 (52.9%) and those with an income level above FCFA 50,000 (38.5%). This cluster prefers mixed modes of transportation, with 57.1% using two modes and 49.5% using three modes. They place the highest importance on speed (mean score 4.46) and also value flexibility (3.95) and accessibility (4.37) but place less emphasis on safety (2.42) and security (2.95), possibly due to the optimization of travel time through the use of multiple transportation modes.

Cluster 3 shows a balanced age distribution with a slight emphasis on individuals between 20 and 25 (27.8%) and leans towards a mid-level education (level 3 at 33.7%). This group also prefers mixed modes of transportation, with nearly equal use of two (42.9%) and three modes (50.5%). They rate having no other choice as a significant reason for their transportation mode (mean score 3.95) and have the highest average travel time (47.89), suggesting limited transportation options and a potential need for improved accessibility.

Cluster 4 is characterized by a strong preference for private cars (85.7%), aligning with the high importance placed on safety (mean score 4.31) and security (4.69). Despite a relatively high mean travel time (41.92), this cluster's choice indicates a willingness to

accept longer commutes for the perceived benefits of private car use, emphasizing the value of personal safety and security in their transportation decisions.

Cluster 5, similar to cluster 1, has a high percentage of younger students (49.0% under 20 years of age) and a significant preference for walking (54.5%) as the main mode of transportation. This cluster has the largest share of participants with the lowest education level (level 1 at 45.2%) and shows moderate concern for most factors influencing transportation choice, with no single reason standing out as particularly important. The average travel time for this cluster is 37.87, which is higher than some clusters but not as high as clusters 3 and 4.

The distribution of gender and income level is relatively even across the clusters, with no single cluster dominated by one gender or income range. However, individuals without a driver's license are more evenly spread across clusters, while those with a license are more concentrated in cluster 2.

3.8. Results of Multinomial Logistics Regresion

The present study employed a multinomial logistic regression model to examine the factors influencing mode choice among private car, taxi, motor-taxi, and walking modes. The model aimed to identify significant predictors and to understand the relationships between these predictors and the choice of transportation mode. The results of the analysis are summarized in Table 9.

The model fitting criteria indicated that the final model provides a significantly better fit than the intercept-only model, which includes no predictors. The likelihood ratio test yielded a chi-squared value of 218.608 with 20 degrees of freedom ($p < 0.001$), indicating a significant improvement in model fit compared to the intercept-only model. The −2 Log Likelihood for the final model was 609.736, suggesting that the model captured a considerable amount of information regarding mode choice.

Table 9. Model estimation results for the association between mode of transport and students' demographic and socio-economic characteristics.

Parameter		B-Coefficient	Std. Error	Wald	Sig. (*p*-Value)	Exp(B) (Odds)
Private car	Intercept	−23.724	4.887	23.563	0.000	
	Driver's license	4.174	1.216	11.777	0.001	64.964
	Safety	1.188	0.345	11.837	0.001	3.279
	Speed	0.786	0.383	4.214	0.040	2.195
	Proximity	0.288	0.324	0.794	0.373	1.334
	Cluster	1.907	0.478	15.914	0.000	6.731
Taxi	Intercept	−3.461	1.158	8.933	0.003	
	Driver's license	−0.640	0.494	1.678	0.195	0.527
	Safety	0.611	0.167	13.456	0.000	1.842
	Speed	−0.518	0.159	10.577	0.001	0.596
	Proximity	0.409	0.159	6.569	0.010	1.505
	Cluster	0.571	0.152	14.043	0.000	1.770
Moto-taxi	Intercept	−7.210	1.307	30.408	0.000	
	Driver's license	0.366	0.361	1.027	0.311	1.442
	Safety	−0.282	0.143	3.877	0.049	0.754
	Speed	0.882	0.188	21.875	0.000	2.415
	Proximity	0.442	0.126	12.352	0.000	1.556
	Cluster	0.564	0.132	18.248	0.000	1.758
Walking	Intercept	−2.997	1.739	2.969	0.085	
	Driver's license	−1.895	1.069	3.142	0.076	0.150

	Safety	0.374	0.217	2.974	0.085	1.453
	Speed	−0.508	0.209	5.906	0.015	0.602
	Proximity	0.695	0.212	10.766	0.001	2.005
	Cluster	0.566	0.196	8.336	0.004	1.761

Model Fitting Information

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	−2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	828.344			
Final	609.736	218.608	20	0.000

Goodness of Fit

	Chi-Square	df	Sig.
Pearson	1269.054	812	0.000

Pseudo-R-Square

Cox and Snell	0.467
Nagelkerke	0.511
McFadden	0.257

NB: the reference category was mixed modes of travel (greater than two modes).

Goodness-of-fit tests were conducted to assess the overall fit of the model. The deviance chi-squared test showed no significant difference (chi-square = 591.184, df = 812, p = 1.000) between the model's deviance and that of the saturated model, suggesting that the fitted model adequately represented the data. The estimates of the pseudo-R-squared values provided different information on the amount of variance in the dependent variable accounted for by the model. The Cox and Snell, Nagelkerke, and McFadden values were 0.467, 0.511, and 0.257, respectively. These values suggest that the model explains a moderate to substantial proportion of the variance in transportation mode choice.

For the private car category, the presence of a driver's license is a highly significant predictor. The odds ratio of 64.964 indicates that individuals with a driver's license are about 65 times more likely to choose a private car over mixed modes (reference category), holding other factors constant. Safety is also a significant factor, with an odds ratio of 3.279, suggesting that individuals who perceive higher safety are approximately 3.3 times more likely to choose a private car compared to mixed modes. Speed has a positive effect as well, with an odds ratio of 2.195, indicating that for those who value speed, the likelihood of choosing a private car is about 2.2 times higher than mixed modes. Being in a cluster increases the odds of choosing a private car by 6.731 times relative to mixed modes. Proximity does not significantly influence the choice of a private car in this model.

In the taxi category, perceptions of safety significantly increase the likelihood of choosing a taxi, with an odds ratio of 1.842, meaning that feeling safer increases the odds of choosing a taxi over mixed modes by 1.842 times. Conversely, valuing speed decreases the likelihood of choosing a taxi, with an odds ratio of 0.596, indicating that those who prioritize speed are less likely to choose a taxi compared to mixed modes. Proximity and being in a cluster both positively influence the choice of a taxi, with odds ratios of 1.505 and 1.770, respectively. The presence of a driver's license is not a significant predictor for choosing a taxi over mixed modes.

For the motorbike taxi category, speed is a significant positive predictor, with an odds ratio of 2.415, suggesting that individuals who value speed are more than twice as likely to choose a motorbike taxi over mixed modes. Proximity and being in a cluster also positively influence the choice of a motorbike taxi, with odds ratios of 1.556 and 1.758, respectively. Safety and the presence of a driver's license do not significantly predict the choice of a motorbike taxi over mixed modes.

Lastly, for walking, proximity is a significant predictor, with an odds ratio of 2.005, indicating that individuals are twice as likely to choose walking when the destination is closer, compared to mixed modes. Speed negatively influences the choice of walking, with an odds ratio of 0.602, suggesting that those who value speed are less likely to choose walking over mixed modes. Being in a cluster increases the likelihood of walking by an odds ratio of 1.761. The presence of a driver's license and safety are not significant predictors for choosing walking over mixed modes.

4. Discussion

The survey reveals that travel between home and campus primarily involves the use of various modes of transportation, with motorcycle taxis being the favored single mode. This pattern differs significantly from that in high-income countries (HICs), especially in Europe, where public transport is more commonly used by students, partly due to its greater availability [6,8,14]. This is also distinct from a case study in China, where the majority of students preferred walking or cycling, depending on the distance [10].

The attributes of accessibility, speed, and flexibility were highlighted as the main reasons for the choice of the participants' current predominant mode of transport. The results also indicated that the pursuit of rapidity and accessibility was particularly common among young male students. The importance of accessibility and flexibility, which can be considered aspects of convenience, has been reported in other studies [3].

Overall, 80% of the respondents expressed a desire to change their mode of transport, with 29.9% showing interest in switching to private cars, primarily for comfort and unlimited mobility. The overall modal preference for students did not consider environmental sustainability as important to the desired transport mode as it received slight to moderate importance. This is in contrast with a study on mobility behavior at the University of Tricity, where young people (Generation Y) were found to be environmentally conscious and preferred public transport and active modes [23]. Prevailing attitudes and stereotypes, such as "walking is for those who are not financially well-off" and "private vehicles are an indicator of wealth", are myths that urgently need to be dismantled.

In terms of barriers to public transport, long waiting times and traffic congestion were the most significant factors, which is consistent with past studies on barriers to using public transport for school commutes [14,24,25]. These results underscore the students' high valuation of the service efficiency and reliability of public transport. In addition, travel time itself, which emerged as another important barrier, suggests that the directness and swiftness of public transport routes are important. On the other hand, factors such as car ownership, weather conditions, and proximity to campus were rarely cited as impediments to public transport in previous research. In considering the factors that could encourage the use of public transportation, affordability, reduced travel time, and comfort emerged as significant incentives. Specifically, travel time is perceived as both a barrier and an influential factor in public transportation choices, reflecting students' current experiences and perceptions of extended travel durations. This suggests that if public transportation were to offer comparatively shorter travel times, it could serve as a persuasive reason for its adoption.

When it comes to active transport, such as walking and cycling, distance, lack of infrastructure, and weather conditions were identified as the most significant barriers. However, other factors like physical effort, theft, and safety concerns also received higher ratings, which is in line with previous research on the subject [3,26]. Overall, these results have significant policy implications for promoting active travel. For instance, the perceived inadequacies in infrastructure as a barrier suggest a pressing need for safe and dedicated pathways that separate active travelers from vehicular traffic. Similarly, other notable barriers such as the physical effort required, adverse weather conditions, theft risk, and safety concerns indicate the need for facilities like secure bike storage, enhanced security, and improved infrastructure.

The chi-squared test results indicated no association between age or income level and barriers to public or active transport, suggesting that in Cameroon, barriers to using these modes of transport are universally experienced across different age groups and income levels within the student population, regardless of specific income or age. The lack of association might suggest that the barriers to public or active transport are more related to systemic or infrastructural issues rather than individual demographic factors, or it could indicate that this study's sample is not diverse enough in terms of age and income to detect any differences, or that the barriers considered in the study are not sensitive to these demographic variables. This could also be attributed to the generally low-income levels within the student community and the lack of existing policies that facilitate transport to and from campus.

The Mann–Whitney test results showed no difference in the perception of barriers towards active and public transport between females and males, indicating that both genders face similar mobility challenges and are not inclined towards specific barriers to active mobility and transport. Therefore, addressing these issues could improve mobility for both genders.

The cluster analysis conducted in the study has revealed the influence of demographic and socio-economic factors on transportation mode choices. The identification of five distinct clusters underscores the diversity of the mobility needs and preferences of students, ranging from the more youthful students who prioritize speed and flexibility of transport modes to those who value safety and security above all. The variation in transportation modes across clusters—from motorbike taxis to private cars and walking—reflects the relationship between individual circumstances and the available transportation options. In addition, the inclination towards multiple transport modes within certain clusters indicates a versatile commuting strategy, where modal choices are tailored according to factors like travel duration, convenience, and necessity. These results contribute to a deeper understanding of the students' mobility patterns and can inform targeted interventions and policies aimed at improving transportation systems to better meet the diverse needs of the student population.

The multinomial logistic regression analysis in this study provided insights into the determinants of transportation mode choice, highlighting the simultaneous influence of various factors such as the possession of a driver's license, safety perceptions, the importance of speed, proximity to the destination, and cluster membership. The strong association between having a driver's license and the preference for private cars is as expected, since driving a private car necessitates the ownership of a license. Safety concerns significantly affected the choice of private cars and taxis, suggesting that increased perceived safety is a key determinant for using these modes. Speed was a crucial factor for those selecting motorbike taxis, indicating a segment of the student population that prioritizes efficiency in their commute, especially in the rush to arrive on campus early. Proximity emerged as a significant predictor for walking, emphasizing the role of urban design in encouraging walking as a mode of transport. Other factors, including demographic characteristics and travel time, were not significant variables, which does not align with the findings of similar studies [5,22].

The following recommendations are suggested to improve the sustainability of travel for the university community:

- Improve pedestrian mobility: carry out studies on pedestrian safety and walkability index, identify gaps, and improve pedestrians' pathways.
- Improve cycling mobility: Create dedicated cycle paths connecting the university to areas with high student residence. Provide standards for safe cycling and ensure compliance. Create parking stations at the university and dedicated changing rooms for cyclists.
- Public transport: Establish mass transport. In the short term, provide dedicated buses for students with frequent departures (especially at peak school hours) from

specific locations around areas where several students reside. In the long term, establish mass transport for the city within which students will benefit from.

- Raise awareness on active mobility and public transport: Organize conferences, workshops, and symposia on sustainable mobility to raise awareness and address specific issues related to this theme. Create a sustainable mobility club tasked with raising awareness and promoting and reflecting on efficient and environmentally friendly mobility. Introduce active mobility days to campus. Create dedicated portals for reporting issues and proposing solutions on active mobility.

5. Conclusions

The transition towards sustainable mobility is currently recognized as a significant socio-economic and environmental challenge. Meanwhile, researchers believe that the mobility patterns of young adults remain understudied, especially given the high heterogeneity of young people in different countries. In the specific context of Cameroon, there is a conspicuous lack of literature on the mobility patterns of students, which makes efforts to facilitate student movement through maximizing route efficiency and shifting towards sustainable modes of transport difficult due to the lack of information. To fill this gap in knowledge, this paper examines the travel patterns of students at the National Advanced School of Public Works in Yaoundé (NASPW) to understand their transport mode choices, reasons for modal choice, and barriers to the use of public and active transport modes as well as factors that could foster the adoption of these modes of transport. To investigate this, online questionnaires were distributed via social media groups and on physical supports, yielding a total sample size of 360 valid responses. The collected data were analyzed, employing statistical analyses such as chi-squared tests, Mann–Whitney tests, cluster analysis, and multinomial logistic regression to investigate the mobility patterns of students, factors influencing modal choice, and the barriers and factors affecting sustainable mobility (active travel and public transport). Statistical tests conducted allowed the association between demographic characteristics and the barriers to active travel and public transportation to be explored.

This study's results showed that motorcycle taxis were the most commonly used mode of transport for commuting between home and campus, with the majority of students (27%) often using more than one mode of transport. Accessibility, vehicle speed, and flexibility appeared as the most important reasons for the predominant modes of transport, while security and safety were of lesser concern. The choice of transportation mode varied among different clusters of students, with factors such as age, income level, and education level influencing their preferences. In addition, these clusters ranged from those who prioritize speed and flexibility to those who value safety and security above all. The multinomial logistic regression analysis showed that the possession of a driver's license, safety perceptions, speed, and proximity were significant predictors for different transportation modes.

The key barriers to public transportation included long waiting times and traffic congestion, while distance, inadequate infrastructure, and weather conditions were barriers to active mobility. The results of the statistical tests indicated no significant differences in the perception of barriers to active transport and public transport between genders and demographic groups. The factors that favored the use of public transportation included affordability and reduced travel time, while active options were preferred due to their cost savings and health benefits.

This research demonstrates that the choice of transport modes amongst students depends on a variety of parameters that are specific to each group depending on their demographics and socio-economic characteristics. The observed mobility pattern is unsustainable and requires interventions from the university and city councils to establish an efficient Sustainable Urban Mobility Plan (SUMP) that will improve home-to-campus and campus-to-home mobility. Future research on this topic may investigate the mobility patterns of students from different universities with differences in geographic areas and also

consider a larger sample size. This research had some limitations, including the introduction of specific questions related to cycling paths and public transport, as these infrastructures are currently lacking. Once these become available, future research should investigate them. Another limitation is the focus on a specific university in Cameroon, which may limit the generalizability of the findings.

Overall, this study provides insights into the mobility patterns and preferences of university students and highlights the need for sustainable transportation solutions. The findings can inform transportation policies and interventions aimed at promoting more sustainable travel modes among students.

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References

1. Hooftman, N.; Messagie, M.; Van Mierlo, J.; Coosemans, T. A review of the European passenger car regulations—Real driving emissions vs local air quality. In *Renewable and Sustainable Energy Reviews*; Elsevier Ltd.: Amsterdam, The Netherlands, 2018; Volume 86, pp. 1–12. https://doi.org/10.1016/j.rser.2018.01.012
2. Nanaki, E.; Koroneos, C.; Roset, J.; Susca, T.; Christensen, T.; Hurtado, S.D.G.; Rybka, A.; Kopitovic, J.; Heidrich, O.; López-Jiménez, P.A. Environmental assessment of 9 European public bus transportation systems. *Sustain. Cities Soc.* **2017**, *28*, 42–52. https://doi.org/10.1016/j.scs.2016.08.025
3. Ribeiro, P.; Fonseca, F.; Meireles, T. Sustainable mobility patterns to university campuses: Evaluation and constraints. *Case Studies on Transport Policy* **2020**, *8*, 639–647. https://doi.org/10.1016/j.cstp.2020.02.005
4. Hopkins, D. Destabilising automobility? The emergent mobilities of generation Y. *Ambio* **2016**, *46*, 371–383. https://doi.org/10.1007/s13280-016-0841-2
5. Henning, E.; Shubert, T.F.; Maciel, A.C. Modelling of University Student Transport Mode Choice in Joinville: A Binary Logistic Model for Active Modes. *J. Sustain. Dev. Energy, Water Environ. Syst.* **2020**, *8*, 678–691. https://doi.org/10.13044/j.sdewes.d7.0303
6. Sgarra, V.; Meta, E.; Saporito, M.R.; Persia, L.; Usami, D.S. Improving sustainable mobility in university campuses: the case study of Sapienza University. *Transp. Res. Procedia* **2022**, *60*, 108–115. https://doi.org/10.1016/j.trpro.2021.12.015
7. Lundberg, B.; Weber, J. Non-motorized transport and university populations: an analysis of connectivity and network perceptions. *J. Transp. Geogr.* **2014**, *39*, 165–178.
8. Fernandes, P.; Sousa, C.; Macedo, J.; Coelho, M.C. How to evaluate the extent of mobility strategies in a university campus: An integrated analysis of impacts. *Int. J. Sustain. Transp.* **2019**, *14*, 120–136. https://doi.org/10.1080/15568318.2018.1531183.
9. Moniruzzaman; Farber, S. What drives sustainable student travel? Mode choice determinants in the Greater Toronto Area. *Int. J. Sustain. Transp.* **2017**, *12*, 367–379.
10. Zhan, G.; Yan, X.; Zhu, S.; Wang, Y. Using hierarchical tree-based regression model to examine university student travel frequency and mode choice patterns in China. *Transp. Policy* **2016**, *45*, 55–65.
11. Felez-Nobrega, M.; Werneck, A.O.; Bauman, A.; Haro, J.M.; Koyanagi, A. Active school commuting in adolescents from 28 countries across Africa, the Americas, and Asia: a temporal trends study. *Int. J. Behav. Nutr. Phys. Act* **2023**, *20*, 1. https://doi.org/10.1186/s12966-022-01404-y
12. Tatah, L.; Wasnyo, Y.; Pearce, M.; Oni, T.; Foley, L.; Mogo, E.; Obonyo, C.; Mbanya, J.C.; Woodcock, J.; Assah, F. Travel Behaviour and Barriers to Active Travel among Adults in Yaoundé, Cameroon. *Sustainability* **2022**, *14*, 9092. https://doi.org/10.3390/ su14159092
13. Diaz Olvera, L.; Plat, D.; Pochet, P. The Puzzle of Mobility and Access to the City in Sub-Saharan Africa. *J. Transp. Geogr.* **2013**, *32*, 56–64. https://doi.org/10.1016/j.jtrangeo.2013.08.009

14. Danaf, M.; Abou-Zeid, M.; Kaysi, I. Modeling travel choices of students at a private, urban university: Insights and policy implications. *Case Stud. Transp. Policy* **2014**, *2*, 142–152.
15. Alfonsi, R.; Persia, L.; Antonino, T.; Usami, D.S. Advancements in Road Safety Management Analysis. *Transp. Res. Procedia* **2016**, *14*, 2064–2073
16. George, E.N.; Jean, F.W.; Fondzenyuy, S.K.; Usami, D.S.; Persia, L. The role of Insurance companies to road traffic safety in Cameroon. *Int. J. Eng. Innov. Technol.* **2020**, *10*, 1–13. ISSN 2277-3754. https://doi.org/10.51456/IJEIT.2020.v10i05.001.
17. Lois, D.; Monzón, A.; Hernández, S. Analysis of satisfaction factors at urban transport interchanges: Measuring travellers' attitudes to information, security and waiting. *Transp. Policy* **2018**, *67*, 49–56. https://doi.org/10.1016/j.tranpol.2017.04.004
18. López-Lambas, M.E.; Monzón, A.; Pieren, G. Analysis of using electric car for urban mobility, perceived satisfaction among university users.. *Transp. Res. Procedia* **2017**, *27*, 524–530. https://doi.org/10.1016/j.trpro.2017.12.132
19. Jeffry, J.T.; Punzalan, J.R.B. On the Misuse of Slovin's Formula. *Philipp. Stat.* **2012**, *61*, 129–136.
20. Soria-Lara, J.A.; Marquet, O.; Miralles-Guasch, C. The influence of location, socioeconomics, and behaviour on travel-demand by car in metropolitan university campuses. *Transp. Res. Part D* **2017**, *53*, 149–160.
21. Shi, C.; Wei, B.; Wei, S.; Wang, W.; Liu, H.; Liu, J. A quantitative discriminant method of elbow point for the optimal number of clusters in clustering algorithm. *J Wireless Com Network* **2021**, *2021*, 31. https://doi.org/10.1186/s13638-021-01910-w
22. Turay, S.S.; Ababio-Donkor, A.; Adams, C.A.; Massaquoi, A.B. Statistical modelling of travel mode choice of public university students in Freetown, Sierra Leone: the case of three campuses. *Urban, Plan. Transp. Res.* **2024**, *12*, 2304589. https://doi.org/10.1080/21650020.2024.2304589
23. Szmelter-Jarosz, A.; Suchanek, M. Mobility Patterns of Students: Evidence from Tricity Area, Poland. *Appl. Sci.* **2021**, *11*, 522. https://doi.org/10.3390/app11020522
24. Nguyen-Phuoc, D.; Amoh-Gyimah, R.; Tran, A.; Phan, C. Mode choice among university students to school in Danang, Vietnam. *Travel Behav. Soc*. **2018**, *13*, 1–10.
25. Zhou, J. Proactive sustainable university transportation: Marginal effects, intrinsic values, and university students' mode choice. *Int. J. Sustain. Transp.* **2016**, *10*, 815–824.
26. Stein, P.; Silva, A. Barriers, motivators and strategies for sustainable mobility at the USP campus in São Carlos, Brazil. *Case Stud. Transp. Policy* **2018**, *6*, 329–335.