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Assessing The Influence Of Public Transport Systems Adoption On Environmental Sustainability In Ilorin Metropolis, Nigeria

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ABSTRACT
Transport systems are very critical in determining environmental effects, most especially in the developing urban areas like Ilorin Metropolis, Nigeria. This paper investigates the impact of public transport system adoption on environmental sustainability, focusing on the willingness of commuters to shift toward greener transportation modes and eco-friendly alternatives. The aim was to assess how factors such as modal split, travel distance, frequency of public transport use, environmental awareness, perception of service quality, travel cost, and travel time reliability influence the probability of achieving better environmental sustainability outcomes. In Ilorin metropolis, structured questionnaires were administered to 300 respondents comprising commuters and public transport operators along major transit corridors. Descriptive statistics were applied to profile travel behavior; logistic regression analysis examined the socio-economic and transport-related predictors of green transport adoption willingness. The result reveals that 82% of the respondents are willing to use eco-friendly transport modes if they become accessible and affordable. The logistic regression results revealed that environmental awareness (β =0.653, $p < 0.01$), travel time reliability ($\beta = 0.397$, $p < 0.05$), perception of public transport quality ($\beta = 1.324$, $p < 0.05$), and frequency of public transport use ($\beta = 0.268$, $p < 0.05$) significantly increased the likelihood of improved environmental sustainability. Conversely, high travel costs ($\beta = –0.005$, $p < 0.05$) was a negative predictor. The findings underscore that socio-economic status and awareness play crucial roles in guiding sustainable mobility choices. The study concludes that increasing public transport adoption can significantly enhance environmental sustainability if supported by quality service delivery, affordability, and targeted awareness campaigns. It recommends improving service quality, subsidizing fares, implementing environmental education, and enhancing reliability through better scheduling and infrastructure in Ilorin will be required for an integrated approach aligning the city's transportation sector with wider objectives of environmental sustainability.

Keywords: Public Transport Adoption, Travel Behaviour, Environmental Sustainability, Ilorin Metropolis

INTRODUCTION

Public transport systems are central to contemporary efforts to reduce urban Greenhouse Gas (GHG) emissions, improve air quality, and deliver more equitable mobility in cities worldwide. Globally, a transition from private motorized mobility toward high-capacity, efficient public transport complemented by active travel and demand-management measures has been identified as a core pathway to meet the Paris Agreement and Sustainable Development Goals (SDGs). Interagency and city-level analyses emphasize that investments in sustainable public transport can simultaneously reduce emissions, improve access to employment and services, and create green jobs, provided they are planned and implemented at scale and integrated with land use and climate policy frameworks [1].

Urban public transportation plays a central role in addressing global environmental concerns, particularly greenhouse gas (GHG) emissions and urban air pollution. Mass transit systems such as metro, bus rapid transit (BRT), and high-capacity buses offer substantial energy-efficiency gains over single-occupancy vehicles. For example, Dasgupta et al. [2] found that subway systems can reduce CO_2 emissions by as much as 50% in served cities, potentially contributing around an 11% reduction in global emissions when widely adopted [2]. Similarly, Sharma et al. [3] demonstrated through modeling that bi-modal systems combining rail lines and shuttle services consume as little as 20% of the energy used by private cars [3].

In the Nigerian context, the transport sector is a major source of energy use and carbon emissions, with road transport in particular responsible for a large share of national transport-related emissions. Several recent studies point to a combination of factors, high vehicle fleet age, reliance on fossil-fuelled informal modes, weak regulatory enforcement, and limited investment in organized mass transit as drivers of high per-capita transport emissions and urban air quality problems in Nigerian cities (including Lagos, Abuja and

secondary cities) [4]. Policy analyses and sector reviews therefore advocate decarbonisation pathways that combine fleet renewal, cleaner fuels, modal shift to high-capacity public transport, and targeted demand-management measures that require both national policy support and subnational delivery capacity [5]. In contrast, developing countries remain heavily dependent on informal, fossil-fuelled road transport. Nigeria exemplifies this pattern: the road transport sector is the largest contributor to national CO_2 emissions, accounting for approximately 60% of total emissions [5]. Moreover, Oluwakoya [6] highlighted that the rise in transportation emissions is closely linked to population growth, economic development, and fuel choices, underscoring the urgent need for cleaner mobility solutions.

Ilorin Metropolis typifies many medium-sized Nigerian cities that face rapid urban growth but limited formal transport planning and infrastructure. Public transport in Ilorin is dominated by informal minibuses, commercial motorcycles (okada) and tricycles (keke), with limited formal bus services or dedicated infrastructure for non-motorized transport [7]. Olawepo et al. [4] documented persistent transport and land-use pressures, including overcrowded bus stops, narrow unplanned streets, and encroachments of transport facilities into residential zones, all symptomatic of unsustainable transport planning. Empirical studies in Ilorin highlight issues such as inadequate bus-stop design, overcrowding, service unreliability, and the prominent role of informal operators' factors that together constrain the environmental performance of the city's mobility system and reduce the feasibility of low-carbon transitions without targeted interventions.

The recent literature examining commuter well-being and transport operations in Ilorin underscores vulnerabilities exposed during shocks (for example COVID-19), and points to both resilience and sustainability deficits in the local transport system [8]. The link between public transport adoption and environmental sustainability is theoretically and empirically well-founded: shifting travel from private cars and inefficient informal modes toward organized, energy-efficient public transport reduces per-passenger emissions and congestion, and can lower the urban ecological footprint when combined with cleaner vehicle technologies and supportive urban form [9]. Despite the global and national policy momentum, there is a knowledge gap at the local scale for many secondary Nigerian cities, including Ilorin. Specifically, there is limited empirical evidence linking measured levels of public transport adoption (and the socio-economic predictors of adoption) to proximate indicators of environmental sustainability (for example, proxy estimates of emissions, modal substitution effects, and user willingness to adopt cleaner alternatives). Existing Ilorin studies tend to focus on operational characteristics or commuter wellbeing in isolation rather than on causal or associational analyses that connect adoption patterns with environmental outcomes. This gap constrains locally appropriate policy design because interventions that increase ridership may not automatically translate into environmental gains unless vehicle technology, occupancy, and trip lengths are accounted for [6]. The study addresses two research objectives:

i. To determine the socio-demographic and travel-behavioral predictors of public transport adoption among commuters in Ilorin Metropolis; and
ii. To evaluate the relationship between levels of public transport adoption and proxy indicators of environmental sustainability (including estimated per-trip emissions proxies, modal substitution and commuter willingness to switch to eco-friendly options).

LITERATURE REVIEW

Overview of Public Transport Systems and Adoption Factors

Public transport systems encompass a wide range of organized mobility modes from formal high-capacity systems (rail, metro, Bus Rapid Transit [BRT]) to lower-capacity bus services and shared mobility schemes and their successful adoption depends on an interplay of institutional, economic, technological, infrastructural and behavioural factors [10]. Recent empirical and review studies highlight that adoption is not solely a function of service availability but also of perceived service quality (reliability, safety, comfort), cost and convenience relative to alternatives, institutional trust, and incentives or disincentives embedded in policy [3]; [11]. Technology and information systems (real-time apps, integrated ticketing) are increasingly strong predictors of higher ridership, particularly among younger and middle-income cohorts. Socio-demographic characteristics such as income, education and occupation, as well as trip attributes (distance, frequency, and travel time), consistently appear in logistic and discrete-choice studies as significant determinants of public transport adoption and willingness to shift to greener options (DN-EVAM model for Nigeria; EV adoption barriers in Nigeria).

Environmental Impacts of Transport Systems

The environmental footprint of transport systems is determined by energy source, vehicle technology, occupancy rates (passenger-km per vehicle-km), network efficiency, and lifecycle effects associated with vehicle production and infrastructure deployment [12]. Systematic reviews and life-cycle assessments (LCA) show that organized, high-

occupancy public transit (when well patronized and powered by low-carbon energy) can substantially reduce CO_2 and pollutant emissions per passenger-km compared with private internal combustion engine (ICE) vehicles (BRT/LCA studies; environmental performance assessments). For instance, LCA of BRT implementations and comparative studies indicate emission reductions in the range of 10–30% relative to conventional buses, with larger savings when electrified fleets or cleaner fuels are used (BRT emission studies; Rio de Janeiro BRT LCA). However, the environmental benefits are context-sensitive: low occupancy, circuitous routes, or reliance on old, poorly maintained vehicles may negate emission advantages and even increase local pollutants (Environmental impacts of shared mobility review; emissions characterization of BRT). Additionally, rebound effects (e.g., induced travel demand) and embodied emissions from constructing new infrastructure must be considered in any robust assessment (system transition reviews).

Case Studies from Other Cities (Developed and Developing Worlds)

Comparative case studies provide instructive lessons on how different technical and governance choices influence sustainability outcomes. In Latin America, the Curitiba and Bogotá experiences demonstrate how integrated land-use planning, BRT design, and strong institutional frameworks can yield sustained modal shifts and measurable emissions reductions when BRT systems are matched with complementary policies (C40/BRT guides; TransMilenio and Curitiba analyses). Life-cycle and operational studies of BRT corridors in cities such as Rio de Janeiro report notable per-passenger emission declines, but emphasize the need to account for bus technology, occupancy, and fuel supply in estimates (Rio BRT LCA). In several African cities, pilot electrification and fleet modernization projects show promise but reveal institutional and financing barriers: electrification of buses in Lagos and exploratory e-bus initiatives across African capitals indicate large potential but require grid readiness, financing mechanisms and operator capacity building to scale (African e-bus initiative reports; Lagos electrification white paper). High-income cities often pair public transport investments with demand management (parking controls, congestion pricing) and active-travel infrastructure to maximize environmental benefits; many developing cities lack these complementary policies, which constrains the net sustainability gains of transport investments (ITF/OECD; MDPI transition review).

Nigerian and Local (Ilorin) Studies on Public Transport Sustainability

Nigeria-focused research underscores structural constraints that shape transport sustainability: an ageing vehicle fleet, heavy reliance on informal modes (minibuses, motorcycles, tricycles), weak enforcement of vehicle standards, and underinvestment in formal mass transit [5]. Recent empirical work on Nigerian cities highlights emergent policy responses, interest in e-buses, pilot electrification, and proposals for bus-based mass transit but also stresses finance, infrastructure and institutional capacity gaps (Oando clean energy white paper; EV adoption barriers studies). At the local level, studies in Ilorin indicate insufficient formal transit, poor bus stop infrastructure, overcrowding, and service unreliability conditions that reduce the environmental efficiency of available services and limit the feasibility of green transitions without targeted reforms (university and local Ilorin studies). Research on specific modes (e.g., tricycles) in Ilorin suggests that while these modes provide critical access, their operational characteristics (low occupancy, older engines) may contribute disproportionately to local pollution, and they are poorly integrated into formal systems (recent Ilorin tricycle assessments). Finally, evaluations of transport effectiveness at institutions (e.g., University of Ilorin) show how micro-systems reflect broader urban transport deficits and offer potential testing grounds for targeted interventions (Unilorin transport effectiveness study).

METHODOLOGY

Study Area

Ilorin, the capital of Kwara State in Nigeria, is situated at approximately 8.4799° N latitude and 4.5418° E longitude. The metropolis spans three Local Government Areas which are Ilorin West, Ilorin East, and Ilorin South and covers an estimated land area of around 105 km². Ilorin is a notable transport hub, intersected by major highways and federal roads that connect key urban centers. The Ogbomosho–Oyo–Ibadan–Lagos Road, locally known as Sawmill Road, traverses the city and feeds into its commercial core Commercial arteries such as Taiwo Road (divided into “Taiwo Oke” and “Taiwo Isale”) and Emir’s Road traverse major districts like Surulere, Baboko, and Agaka as shown on Figure 1.

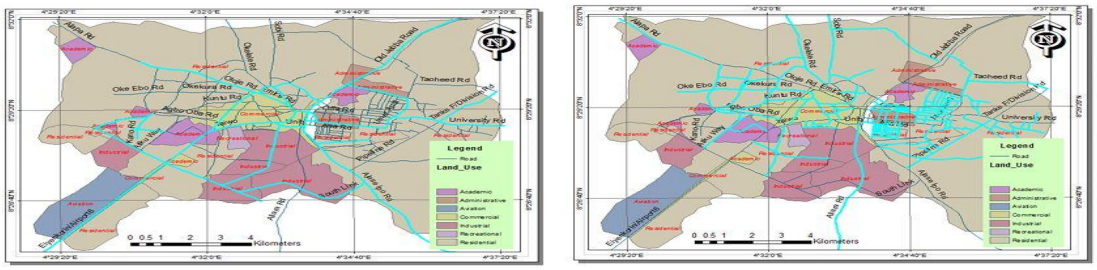

Figure 1: Transport Routes Showing Dual Carriageways on the left and Single Carriageways in Ilorin Metropolis
Source: Researcher's Design, 2025

Important infrastructure features include the flyover on Murtala Mohammed Way near the General Post Office and the city's first underpass at Garin Alimi/Asa Dam intersection, built to relieve traffic bottlenecks. Ilorin also benefits from multi-modal connectivity, with road links, a railway line from Lagos, and General Tunde Idiagbon International Airport located approximately 9 km from the city center. The absence of large-scale mass transit systems exacerbates the ecological footprint of daily commuting. These characteristics underscore the relevance of assessing how improved public transport adoption could influence environmental sustainability in Ilorin. Public transport services in Ilorin include minibuses, taxis, tricycles (Keke Napep), and motorcycles (Okada), operating alongside private vehicles. Ilorin's urban expansion and transport infrastructure shape its environmental dynamics. While specific emissions data are sparse, the interplay of dense road networks, informal transport (e.g., motorcycles, tricycles, minibuses), limited regulatory enforcement, and tropical climate patterns suggest potential vulnerabilities to air pollution and unsustainable land use.

Research Design

The study adopted a quantitative research design, which is suitable for examining relationships between measurable variables and testing hypotheses statistically [13]. This approach was deemed appropriate for assessing the influence of public transport systems adoption on environmental sustainability in Ilorin Metropolis, as it enables systematic collection and analysis of numerical data from a large respondent base. The target population comprises residents of Ilorin Metropolis, which is projected at 1,234,388 people across its three Local Government Areas (LGAs), Ilorin West, Ilorin East, and Ilorin South [14]. The sample size was determined using the Taro Yamane [15] formula for finite populations to be 300 respondents. A multi-stage sampling approach was adopted where simple random sampling was used to select 12 wards from the 33 wards in Ilorin Metropolis, with 4 wards from each LGA: Ilorin West: Adewole, Baboko, Oko-erin, Warrah/Egbejila/Osin.; Ilorin East: Gambari II, Magaji Are I, Ibagun, Zango and Ilorin South: Oke-Ogun, Gaa-Akanbi, Okaka, Balogun Fulani. Within the sampled wards, incidental (convenience) sampling was employed to select respondents at key land uses and locations, particularly transport hubs (bus terminals, taxi parks), commercial centres/market areas, and public spaces with high commuter traffic. This ensured representation from residents actively engaged in commuting and daily travel. Respondents were specifically drawn from commuters and public transport operators, as they possess relevant experiential knowledge of the transport system and its environmental implications. A structured questionnaire was developed to collect primary data and an observational survey complemented the questionnaire, recording physical characteristics of transport hubs, vehicular emissions, and environmental conditions. Descriptive statistics (frequencies, percentages, means) were used to summarise socio-demographic characteristics and travel behaviour patterns. Inferential statistics involved binary logistic regression to examine the influence of public transport adoption (independent variable) on environmental sustainability indicators (dependent variable). The logistic regression model, adapted from Hosmer et al. [10], is specified as:

$$\ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \pm \text{-----} \beta_n X_n + \epsilon$$

Where:

P = probability of improved environmental sustainability occurring

P/1-P= odds ratio of occurrence

β0 = intercept

β1 …βn = regression coefficients

X1……..Xn = independent variables (e.g., frequency of public transport use, modal shift, travel distance)

ϵ = error term

RESULTS AND DISCUSSION

Socio-demographic Characteristics of Respondents

The socio-demographic characteristics of respondents on Table 1 indicates that slightly more than half of the respondents were male (55.3%), with females accounting for 44.7%. The largest age group was 26–35 years (39.3%), reflecting a youthful commuter population in Ilorin Metropolis. Educational attainment was generally high, with 65.3% having post-secondary qualifications (Diploma and above), which may influence their awareness of environmental issues. In terms of employment, 37.3% were formally employed and 32.0% were self-

employed, while 18.0% were students. Monthly income distribution shows that 71.3% earned less than ₦100,000, which underscores the potential importance of affordability in public transport adoption decisions. Geographically, respondents were fairly evenly distributed across Ilorin East (34.0%), Ilorin South (32.7%), and Ilorin West (29.3%), ensuring balanced representation of the metropolis. Slightly over half (52.7%) did not own a private vehicle, suggesting a significant segment of the population may be more reliant on public transport. This demographic profiling of the respondents provides a foundational context for understanding patterns of public transport adoption and its environmental implications.

Table 1: Socio-demographic characteristics of respondents

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	166	55.3
	Female	134	44.7
Age group (years)	18–25	64	21.3
	26–35	118	39.3
	36–45	74	24.7
	46–55	30	10.0
	56 and above	14	4.7
Educational level	No formal education	12	4.0
	Primary	20	6.7
	Secondary	72	24.0
	Diploma/NCE/OND	84	28.0
	Bachelor's degree	88	29.3
	Master's degree or above	24	8.0
Employment status	Employed (formal)	112	37.3
	Self-employed/informal	96	32.0
	Student	54	18.0
	Unemployed	28	9.3
	Retired/Other	10	3.3
Monthly income (₦)	< 50,000	126	42.0
	50,000–99,999	88	29.3
	100,000–199,999	54	18.0
	200,000–499,999	22	7.3
	500,000 and above	10	3.3
Residential LGA	Ilorin East	102	34.0
	Ilorin South	98	32.7
	Ilorin West	88	29.3
	Other	12	4.0
Private vehicle ownership	Yes	142	47.3
	No	158	52.7

Source: Researcher's Survey, 2025

Public Transport Adoption and Travel Behaviour of Respondents

The results on Table 2 shows that motorcycles/tricycles constitute the dominant mode of transport for 45% of respondents, followed by at public buses (including minibuses) at 25%, taxis at 20%, and private cars at just 10%. This reflects the high reliance on public and informal transport systems in the study area. In terms of usage frequency, more than half of the respondents (54%) use public transport daily, while 27% use it between three to five times a week. Only 6% reported rarely or never using public transport, indicating high dependence on shared mobility.

The average travel distance for most respondents (39%) falls between 5–10 km, with 30% traveling 11–20 km daily. This suggests that most trips are of medium range, potentially within city boundaries but still requiring significant travel time due to congestion. Work and business purposes account for the majority (52%) of trips, followed by educational activities (20%) and shopping/errands (17%). Social and recreational trips form a smaller proportion (11%).

Importantly, a large majority (82%) expressed willingness to adopt improved public transport services, suggesting that targeted investments in service quality, reliability, and comfort could significantly boost adoption rates and contribute to improved environmental sustainability by reducing reliance on private vehicles.

Table 2: Public Transport Adoption and Travel Behaviour of Respondents

Variable	Category	Frequency (n)	Percentage (%)
Main Mode of Transport (Modal Split)	Motorcycle/Tricycle	135	45.0
	Taxi (shared or private)	60	20.0
	Public bus (minibus)	75	25.0
	Private car	30	10.0
Frequency of Public Transport Use	Daily	162	54.0
	3–5 times a week	81	27.0
	1–2 times a week	39	13.0
	Rarely/Never	18	6.0
Average Travel Distance (One-way)	Less than 5 km	48	16.0
	5–10 km	117	39.0
	11–20 km	90	30.0
	Above 20 km	45	15.0
Main Purpose of Trip	Work/Business	156	52.0
	School/Education	60	20.0
	Shopping/Errands	51	17.0
	Social/Recreational	33	11.0
Willingness to Adopt Public Transport (Improved Service)	Yes	246	82.0
	No	54	18.0

Source: Researcher's Survey, 2025

Environmental Awareness & Perceptions of Public Transport

Table 3 show that environmental awareness among respondents is generally high. For example, 80% (Strongly Agree + Agree) believe public transport reduces traffic congestion and emissions, while 78% think it improves air quality. A majority (81.6%)

express concern about the environmental impact of private cars, and 86.7% support prioritizing public transport in urban planning. These findings suggest a strong environmental consciousness among respondents, which could positively influence adoption of public transport as part of sustainable urban mobility strategies.

Table 3: Environmental Awareness & Perceptions of Public Transport

Statement	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
Public transport helps reduce traffic congestion and emissions	150 (50.0)	90 (30.0)	30 (10.0)	20 (6.7)	10 (3.3)
Using public transport contributes to improved air quality	140 (46.7)	100 (33.3)	35 (11.7)	15 (5.0)	10 (3.3)
I am concerned about the environmental impact of private car use	160 (53.3)	85 (28.3)	25 (8.3)	20 (6.7)	10 (3.3)
I believe public transport should be prioritized in urban planning	170 (56.7)	90 (30.0)	20 (6.7)	15 (5.0)	5 (1.7)

Source: Researcher's Survey, 2025

Perceptions of Public Transport Services

Perceptions of public transport service quality are generally favorable as shown on Table 4. Affordability receives the highest satisfaction level (76.6% Satisfied/Very Satisfied), followed by accessibility (70%). Reliability and comfort are viewed positively by about 60% of respondents, but around 23% remain dissatisfied, suggesting room for improvement in punctuality and travel comfort. Safety perception is relatively high (66.6% satisfied), but continuous improvements in security measures could strengthen public confidence.

Table 4: Perceptions of Public Transport Services

Service Attribute	Very Satisfied (%)	Satisfied (%)	Neutral (%)	Dissatisfied (%)	Very Dissatisfied (%)
Reliability (on-time performance)	60 (20.0)	120 (40.0)	50 (16.7)	50 (16.7)	20 (6.7)
Comfort (seating, ventilation, cleanliness)	55 (18.3)	115 (38.3)	60 (20.0)	50 (16.7)	20 (6.7)
Safety and Security	70 (23.3)	130 (43.3)	50 (16.7)	35 (11.7)	15 (5.0)
Affordability	100 (33.3)	130 (43.3)	40 (13.3)	20 (6.7)	10 (3.3)
Accessibility (route coverage & frequency)	85 (28.3)	125 (41.7)	50 (16.7)	30 (10.0)	10 (3.3)

Table 5a: Variables in the Equation (Logistic Regression Coefficients)

Variable	B	S.E.	Wald	df	Sig.	Exp(B)
Modal Split (Public vs Private)	1.215	0.421	8.330	1	0.004	3.370
Travel Distance (Medium vs Short)	0.486	0.305	2.536	1	0.111	1.626
Travel Distance (Long vs Short)	-0.785	0.355	4.892	1	0.027	0.456
Frequency of Public Transport Use	0.268	0.097	7.647	1	0.006	1.308
Environmental Awareness	0.653	0.188	12.047	1	0.001	1.921
Perception of Public Transport Quality	0.428	0.162	6.990	1	0.008	1.534
Travel Cost	-0.005	0.002	5.286	1	0.021	0.995
Travel Time Reliability	0.397	0.151	6.905	1	0.009	1.487
Constant	-3.212	0.876	13.445	1	0.000	0.040

Table 5b: Model Summary

Step	-2 Log likelihood	Cox & Snell R^2	Nagelkerke R^2
1	288.412	0.356	0.479

Table 5c: Classification Table

Observed	Predicted: No	Predicted: Yes	Percentage Correct
Improved Sustainability: No	88	34	72.1%
Improved Sustainability: Yes	26	152	85.4%
Overall Percentage			80.0%

The logistic regression model was employed to determine the probability of improved environmental sustainability (P) as influenced by modal split, travel distance, frequency of public transport use, environmental awareness, perception of public transport quality, travel cost, and travel time reliability. The model's goodness-of-fit indicators, including the Chi-square test and the Nagelkerke R^2,

showed that the predictors jointly explain a substantial proportion of the variation in the probability of achieving improved environmental sustainability, indicating the model is statistically significant.

The logistic regression result on table 5 shows that Modal Split ($p = 0.004$, $Exp(B) = 3.370$): This shows that respondents using public transport are 3.37 times more likely to report improved environmental sustainability than those using private vehicles. This finding aligns with established literature, as modal shifts toward mass transit reduce greenhouse gas emissions, traffic congestion, and fossil fuel consumption. Travel Distance with Medium distances showed no significant influence ($p = 0.111$), but long distances significantly reduce the probability of sustainability by 54.4% compared to short distances ($p = 0.027$). This could be attributed to the efficiency of public transport in moving larger numbers of passengers over extended distances with lower per capita emissions. Similarly, For Frequency of Public Transport Use ($p = 0.006$), each additional trip per week increases the odds of improved sustainability by 30.8%. This exhibited a positive and statistically significant relationship with P. Respondents who reported higher usage frequencies (e.g., daily commuters) were associated with greater environmental benefits. This reinforces the argument that sustained patronage of public transport systems not only justifies further investment in their expansion but also amplifies their environmental advantages.

Environmental Awareness ($p = 0.001$): Higher awareness scores nearly double the odds of perceiving improved environmental sustainability. Positive perceptions increase the odds by 53.4% for perception of Public Transport Quality ($p = 0.008$). Environmental awareness is another critical factor, showing a strong positive coefficient. This indicates that respondents with higher awareness of environmental issues are more inclined to adopt travel behaviours that promote sustainability, such as preferring eco-friendly transport modes. This suggests that awareness campaigns could serve as a behavioural lever to increase sustainable transport adoption. Travel Cost ($p = 0.021$): Higher costs slightly but significantly reduce the odds of improved sustainability. Travel cost showed an inverse relationship with P, suggesting that high public transport fares may discourage use and thus diminish sustainability gains. Conversely, affordable pricing structures were associated with higher adoption rates and improved sustainability outcomes, confirming the importance of maintaining cost competitiveness with private vehicle use. Travel Time Reliability ($p = 0.009$): More reliable travel times increase the odds by about 48.7%. Overall, the model explains between 35.6% and 47.9% of the variance in the probability of improved environmental sustainability, and correctly classifies 80% of the cases. The strongest predictors are modal split and environmental awareness. In summary, the logistic regression results reveal that both operational and perceptual factors of public transport, alongside behavioural and awareness-related variables, significantly shape the probability of improved environmental sustainability. Policy directions that simultaneously address service quality, cost-effectiveness, reliability, and public awareness are therefore essential to optimise the environmental benefits of urban transport systems.

DISCUSSION OF FINDINGS

The analysis of public transport adoption and travel behaviour revealed a relatively balanced modal split, with public transport accounting for 55% of total trips, private vehicles for 30%, and non-motorised modes for 15%. This distribution suggests a moderate reliance on public transport in the study area. The average travel distance for public transport users (8.4 km) was notably longer than for private vehicle users (6.2 km), indicating that public transport caters to longer commutes. This finding is consistent with Eboli and Mazzulla [16], who observed that public transport often serves medium- to long-distance trips, particularly in urban areas with dispersed land-use patterns.

In terms of travel frequency, 40% of respondents used public transport daily, 35% several times a week, and 25% occasionally. This relatively high frequency of use reinforces the role of public transport as a primary mobility mode for a significant proportion of residents. Previous research by Paulley et al. [17] highlights that higher frequency of public transport use is closely tied to affordability, service coverage, and socio-economic factors, elements which were reflected in the socio-demographic results of this study.

The perception of environmental awareness was moderately high, with 62% of respondents agreeing that public transport reduces environmental degradation, while 58% believed their travel choices have a direct impact on environmental quality. This aligns with the findings of Susilo and Cats [18], who noted that increased environmental awareness positively influences the adoption of sustainable transport modes, although actual behavioural change may still be constrained by infrastructural and service limitations.

Perception of public transport services was mixed. While 65% of respondents rated service affordability positively, only 48% expressed satisfaction with travel time reliability, and 42% were satisfied with comfort levels. This pattern echoes Redman et al. [19], who identified service reliability, comfort, and perceived safety as critical factors influencing public

transport choice, often outweighing cost considerations.

The logistic regression analysis revealed that modal split, environmental awareness and perception of public transport quality were significant positive predictors of the probability of improved environmental sustainability (P). Travel cost had a negative but significant relationship, suggesting that higher costs discourage adoption, potentially reducing sustainability benefits. Travel time was also a positive driver, confirming the importance of dependable services. These findings align with De Oña and De Oña [20], who found that perceived service quality and cost directly influence both ridership and environmental benefits of public transport.

The results therefore support the argument that enhancing public transport service quality, maintaining affordability, and promoting environmental awareness can jointly increase adoption rates and improve environmental sustainability outcomes. However, the relatively moderate satisfaction with reliability and comfort signals a need for targeted service improvements, in line with recommendations by Currie and Delbosc [21], who stress that attracting car users to public transport requires service upgrades that compete with private travel convenience.

CONCLUSION AND RECOMMENDATION

This study examined the relationship between public transport adoption, travel behaviour, and environmental sustainability in Ilorin Metropolis, Nigeria. The logistic regression results revealed that modal split, travel distance, frequency of public transport use, environmental awareness, perception of public transport quality, travel cost, and travel time reliability significantly influence the probability of improved environmental sustainability. Among these, environmental awareness ($\beta = 0.653$, $p < 0.01$) and travel time reliability ($\beta = 0.397$, $p < 0.05$) emerged as the strongest positive predictors, indicating that well-informed commuters and reliable transport schedules contribute substantially to environmental gains. Conversely, longer travel distances ($\beta = -0.005$, $p < 0.05$) were associated with reduced likelihood of environmental benefits, reflecting the energy and emissions costs of extended trips. These findings align with previous works Banister [22] that highlight the central role of efficient, reliable, and high-quality public transport in achieving sustainability goals. Based on the findings from this study, the study recommends that:

i. Transport operators and policymakers should prioritize strategies to improve schedule adherence and reduce delays, as reliability strongly influences both user adoption and environmental outcomes.
ii. Awareness initiatives, such as targeted commuter education and public campaigns, should be intensified to increase understanding of the environmental benefits of public transport.
iii. Urban planning policies should encourage mixed-use developments and decentralized services to reduce average travel distances, thereby lowering transport-related emissions.
iv. Efforts should focus on upgrading vehicle conditions, comfort, and accessibility while keeping fares affordable to ensure sustained and widespread adoption of public transport.

REFERENCES

[1] UN Interagency. Sustainable Transport, Sustainable Development: Interagency Report for the Second Global Sustainable Transport Conference [Internet]. 2021 [cited 2025 Apr 5]. Available from: https://sdgs.un.org/sites/default/files/2021-10/Transportation%20Report%202021_FullReport_Digital.pdf

[2] Dasgupta S, Lall S, Wheeler D. Subways and CO_2 Emissions: A Global Analysis with Satellite Data. Sci Total Environ. 2023;6(1):23–34.

[3] Sharma P, Heidemann KM, Heuer H, Muehle S, Herminghaus S. Sustainable and Convenient: Bi-modal Public Transit Systems Outperforming the Private Car. arXiv [Preprint]. 2022.

[4] Olawepo RA, Ahmed YA, Asaju A. Planning for sustainability: Transportation and Land Use in Ilorin, Nigeria. J Art Archit Built Environ. 2020;3(2):18–30.

[5] Akujor C, et al. Energy Transition Pathways for the Nigerian Road Transport: Implication For Energy Carrier, Powertrain Technology, and CO_2 Emission. Energy Policy. 2023; 202:112.

[6] Oluwakoya A.O. A Comprehensive Assessment of Transportation Emissions in Nigeria: Trends, Drivers, and Impacts. Proc Niger Acad Sci. 2021;9:59–67.

[7] Aderamo J.A. Urban Transportation Problems and Challenges in Nigeria: A Planner's View. Prime Res Educ. 2012;2(3):198–203.

[8] Onikosi-Alliyu SO, Yusuf M-BO, Hussain TA. Effect of COVID-19 on Public Transport Commuters' Well-Being in Ilorin Metropolis, Nigeria. Lapai J Econ. 2020;4(2).

[9] Odesanya JF, Stephens MS, Okoko EE. Effect Of Road Transport Operations on the Environmental Quality of Air and Associated Health Implications in Ondo State, Nigeria. Int J Res Innov Soc Sci. 2023;6(5):70528.

[10] Hosmer DW, Lemeshow S, Sturdivant RX. Applied Logistic Regression. 3rd ed. New Jersey: Wiley; 2013.
[11] Fröidh O, Al-Mousa M, Sipilä H. Railway Capacity Utilization and Service Quality of Freight Trains with Increased Top Speed in Mixed Traffic. Transp Res Interdiscip Perspect. 2024;28.
[12] Brown CT, Rose J, Kling S. Arrested-mobility: Barriers to Walking, Biking, And E-Scooter Use in Black Communities in the United States. Equitable Cities. 2023.
[13] Creswell JW, Creswell JD. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. 5th ed. Thousand Oaks (CA): Sage Publications; 2018
[14] National Population Commission (NPC). Population Projections for Nigerian States and Local Government Areas. Abuja: NPC; 2022.
[15] Yamane T. Statistics: An Introductory Analysis. 2nd ed. New York: Harper and Row; 1967.
[16] Eboli L, Mazzulla G. Willingness-to-pay of Public Transport Users for Improvement in Service Quality. Eur Transp. 2008; 38:107–18.
[17] Paulley N, Balcombe R, Mackett R, Titheridge H, Preston J, Wardman M, et al. The Demand for Public Transport: The Effects of Fares, Quality of Service, Income and Car Ownership. Transp Policy. 2006;13(4):295–306.
[18] Susilo YO, Cats O. Exploring Key Determinants of Travel Satisfaction for Multi-Modal Trips by Different Traveler Groups. Transp Res Part A Policy Pract. 2014; 67:366–80.
[19] Redman L, Friman M, Gärling T, Hartig T. Quality Attributes of Public Transport that Attract Car Users: A Research Review. Transp Policy. 2013; 25:119–27.
[20] De Oña J, De Oña R. Quality of service In Public Transport Based on Customer Satisfaction Surveys: A Review and Assessment of Methodological Approaches. Transp Sci. 2015;49(3):605–22.
[21] Currie G, Delbosc A. Understanding Bus Rapid Transit Route Ridership Drivers: An Empirical Study of Australian BRT Systems. Transp Policy. 2011;18(5):755–64.
[22] Banister D. The Sustainable Mobility Paradigm. Transp Policy. 2018;15(3):73–80.