# ASSESSMENT OF SUSTAINABLE MOBILITY PATTERNS AMONG UNIVERSITY STUDENTS: EVIDENCE FROM EKITI STATE UNIVERSITY, ADO-EKITI, NIGERIA

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## Abstract

*Transportation contributes significantly to global greenhouse gas emissions, with estimation that the sector accounts for nearly one-quarter of global $CO_2$ emissions. Sustainable mobility has become a strategic priority in global climate mitigation efforts. Universities represent concentrated mobility hubs where daily commuting patterns significantly affect urban transport systems and environmental sustainability. They also generate concentrated commuting flows, making them strategic environments for sustainable mobility interventions. This study examines the relationship between students' residential location, commuting distance, and mobility patterns at Ekiti State University (EKSU), Ado-Ekiti, Nigeria. Using a survey of 411 student respondents, the research analyzes residence distance, walking time, modal split, and the use of non-motorized transport (NMT). Findings from the study reveal that a significant majority of students (88.1%) reside within 3 km of the campus, with 64.5% regularly walking to and from the university. Walking emerges as the dominant mode of transport, supported by short travel distances and economic considerations, while motorcycle transport serves as a complementary mode. The study identifies a strong relationship between proximity and mobility choice, highlighting a predominantly pedestrian-oriented transport system. Compared with similar studies in both developing and developed contexts, the findings underscore the influence of infrastructure, affordability, and urban form on student mobility. The study concludes by emphasizing the need for improved pedestrian infrastructure, expanded student housing, and integrated transport planning to enhance mobility and sustainability.*

**Keywords:** Sustainable mobility, university, modal split, university students, active transport, travel behavior.

## Introduction

Transportation contributes approximately one-quarter of global energy-related $CO_2$ emissions, as reported by the International Energy Agency (Teske *et al*., 2021; Küfeoğlu, 2024). Urban transportation systems are particularly significant sources of

greenhouse gas emissions and air pollutants due to high travel demand, traffic congestion, and reliance on fossil-fuel-powered vehicles (Tsigdinos, 2025). The substantial contribution of the transport sector to global $CO_2$ emission underscores the urgency of transitioning toward sustainable mobility systems (Winkler *et al*., 2023; Küfeoğlu, 2024).

In developing countries, transportation systems are characterized by persistent challenges, including traffic congestion, inadequate infrastructure, high emission levels, and safety concerns (Onokala & Olajide, 2020; Mohapatra *et al*., 2023). In Nigeria, rapid urbanization and increasing motorization rates have intensified mobility pressures, exacerbating environmental degradation and urban traffic inefficiencies (Auwalu & Bello,2023; Oluwakoya, 2024). Urban commuting patterns significantly influence these outcomes, as daily travel demand directly affects fuel consumption, congestion levels, and air quality (Gričar *et al*., 2023).

University campuses represent concentrated trip-generation hubs and function as micro-urban systems where thousands of students commute daily (Aluko, 2025). As such, they provide strategic environments for analyzing travel behavior and implementing sustainable transportation interventions. Given their structured populations and policy frameworks, universities offer controlled settings for assessing mobility trends and promoting environmentally responsible commuting practices (Alimohamadi, 2024; Oestreich *et al*., 2024).

Sustainable mobility refers to transportation systems that minimize environmental externalities, promote social equity, and maintain economic viability (De Vos, 2024). It emphasizes reduced dependence on private vehicles, increased utilization of public transportation, promotion of active transport modes such as walking and cycling, and integration of environmental responsibility into transport planning ((Lättman & Otsuka,2024; Palic & Selimic, 2024). Cities such as Copenhagen and Amsterdam illustrate how coordinated infrastructure development and policy integration can foster high levels of cycling and public transport usage (Mntungwa, 2025).

Among university students, mobility choices are influenced by multiple determinants, including accessibility, travel cost, convenience, safety, and environmental awareness (Aluko, 2025). Understanding these factors is critical for designing effective institutional transport policies.

This study provides a comprehensive assessment of mobility patterns among students of Ekiti State University (EKSU), located in Ado Ekiti. With a student population exceeding 25,000, EKSU generates substantial daily commuting flows that

influence traffic congestion, fuel consumption, and environmental quality within the host city. Despite growing global research on sustainable campus mobility, empirical evidence from Nigerian universities remains limited.

Accordingly, this study seeks to bridge this gap by systematically evaluating student mobility patterns at EKSU and identifying the determinants influencing sustainable transport adoption.

## Literature Review

Sustainable mobility constitutes a critical strategy for mitigating urban congestion, reducing greenhouse gas emissions, and limiting environmental degradation (Mavlutova *et al.*, 2023). University students represent a substantial and dynamic segment of urban travelers whose commuting patterns exert measurable influence on local transportation systems (Joumblat *et al.*, 2024). Given their mobility intensity and long-term behavioral formation stage, students are a strategic group for advancing sustainable transport transitions.

The sustainable mobility paradigm, as articulated by Banister (2008), prioritizes accessibility over mobility and advocates a modal shift from private automobile use toward low-carbon and active transportation modes. This framework emphasizes reducing automobile dependence, enhancing multimodal integration, and restructuring urban systems to support environmentally sustainable travel behavior. Empirical evidence suggests that young adults are generally more receptive to sustainable transportation alternatives compared to older cohorts, particularly when supportive infrastructure and institutional incentives are present.

European university cities such as Copenhagen and Amsterdam demonstrate consistently high cycling modal shares, attributable to integrated infrastructure provision, supportive policy frameworks, and strong pro-environmental social norms (Raposo, 2023; Marknell & Svenby, 2025). These cases illustrate how coordinated planning interventions can normalize sustainable commuting cultures within academic environments.

The World Health Organization recognizes active transportation, particularly walking and cycling as a determinant of improved public health outcomes (World Health Organization, 2025). Documented benefits include reduced cardiovascular risk, lower obesity prevalence, enhanced mental health, and overall improvements in population well-being (Logan *et al.*, 2023; World Health Organization, 2026). Consequently, sustainable mobility policies generate co-benefits that extend beyond environmental sustainability to public health advancement.

Conversely, universities situated in automobile-dependent regions typically exhibit high reliance on private vehicles. Institutional policies play a decisive role in shaping modal choice. Measures such as parking pricing, parking supply restrictions, and subsidized public transit passes have been empirically shown to significantly influence commuting behavior. Specifically, parking restrictions tend to reduce private car usage, while subsidized transit programs increase public transport ridership. Key determinants influencing student travel behavior include travel distance, socioeconomic status, environmental attitudes, availability and quality of infrastructure, and institutional transport policies.

Methodologically, previous studies have employed modal split analysis, travel diaries, and multivariate regression models to examine determinants of student mobility behavior. While these approaches provide valuable insights, gaps remain in understanding the interaction between infrastructural provision and behavioral motivation, particularly within diverse socioeconomic and institutional contexts.

In the Nigerian context, transport research has predominantly focused on congestion dynamics and public transport inefficiencies. Limited studies have quantitatively modeled student commuting behavior using inferential statistical techniques such as regression analysis. Identified barriers to sustainable mobility adoption in Nigerian universities include poor pedestrian infrastructure, absence of dedicated cycling lanes, inadequate and unreliable bus services, and safety and security concerns. These contextual challenges underscore the need for systematic, data-driven assessments of student mobility patterns within Nigerian higher education institutions.

## Methodology

### Study Area

The study was conducted at Ekiti State University, located in Ado Ekiti, Nigeria. The university is surrounded by several residential areas, including Iworoko, Are and other nearby communities, which accommodate a large proportion of the student population.

### Data Collection

Primary data were collected through a structured questionnaire administered online to students. Students were contacted through the various WhatsApp groups of their departments and levels. The questionnaire captured information on residential location and distance from campus, walking time to campus, mode of transport used, and frequency of walking (NMT usage). A total of 411 valid responses were obtained and used for analysis.

## Data Analysis

The data were analyzed using descriptive statistics, including frequencies and percentages. Results were presented in tables and figures. These include residence distance distribution, walking time distribution, modal split of commuting patterns, and non-motorized transport usage in addition to demographic data.

## Results and Discussion

### Demographic Characteristics

**Table 1: Respondents' Socio-demographic Characteristics**

| Variations | Students Freq. | Students % |
|---|---|---|
| ***Respondents' age (years)** | | |
| 16 – 25 | 379 | 92.2 |
| 26 – 35 | 24 | 5.85 |
| 36 – 45 | 8 | 1.95 |
| 46 – 55 | - | - |
| 56 – 65 | - | - |
| 66 and over | - | - |
| **Total** | **411** | **100** |
| | | |
| **Gender** | | |
| Male | 291 | 70.8 |
| Female | 120 | 29.2 |
| **Total** | **411** | **100** |

Source: Fieldwork, 2025

Table 1 presents the socio-demographic characteristics of 411 student respondents, focusing on age and gender.

### Age distribution

The vast majority of respondents (92.2%) fall within the 16–25 age group, an age-group typically representative of undergraduate students. A much smaller proportion (5.85%) are aged 26–35, while only 1.95% fall within 36–45 years. Notably, there are no respondents above 45 years. The reported mean age of approximately 21.5 years further reinforces that the study population is largely composed of young adults.

### Gender distribution

The sample is male-dominated, with 70.8% male respondents compared to 29.2% female respondents. This imbalance suggests higher male participation in the surveyed group.

**Residence Distance from Campus**

**Table 2: Student-respondents' Residence Distance from Campus**

| Variations | Frequency | Percent |
|---|---|---|
| **Residence location** | | |
| On campus or near the campus (1 km or less) of EKSU | 153 | 37.2 |
| Private residential accommodations around the school/ Iworoko (1 – 3 km) | 198 | 48.2 |
| Close by Ado-Ekiti township (Ilokun, Irasa, Adebayo/ Opopogbooro area (3 – 5 km) | 31 | 7.5 |
| Beyond Ori Apata (Adebayo/Opopogbooro area: More than 5 km) | 16 | 3.9 |
| Others | 13 | 3.2 |
| **Total** | **411** | **100** |
| | | |
| **Walking Time to Campus** | | |
| 1-20 minutes | 157 | 38.2 |
| 21-40 minutes | 141 | 34.3 |
| 41-60 minutes | 41 | 10.0 |
| Does not apply | 72 | 17.5 |
| **Total** | **411** | **100** |

Source: Fieldwork, 2025

Table 2 presents the distribution of student-respondents by residence distance from campus and their corresponding walking time to Ekiti State University (EKSU) campus. The results reveal clear patterns in students' residential choices and mobility behavior. They indicate that a substantial proportion of students reside in close proximity to the university. Nearly half of the respondents (48.2%) live in private residential accommodations within a distance of 1–3 km. In addition, 37.2% of the respondents live on campus or within 1 km of campus. This implies that approximately 85.4% of the students reside within a 3 km radius of the university.

In contrast, only 7.5% of the respondents live within 3–5 km, while an even smaller proportion (3.9%) reside beyond 5 km. A marginal 3.2% fall into other unspecified categories. This distribution clearly demonstrates a strong spatial concentration of students around the university environment.

The predominance of off-campus residence within the 1–3 km range reflects the limited capacity of on-campus accommodation, which compels many students to seek housing in nearby communities. This pattern is consistent with findings from many other campuses, where rapid enrollment growth has outpaced hostel provision, leading to the expansion of student-dominated neighbourhoods around campuses (Gaete-Sepulveda & Murach, 2025; Shillingi & Kamugisha, 2025). Such clustering is commonly observed in areas adjacent to major institutions, where proximity reduces both transportation costs and travel-related stress.

**Walking Time to Campus**

The walking-time data further reinforces the importance of proximity in students' residential decisions (Daliri Dizaj & Hatami Khanghahi, 2022; Dema, *et al.,* 2023). The results show that 38.2% of respondents spend 1–20 minutes walking to campus, while 34.3% spend 21–40 minutes. Combined, this indicates that over 72% of students can access the campus within 40 minutes on foot. Only 10.0% of respondents report walking between 41–60 minutes, while 17.5% indicate that walking time does not apply, likely due to the use of alternative modes of transport such as motorcycles or buses. The dominance of short walking times suggests that the university operates within a relatively walkable spatial structure, where most students live within practical walking distance of academic facilities.

This pattern aligns with mobility studies which show that students residing within shorter distances are significantly more likely to walk to campus (Koning *et al*., 2022). Walking remains a preferred mode of transport due to its affordability, convenience, and reliability, especially in contexts where transport infrastructure may be limited or costly. In addition, it has also been shown that students, compared to other population groups, are more likely to adopt active travel modes, especially when distances are short and infrastructure permits (Whalen *et al*., 2013).

The observed residential and mobility patterns are consistent with findings from similar studies. In Nigeria, similar research has shown that a majority of university students live off-campus but within close proximity due to inadequate hostel facilities (Adelowokan & Sanni, 2024; Ajewole, *et al.,* 2024). Neighbourhoods surrounding universities often evolve into student residential hubs.

In other climes, studies also highlight the importance of proximity in student residential decisions. For example, research conducted in European universities indicates that a significant proportion of students live within a 5 km radius of campus, with many relying on walking or other forms of active transport for short-distance commuting. However, a notable difference exists in the United States, where students are more likely to utilize public transportation systems or private vehicles, enabling longer commuting distances.

**Modal Split of Students' Commute to and from EKSU**

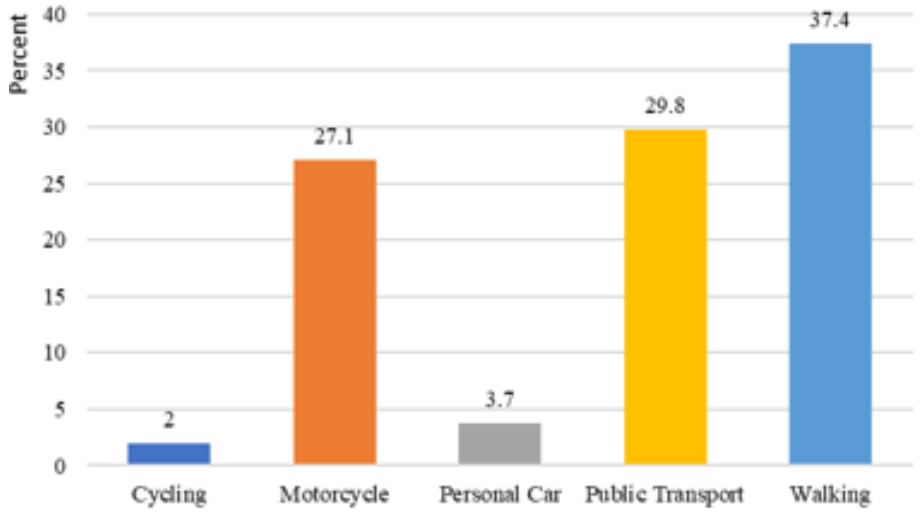


**Fig. 1: Students' Commute Mode to and from EKSU Campus**
Source: Fieldwork, 2025

Figure 1 presents the modal split of students' commuting patterns to and from campus. The results indicate the relative dominance of specific transport modes used by students. It also reflects the students' residential locations, economic conditions, and available transport infrastructure. The figure shows that walking, mini-bus services and motorcycle transport constitute a significant proportion of students' daily mobility. This pattern is consistent with the earlier findings on residential proximity, where the majority of students were found to live within 1–3 km of the campus, making walking a practical and economical option. Walking, therefore, emerges as a major commuting mode due to its zero cost, accessibility, and reliability, particularly in a context where many students aim to minimize daily expenses.

Motorcycle transport (commonly known as okada in Nigeria) represents another dominant mode due to its flexibility, speed, and ability to navigate poor road conditions. Other modes such as cars and cycling appear less dominant, reflecting both limited affordability among students, especially with car mode. Overall, the modal split suggests a strong reliance on non-motorized and para-transit systems, which is typical of university settings in developing countries (Aderibigbe *et al.*, 2024).

The modal distribution strongly aligns with the principle that distance is a key determinant of transport mode choice. Studies show that students living closer to campus are more likely to walk, while those farther away tend to rely on motorized transport (Liu *et al.*, 2023). For instance, a study on university commuting patterns found that walking dominates within short distances (around 1–2 km), accounting for up to 60% of trips, but declines sharply as distance increases (Ribeiro & Fonseca, 2022).

Similarly, another study observed that students living within walking distance often choose accommodation specifically to reduce travel costs and time (Aluko, 2025).

The modal split observed in this study differs in important ways from patterns in developed countries. For example, in many European universities, public transport dominates student travel, accounting for about 50–60% of trips, while walking represents a smaller share (around 15–25%) (Romanowska *et al.*, 2019; Liu, Bardaka & Paschalidis, 2023; Cunha & Cadima, 2024). In the United States, similar studies show a strong dominance of private cars, with up to 64% of students commuting by single-occupancy vehicles, while only about 19% walk (Al-Alawneh *et al.*, 2023). These differences highlight the influence of transport infrastructure, rail systems, income levels and urban planning, as well as campus design. They are, however, consistent with studies conducted in developing countries, where informal transport systems such as motorcycles and minibuses play a major role in student mobility and active travel (walking) remains a dominant mode due to economic factors.

**Table 3: Student Respondents use of NMT Modes**

| **Variations Walking Patterns** | **Frequency** | **Percent** |
|---|---|---|
| Do you walk to or from the university? | | |
| Yes | 265 | 64.5 |
| No | 146 | 35.5 |
| **Total** | **411** | **100** |
| | | |
| If you walk, then how often do you walk to or from the campus per week? | | |
| Frequently | 212 | 51.6 |
| Occasionally | 85 | 20.7 |
| Rarely | 70 | 17.0 |
| Does not apply | 44 | 10.7 |
| **Total** | | **100** |

Source: Fieldwork, 2025

**Frequency of Walking Behavior**

Table 3 presents the distribution of students' use of non-motorized transport (NMT), particularly walking, as a means of commuting to and from campus. Further analysis of walking frequency shows that 51.6% of respondents walk frequently, while 20.7% walk occasionally and 17.0% walk rarely. Only 10.7% indicated that the question does not apply, likely representing students who rely entirely on motorized transport. The fact that over half of the respondents walk frequently suggests that walking is not just an alternative mode, but rather a routine and integral part of students' daily mobility patterns. This reinforces the characterization of the university as a

pedestrian-oriented university environment, where active travel is embedded in everyday student life.

The findings from this study are highly consistent with results from other university settings, particularly in developing countries and compact campus environments. For example, a study conducted among university students in Colombia found that 65.3% of students were active commuters (i.e., walking to and from campus), a figure almost identical to the 64.5% observed in this study (García-Hermoso *et al.*, 2018). This close similarity suggests that high levels of walking among students are common where residential proximity to campus is high.

Similarly, research on university commuting behavior indicates that students are more likely to use active modes of transport than the general population, largely due to shorter travel distances and economic considerations (Liu *et al.*, 2023; Whalen & Páez Carrasco, 2013). This supports the pattern observed in this study, where walking dominates, perhaps due to affordability and accessibility. However, contrasts emerge when comparing these findings with studies from developed countries. For instance, a study in Europe reported that only about 15% of students walk to campus, with the majority relying on public transport (Romanowska *et al.*, 2019). Likewise, another study found that walking accounted for only 11.5% of student trips in a university setting where motorized transport was more accessible (Farooq *et al.*, 2024).

## Conclusion

The results demonstrate that walking is the predominant form of non-motorized transport among EKSU students, with a majority not only engaging in walking but doing so frequently. It also indicates that EKSU exhibits a highly localized residential pattern, with most students living within 3 km of campus and relying heavily on walking as their primary mode of transportation. The modal split of EKSU students reveals a proximity-driven and cost-sensitive mobility pattern, dominated by walking and informal transport modes.

This study demonstrates that sustainable mobility among university students is influenced by a combination of infrastructural, economic, and behavioral factors. While a significant proportion already uses sustainable modes, further improvements in transport infrastructure and policy support are necessary to reduce dependence on motorized modes. Universities can serve as testing grounds for sustainable mobility initiatives that contribute to broader urban sustainability goals.

## Recommendations

Based on the findings and conclusions of this study, the following recommendations are suggested to improve sustainable mobility among students of Ekiti State University and other similar university environments in Nigeria:

**Improve pedestrian infrastructure**: The university management should pay attention to improving pedestrian infrastructure such as walkways, sidewalks, pedestrian crossings, and street lighting. Safe and accessible walking infrastructure will enhance the comfort and safety of students who predominantly rely on walking.

**Introduce campus cycling facilities**: Dedicated bicycle lanes, bicycle parking areas, and campus bicycle-sharing schemes should be introduced to encourage cycling as an alternative sustainable transport mode among the students. This would diversify non-motorized transport options and reduce pressure on motorized transport systems.

**Promote Sustainable Mobility Awareness:** Awareness campaigns, seminars, and student engagement programs should be organized to educate students on the environmental, economic, and health benefits of sustainable transportation practices such as walking and cycling

## References

Adelowokan, O. A., & Sanni, L. (2024). Comparative Study of the On-and Off-Campus Students' Hostel in Federal Universities in Southwestern Nigeria. *Ibadan Planning Journal*, *10*(2), 51-62.

Aderibigbe, O. O., Fadare, S. O., & Gumbo, T. (2024). Transport situation in the global south: insights from Nigeria, South Africa and India. In *Emerging technologies for smart cities: sustainable transport planning in the global North and global South* (pp. 43-77). Cham: Springer Nature Switzerland.

Ajewole, I. P., Wahab, J. F., Olaifa, A. S., Olofin, T. B., & Daramola, O. R. (2024). The Challenges of Hostel Accommodation In Nigerian Universities-Implications on Undergraduates. *Fuoye Journal of Educational Management*, *1*(1).

Al-Alawneh, D., Gharaibeh, A., Mahasneh, J., & Alomari, A. H. (2023). Factors associated with driving alone decisions and campus parking behaviors among rural university commuters. *Advances in Transportation Studies*, *61*.

Alimohamadi, H. (2024). Enhancing sustainable commuting strategies for Lahti city: integrating multi-thematic interventions for effective urban mobility.

Aluko, O.K. (2025) *Evaluating the Challenges and Opportunities for Sustainable Mobility in a Suburban University: The Case of Ekiti State University, Ado-Ekiti.*

Doctoral Dissertation

Auwalu, F. K., & Bello, M. (2023). Exploring the contemporary challenges of urbanization and the role of sustainable urban development: a study of Lagos City, Nigeria. *Journal of Contemporary Urban Affairs*, *7*(1), 175-188.

Banister, D. (2008) The sustainable urban mobility paradigm. *Transport policy*, 15(2), 73-80.

Cunha, I., & Cadima, C. (2024). Active travel in the university setting. *Journal of Transport and Land Use*, *17*(1), 707-730.

Daliri Dizaj, M., & Hatami Khanghahi, T. (2022). Students' residential preferences: a case study is dormitories of University of Mohaghegh Ardabili. *Journal of Asian Architecture and Building Engineering*, *21*(4), 1348-1363.

De Vos, J. (2024). Towards truly sustainable mobility. *Transportation research interdisciplinary perspectives*, *24*, 101039.

Dema, Y., Setianingsih, R. E., Billy, Y. L., & Purnama, Y. H. (2023). Proximity: A Case Study of The Quest of Students' Decision to Choose a Private University in Jakarta. *Jurnal Komunikasi Dan Bisnis*, *11*(2), 174-190.

Farooq, A. S., Akhtar, A., Javid, M. A., Zafar, S., & Khan, Z. U. (2024). Comparison of current and proposed travel modes for students considering travelling and sustainable indicators. *Discover Sustainability*, *5*(1), 367.

Gaete-Sepulveda, M., & Murach, A. (2025). A holistic model for student-centered on and off-campus housing–a cross-country evaluation. *International Journal of Sustainability in Higher Education*.

García-Hermoso, A., Quintero, A. P., Hernández, E., Correa-Bautista, J. E., Izquierdo, M., Tordecilla-Sanders, A., ... & Ramírez-Vélez, R. (2018). Active commuting to and from university, obesity and metabolic syndrome among Colombian university students. *BMC Public Health*, *18*(1), 523.

Gričar, S., Lojanica, N., Obradović, S., & Bojnec, Š. (2023). Unlocking sustainable commuting: Exploring the nexus of macroeconomic factors, environmental impact, and daily travel patterns. *Energies*, *16*(20), 7087.

Joumblat, R., Jawad, H., & Elkordi, A. (2024). Analysing Travel Patterns at Beirut Arab University, Lebanon: An In-Depth Characterization of Travel Behavior on Campus. *Sustainability*, *16*(18), 8254.

Kate E. Whalen, Antonio Páez, Juan A. Carrasco, (2013). Mode choice of university students commuting to school and the role of active travel. *Journal of Transport Geography*, 31, 132-142

Koning, M., Kim, J. H., Saeidi-Rizi, F., & Durst, N. (2022). The role of the campus

outdoor environment on university student mental health. *Journal of People, Plants, and Environment*, *25*(3), 263-272.

Küfeoğlu, S. (2024). Transportation sector emissions. In *Net Zero: Decarbonizing the Global Economies* (pp. 493-554). Cham: Springer Nature Switzerland.

Lättman, K., & Otsuka, N. (2024). Sustainable development of urban mobility through active travel and public transport. *Sustainability*, *16*(2), 534.

Liu, C., Bardaka, E., & Paschalidis, E. (2023). Sustainable transport choices in public transit access: Travel behavior differences between university students and other young adults. *International Journal of Sustainable Transportation*, *17*(6), 679-695.

Logan, G., Somers, C., Baker, G., Connell, H., Gray, S., Kelly, P., ... & Gill, J. M. (2023). Benefits, risks, barriers, and facilitators to cycling: a narrative review. *Frontiers in sports and active living*, *5*, 1168357.

Marknell, A., & Svenby, L. (2025). Reinventing Urban Mobility: Analysing Key Enablers for Bicycle-Friendly Cities.

Mavlutova, I., Atstaja, D., Grasis, J., Kuzmina, J., Uvarova, I., & Roga, D. (2023). Urban transportation concept and sustainable urban mobility in smart cities: a review. *Energies*, *16*(8), 3585.

Mntungwa, P. R. (2025). Public transport network improvements as a catalyst for integrated land use-transport development: lessons from case studies of Copenhagen, Curitiba, Hong Kong and Seoul.

Mohapatra, S., Mohanachandran, D., Dwivedi, G., Kesharvani, S., Harish, V. S. K. V., Verma, S., & Verma, P. (2023). A comprehensive study on the sustainable transportation system in India and lessons to be learned from other developing nations. *Energies*, *16*(4), 1986.

Oestreich, L., Neuenfeldt Júnior, Á., & Ruiz-Padillo, A. (2024). Guidelines to promote sustainable transport in higher education universities: A bibliometric and systematic review. *International Journal of Sustainability in Higher Education*, *25*(8), 1912-1928.

Oluwakoya, A. O. (2024). A comprehensive assessment of transportation emissions in Nigeria: Trends, drivers, and impacts. *Proceedings of the Nigerian Academy of Science*, *16*(1s), 61-71.

Onokala, P. C., & Olajide, C. J. (2020). Problems and challenges facing the Nigerian transportation system which affect their contribution to the economic development of the country in the 21st century. *Transportation Research Procedia*, *48*, 2945-2962.

Palic, N., & Selimic, M. (2024). Public Transportation Policies and Their Role in

Promoting Sustainable Mobility in Sarajevo. *Economy Transdisciplinarity Cognition*, *27*(2), 306-317.

Raposo, R. M. (2023). *Sustainable Mobility, Urban Planning Strategies and Cycling: What can Portugal Learn from the Netherlands* (Master's thesis, Instituto Politecnico do Porto (Portugal)).

Ribeiro, P. J., & Fonseca, F. (2022). Students' home-university commuting patterns: A shift towards more sustainable modes of transport. *Case studies on transport policy*, *10*(2), 954-964.

Romanowska, A., Okraszewska, R., & Jamroz, K. (2019). A Study of Transport Behaviour of Academic Communities. *Sustainability*, *11*(13), 3519. https://doi.org/10.3390/su11133519

Shillingi, V., & Kamugisha, D. (2025). Academic performance of university students: Is off-campus accommodation a predicament or help?. *African Scientific Annual Review*, *2*(1), 161-172.

Sultana, S., Kim, H., Pourebrahim, N., & Karimi, F. (2018). Geographical Assessment of Low-Carbon Transportation Modes: A Case Study from a Commuter University. *Sustainability*, *10*(8), 2696. https://doi.org/10.3390/su10082696

Teske, S., Niklas, S., & Langdon, R. (2021). *TUMI Transport Outlook* 1.5 C-A global scenario to decarbonise transport.

Tsigdinos, S. (2025). Emissions from the Transport Sector. In *Hydrogen and Low-Carbon Fuels in Circular Bio-economy: Assessment Methodologies, Production Technologies and Sector-Specific Applications* (pp. 7-25). Cham: Springer Nature Switzerland.

Winkler, L., Pearce, D., Nelson, J., & Babacan, O. (2023). The effect of sustainable mobility transition policies on cumulative urban transport emissions and energy demand. *Nature Communications*, *14*(1), 2357.

World Health Organization. (2025). Promoting walking and cycling: a toolkit of policy options.

World Health Organization. (2026). *Promoting mental health through cycling and walking: a win-win approach for health and sustainability* (No. WHO/EURO: 2026-12905-52679-81719 (PDF)). World Health Organization. Regional Office for Europe.