

An Evaluation of Sustainable Mobility Pattern In a Suburban University

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Abstract— This study examined the travel pattern of staff and students in Ekiti State University Ado Ekiti, Nigeria. The goal is to determine the current level of use of sustainable modes and identify measures to improve them in a sub-urban university campus. The use of Google Forms questionnaire survey was adopted to collect data. A total of 654 individuals consisting of 243 staff and 411 undergraduate students participated in the survey. The questionnaire covered themes including: choice of transport modes, challenges with cycling, and suggestions on what is required to improve cycling as a transport mode. The results showed that 45.3% of staff indicated that walking was their sole modes of movement within the University while the use of motorized modes was selected by 28.3% - with personal vehicles selected by 16.0%; and commercial tricycle, 12.3%. For the students, 50.6% indicated that walking was their sole mode of movement within the University while the sole use of motorized modes was selected by 18.2% with personal vehicles selected by 1.9%; commercial tricycle, 10.7% and commercial motorcycle, 4.4%. 1.2% selected cycling. Similarly, when asked why staff might not want to cycle, the most important reason was lack of cycling facilities (22.2%) while the least important reason was unfriendly weather (7.8%). For the students, when asked why students might not want to cycle, the most important reason was also lack of cycling facilities (30.7%). When asked what improvement staff wanted to enhance cycling, the most important suggestion was dedicated and well-maintained cycle lanes (53.5%). The students also had a similar response, suggesting dedicated and well-maintained cycle lanes (48.9%) as the most important improvement required.

These findings reveal that cycling was poorly adopted and that much needs to be done to improve cycling as a mode in the University. The conclusions indicate that improvement in the adoption of cycling may be able to reduce the use of motorized mode which is shown to be high for both staff and students.

Keywords—Mobility, Walking, Cycling, Sub-urban university.

I. INTRODUCTION

THE CONCEPT OF SUSTAINABLE MOBILITY is gaining increasing importance in urban planning [1, 2].

The need to reduce carbon footprints through the adoption

of more sustainable transport modes remains a subject of research and discussion by transportation professionals and researchers [3]. Of late, higher educational institutions, especially universities, have become the centre of interest for researching and exploring modal choices of members of the higher educational institution's community [4, 5, 6]. The reasons for this are obvious. First, these communities are self-contained communities, usually with relatively large populations and also being high traffic generators, fairly independent in making policies, and may be able to manage their mobility requirements. They are also communities with members from a variety of backgrounds who are regarded as individuals who may be able to influence the choices of the larger society due to their learning. The higher educational institution campus is thus often regarded as a miniature version of the larger urban environment with respect to mobility [7, 8].

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It is also believed that an understanding of how university community members (especially, the staff and students) move around and within the community can guide in developing strategies for sustainable mobility.

However, while such studies are well known in many countries of the world [9, 10], especially in the West, it has not been widely reported in sub-Saharan Africa and many other developing countries of the world. It is therefore the intent of this paper to examine this theme in a developing country context - Nigeria. Nigeria is the largest Black Country with more than 297 universities. Mobility characteristics of these universities may provide information about the similarities and differences between universities across nations while at the same time guiding policy directions in a developing country context. This paper thus studies the travel pattern of staff and students in one of the higher educational institutions in Nigeria: Ekiti State University, Ado Ekiti. Based on an online questionnaire survey conducted with 411 undergraduate students and 243 staff members, the study was carried out to determine the current level of use of sustainable modes among staff and students and to identify measures that can be deployed to improve sustainable modes uptake among them. The approach described in this paper can also be useful to campus managers and urban planners to identify policies that can improve the use of sustainable transport modes among the university community staff and students.

II. BACKGROUND AND CONTEXT

The term sustainable mobility defines transportation options that lessen environmental impact, promote social equity and support economic development. This is becoming a more interesting research area for universities [9, 10]. Similarly, universities are making efforts to improve on their sustainability goals [10]. More effort is put into reducing car use as this mode contributes significantly to carbon footprint. Understanding the extent to which sustainable mobility is embraced in Ekiti State University, Ado Ekiti is the focus of this paper. The university is faced with the challenge of high dependence on motorized modes, being a university located in a suburban area. The University is located at the boundary of Ado Ekiti, about 12 km from the centre of Ado Ekiti and about 5 km away from the built-up residential areas of Ado Ekiti. It forms a neighbour with a small town called Iworoko Ekiti. Ado Ekiti is the administrative headquarters of Ekiti State, and has a population of 556,505 [11]. The university is served by a major highway connecting the state capital to the northern part of the state. The location of the campus in the suburban area of the city necessitates the use of motorized modes for staff and students who live in the city. It also operates as a non-residential campus, making it essential for staff and students to live outside the campus, and largely requiring motorized modes to assess the university campus, though there are residential buildings and hostels within short distances from the campus.

Similarly, the challenge of poorly managed public transport system characteristic of cities of developing countries further increases the dependence on private motorized modes by promoting car dependence. Within the campus, there are no limits to parking, thereby further encouraging private motorized transport use. In addition, the spread of the university facilities which necessitates staff and students travelling distances up to or more than a kilometre frequently often encourages the use of motorized modes within the campus. The University has a student population of 32978 and staff population of 2249. This entire population live outside the campus and come into the campus daily using one transport mode or the other. It has one functional motorable entrance and several pedestrian paths leading into it. It covers an area of 3,500 hectares of land [12], though the developed area is smaller. Due to its location in the suburban area of the city, staff and students who live in the city come mainly by private cars or public transport to campus. The main public transport system serving the campus comprises minibuses of a capacity of nine passengers which operates informally without fixed schedules. With travel distances within the campus reaching up to a kilometre and more, staff and students adopts various transport modes for mobility within the campus, ranging from walking to the use of private vehicles, hired motorcycles (popularly known as okada), and tricycles used for public transport (locally known as Marwa). There are a few walkways within the campus which were built in the past but these are not usually maintained or extended. The university is owned by the Ekiti State government. It is located in the south-western part of Nigeria. Currently, the university does not have any sustainability goals with respect to mobility. Figure 1 shows the map of the built-up area of the university.

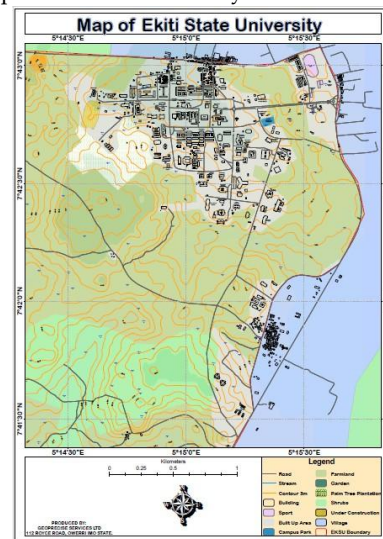


Figure 1: Map of the study area [27]

III. METHODOLOGY

Data was collected through the use of an online questionnaire survey conducted using Google Forms. The

questionnaire was designed to contain four main parts. The first part, labelled demographics, contained six questions and asked questions about respondents' bio-data. It included questions such as gender, age, level of study (for students), trade union membership (for staff), educational attainment, marital status, and whether or not they possessed a vehicle. The second part was labelled Modal Choice and it had 14 questions covering respondents' places of residence, choices of modes as well as motivations for modal choice and why they would not consider sustainable transport modes (walking and cycling) as transport mode choices. The third and the last part was themed Challenges and Opportunities for walking and cycling. This part had five questions. The target population was approached through the social media (Whatsapp and Telegram) platforms of the various unions and faculties for staff and students respectively. The questionnaire required about nine minutes to complete, was administered in English language and was concluded in January, 2025. This survey was analyzed statistically to obtain descriptive data and cross tabulation of various characteristics

IV. RESULTS

A. Sample structure

A total of 654 respondents completed the survey and provided information about their travel characteristics. Of this number, 37% were staff while 63% were students. 56.4% of the staff were male while 43.6% were female; 70.3% of the students were male while 29.7% were female. The ages of staff ranged from 16 – 25 range to 65 and above range while the ages of students ranged from 16 – 25 range to 36 – 45 range. The university had a total of 2249 staff and 32978 students which showed that about 10.8% of staff participated in the survey while 1.25% of students participated. Table 5.1 shows these details.

Table 5.1: Respondents distribution by gender and age

	Age (Years)	Female	Male	Total	Grand Total
Staff	16-25	1	0	1	
	26-35	4	3	7	
	36-45	33	41	74	
	46-55	49	59	108	
	56-65	18	29	47	
	66 and over	1	5	6	
	Total	106	137	243	
Students	16-25	110	269	379	
	26-35	4	20	24	
	36-45	6	2	8	
	Total	120	291	411	654

Due to the constraints of space and time, what is discussed in this paper are respondents' modes to, from, and within the university, the reasons for not cycling, and what might be done to improve cycling as a travel mode in the university.

B. Transport mode used to and from the university

Tables 5.2 and 5.3 present cross tabulations of the journey modes of staff and students to the university. It is shown that out of the staff that completed the questions on residence location and travel mode, no one indicated cycling as a travel mode to the university. Two respondents indicated that they walked to the university, though one of the two is unlikely due to the distance involved and might have been a response in error. About 4% travelled by motorcycle, 64.7% by personal vehicles, and 29% by public transport. In terms of the distance from the university, more than 45% lived beyond 5km from the university, 48.8% live within 3km to 5 km from the university, while only 5.5% live within 2km to the university. With over 90% living beyond 3km from the university and no one indicating the use of bicycle, motorized modes were the options available to these staff. In the case of the students, majority of them lived within 2km from the university, being 86%; only 11.5% lived beyond 3km from the university. This informed the higher percentage of walkers, being 37.5% and a few cyclists, being about 2%. The use of motorized mode is nevertheless high, being 60.5%.

Table 5.2: Table showing journey modes of staff to the university based on their current residential location.

Journey Mode	Distance from the University				Total
	> 5 km	3–5 km	1 – 2 km	<1km	
Cycling					
Motorcycle	4	2	1	1	8
Personal Car	62	63	5		130
Public Transport	25	31	1	2	59
Walking	1	0	0	1	2
Total	92	98	7	4	201

Table 5.3: Table showing journey modes of students to the university based on their current residential location.

Journey Mode	Distance from the University				Total
	> 5 km	3–5 km	1 – 2 km	<1km	
Cycling	0	0	4	4	8
Motorcycle	2	2	74	32	110
Personal Car	3	3	3	5	15
Public Transport	11	24	55	23	122
Walking	0	2	62	89	153
Total	16	31	198	153	408

C. *Transport mode used within the university*

Tables 5.4 and 5.5 show the transport modes used by both staff and students for trips within the university. It shows that majority of both staff and students moved around within the university by walking. For staff, 45.3% moved around the university by walking while 50.6 % of the students moved around by walking. These are those who selected walking as their main mode. Other significant travel mode by staff were the use of private cars (by 16%) and the use of tricycle (by 12.3%). There were also significant combined modes. These included combinations of walking and the use of private cars (being 11.9%) and walking and the use of tricycle (being 7.0%). This table shows that walking was widely adopted by staff.

Similarly, for the students, some of the other significant modes included tricycle (at 10.7%) and motorcycle (at 4.4%). For combined modes among students, walking and motorcycle (at 5.4%) and walking and tricycle (at 21.2%) were significant. While the use of personal vehicle stood at 16% among staff, it was only 1.9% among students. The significant record of the use of personal vehicles, tricycles, motorcycles indicates that the trips within the university were not all entirely short: some staff and students who could afford to use motorized modes did use it or combined walking with motorized modes. Such trips might benefit from cycling. However, cycling did not come up with any significance whether among staff or students as it stood at 0.4% in combination with motorcycle and personal vehicle among staff and at less than 1.7% among students. This implies that cycling was not one of the travel modes available to respondents in the university.

Table 5.4: Table showing how students move around within the University

How do you move around within the University	Percentage
Cycling; Motorcycle; Personal vehicle	0.4
Motorcycle	0.8
Motorcycle; Personal vehicle	0.8
Personal vehicle	16.0
Tricycle	12.3
Tricycle; Motorcycle	0.4
Tricycle; Personal vehicle	2.1
Walking	45.3
Walking; Motorcycle	0.8
Walking; Personal vehicle	11.9
Walking; Tricycle	7.0
Walking; Tricycle; Motorcycle	0.4
Walking; Tricycle; Personal vehicle	1.6
Total	100.0

Table 5.5: Table showing how staff move around within the University

How do you move around within the University?	Percentage
Cycling	1.2
Cycling; Tricycle	0.5
Motorcycle	4.4
Motorcycle; Personal vehicle	0.2
Personal vehicle	1.9
Tricycle	10.7
Tricycle; Motorcycle	1.0
Walking	50.6
Walking; Cycling	1.0
Walking; Cycling; Tricycle; Motorcycle	0.2
Walking; Motorcycle	5.4
Walking; Personal vehicle	0.5
Walking; Tricycle	21.2
Walking; Tricycle; Motorcycle	1.0
Walking; Tricycle; Motorcycle; Personal vehicle	0.2
Total	100.0

D. *Reported attitude to cycling as a transport mode*

Respondents were asked to state the reasons why they might not be considering cycling as a transport mode for trips in the university. Tables 5.6 and 5.7 shows the responses of staff and students respectively. For staff, the two most important reasons selected were *Lack of cycling facilities* and *I don't know how to cycle*, each having a percentage score of 22.2%. These were followed by *Safety concerns* and *Personal preference* (e.g., *I can afford a car*) at 18.1% and 13.2% respectively.

For students, *Lack of cycling facilities* took the lead with a percentage score of 30.7%, followed by *I don't know how to cycle* (19.2%) and *Safety concerns* (14.8%). This shows that both staff and students in the university expected some facilities that could support cycling to enable them consider cycling as a travel mode. The next most selected reason, *I don't know how to cycle* is also similar to the first in that it shows that cycling was not well known to the university community and many respondents did not know how to cycling. In addition, *Safety concerns*, the third most selected reason indicates that many staff and students did not trust that cycling would be safe for them. It is important to note that both tables show that cycling was not regarded as demeaning by the majority of the respondents. As shown on the tables, the option *I consider cycling degrading* (class feeling) had the lowest percentages for both staff and students, being 2.1% for staff and 4.4% for students.

Table 5.6: Table showing reasons for not considering cycling as a transport mode choice by staff members

Reason for not considering cycling	Percentage
Lack of cycling facilities	22.2%
Safety concerns	18.1%
Unfriendly weather condition	7.8%
Lack of incentives for cycling	3.3%
I don't know how to cycle	22.2%
Personal preference (e.g., I can afford a car)	13.2%
I consider cycling degrading (class feeling)	2.1%
Invalid	11.1
Total	100.0

Table 5.7: Table showing reasons for not considering cycling as a transport mode choice by students

Reason for not considering cycling	Percentage
Lack of cycling facilities	30.7%
Safety concerns	14.8%
Unfriendly weather condition	5.1%
Lack of incentives for cycling	8.8%
I don't know how to cycle	19.2%
Personal preference (e.g. I can afford a car)	4.6%
I consider cycling degrading (class feeling)	4.4%
Invalid	12.4%
Total	100.0

E. Reported measures to promote cycling as a transport mode

Respondents were also asked to suggest measure that could promote cycling as a transport mode within the university. For this question, respondents had the choice of selecting more than one improvement option. As shown in tables 5.8 and 5.9, the most desired improvement was *Dedicated and well maintained cycle lanes*. This measure had 53.5% among staff and 48.9% among students. The order of importance of other measures selected varied for staff and students. For staff, *Public awareness campaign on the benefits of cycling* was the second most important measure (having a percentage value of 44.4%), followed by *Improved safety measures* (39.5%), *Better road conditions* (33.3%) and *Safe storage and parking facilities for bicycles* (30.5%).

For the students, *Safe storage and parking facilities for bicycles* (at 41.6%) was the second most important measure, followed by *Better road conditions*, *Improved safety measures*, and *University-wide bike rental services* in that order. This variation in the level of important of various measures might relate to the difference in the characteristics of staff and students. For example, the importance attached to *Safe storage and parking facilities for bicycles* by students was more than that of the staff. Similarly, students wished that there would be *University-wide bike rental services* more than staff desired it. These differences arise as a result of the fact that staff had their private space (offices) within

the university while the students did not and might not be able to secure their bicycles. In addition, staff were in the working class and could afford to buy and own a bicycle while students did not earn money and would prefer rental services. Notwithstanding these differences, improved road condition, and improved safety measures were selected as important to both staff and students.

Table 5.8: Table showing suggested improvements by staff members

Suggested Improvement	Percentage
Dedicated and well maintained cycle lanes	53.5%
Safe storage and parking facilities for bicycles	30.5%
University-wide bike rental services	25.9%
Better road conditions (e.g., smoother surfaces, pothole repairs)	33.3%
Improved safety measures	39.5%
Public awareness campaign on the benefits of walking and cycling	44.4%

Table 5.9: Table showing suggested improvements by students

Suggested Improvement	Percentage (%)
Dedicated and well-maintained cycle lanes	48.9
Safe storage and parking facilities for bicycles	41.6
University-wide bike rental services	32.8
Better road conditions (e.g. smoother surfaces, pothole repairs)	39.7
Improved safety measures	36.0
Public awareness campaign on the benefits of walking and cycling	23.1

V. DISCUSSION

This study shows the transport modes in use in the university. It has shown that the university is a high traffic generator with about 95% and 60% of staff and students respectively depending on motorized modes for trips to and from the university. With respect to the staff, about 64.7% travelled to the university by private vehicles while only 29% made use of public transport. In the case of the students, the percentage of those who depended on private vehicles was low, being only 3.7%. However, over 56% of the students still adopted the use of motorized mode for trips which were mostly less than 2km in distance. This high reliance on motorized modes by students may likely be related to the problems mentioned regarding reasons why cycling would not be adopted: the absence of cycling infrastructure. Studies have shown that

students switch to motorized modes when walking and cycling infrastructure are not available [10, 13].

For trips within the university, it was shown that walking was widely used by the majority of staff and students, while a significant percentage of trips were still being made by motorized modes, especially with private vehicles, tricycles, and motorcycles. With universities moving towards more sustainable modes [10], it is believed that the share of motorized modes in use could be reduced. This is more so as staff who used private vehicles accounted for as much as 16%. Reference [14] noted that many universities are now discouraging car use and promoting active modes. Moreover, the longest travel distance within the university is below 2km. The use of active modes is thus very appropriate since the distances involved are relatively short. This is more so as [15] identified distances up to 2.6km as walking distance in their study. In addition, an untamed use of motorized modes can cause a reinforcing loop of more people switching to motorized modes. This is because, as more people use motorized modes, the street becomes less attractive for active modes, making more people to adopt motorized mode. This is what [13] found when they showed that street density increases the utility of cars and public transport while the provision of adequate sidewalk decreases the use of motorized modes.

Similarly, for trips considered fairly long in the university, cycling may be a better alternative to motorized modes. The survey however pointed out that cycling was very low in the university, being only 3.7% of students' trips to the university. It further showed that many respondents were not considering cycling as an option at all. Three main reasons were adduced for why cycling was not being considered. These were *Lack of cycling facilities*, *I don't know how to cycle*, and *Safety concerns* in that order. That lack of cycling facilities as a factor topped the list is important. References [10, 13] showed that infrastructural factors affect decisions on the use of active modes. Specifically, [16, 17, 18] showed that improvement in bicycle infrastructure increase the adoption of cycling. Similarly, traffic safety has been identified as critical for cycling [19, 20, 21]. However, *I don't know how to cycle* as a factor, is rare in the literature. This study finds this factor to be the second most important to the respondents, both staff and students. In the same vein, while unfriendly weather has been found to affect the adoption of active modes [22, 23, 24], this factor came fifth for both staff and students in the survey, coming behind factors such as *Lack of cycling facilities*, *I don't know how to cycle*, and *Safety concerns*. This might mean that the majority of the respondents were used to dealing with unfriendly weather condition, especially as they walked around under different weather condition within the university. By addressing the problems important to the respondents, cycling may be able to fill a gap suitable for it.

Finally, respondents provided information on measures that could be implemented to enhance cycling. The most

important measure identified was provision of dedicated and well maintained cycle lanes. This measure underlines the importance of the concern of both staff and students about cycle infrastructure provision and safety. This may also mean that the provision of cycling infrastructure would create awareness about cycling as a transport option as well as increase the sense of safety when cycling. This probably agrees with the second most important measure selected by staff members: *Public awareness campaign on the benefits of walking and cycling*. The prominence of this factor suggests that cycling was not well known in the university community. This is also reinforced by the fact that cycling was not being used by staff. This measure was, however, not treated as important to the students as it ranked last in their order of measures required to improve cycling.

For the students, *Safe storage and parking facilities for bicycles* was the second most important measure. The fear of bicycle theft [25] have been reported in the literature to affect the adoption of cycling by students. This was followed by *Better road conditions*, a measure that is very similar to the most important for the two groups of respondents. Furthermore, students expressed concerns about the need for a *University-wide bike rental services*. Not owning a bicycle [18, 26] has been reported in the literature to affect the adoption of cycling by students. Addressing these factors may therefore open a new chapter for trips to, from and within the university and establish cycling as a transport mode.

VI. CONCLUSION

Universities are high generators of transport-related GHG emissions [10]. This study has shown that Ekiti State University, Ado Ekiti staff and students depended on motorized modes to a relatively large extent for trips to the university. It was shown that many of the journeys that could be made by walking and cycling were being made by motorized modes. This shows that the university had a unique opportunity to pursue sustainability goals. Nevertheless, it was shown that both staff and students employed active modes significantly in their intra campus trips, particularly walking. It thus points out that the percentage of staff and students using motorized modes can be reduced if appropriate measures are put in place to further encourage sustainable modes. With emphasis on cycling, many of the trips using motorized modes can switch to cycling as the distances involved were within cycling range. The study identifies why cycling is not in use currently and what should be done to enhance the uptake of cycling. It identifies problems such as lack of cycling facilities, inability to ride a bicycle, and safety concerns as the main discouraging factors. By looking at these problems and addressing them, cycling may become more known in the university, improve the uptake of active modes, and reduce the use of motorized modes. To promote cycling, the following actions are recommended: i) publicity/ awareness on cycling and its benefits; ii)

provision of cycling infrastructure, including lanes, parking, and rental services; and iii) incentivizing the use of bicycles. It is also important to support walking by improving pedestrian infrastructure in general. The findings from this study can be adopted to design policies that can more effectively promote active modes and bring their benefits to bear within the university community. The measures recommended will, nevertheless, need to be subjected to further testing in future research.

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