

User Experiences on the Integration of Non-Motorised Transport in Public Transport Systems: a Case of the Harambee Bus Rapid Transit

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1 ABSTRACT

The transportation industry is the leading contributor to greenhouse gas emissions and there is a need for more sustainable forms of public transportation in cities. Non-motorised transport (NMT) includes walking, cycling, animal drawn transportation, skating and so forth. With an increasing demand of public transportation and convenience, more cities around the world look towards the integration of NMT into public transportation systems. Accessibility, infrastructure, safety and sustainability are four core components when integrating NMT and public transport, however, very little is known around performances of innovative transport systems in meeting the needs of users/commuters. A case study research design using the case of the Harambee bus rapid transit (BRT). The study adopted qualitative and quantitative research approaches. Data collection instruments in the form of survey questionnaires and participant observations were used to gather from commuters. The four core components of accessibility, infrastructure, safety and sustainability were identified. It was found majority of Harambee BRT and NMT trips are work related. Most Harambee BRT users utilise the provided NMT, and the majority of trips start and end in Thembisa. Aspects of accessibility and sustainability of the NMT had positive user experiences. User experiences around safety and infrastructure of the NMT had shortcomings with camera provision, patrolling of guards, a desk to report issues, barriers between road users, water and shelter provision. More urban planning research around the functions and standards of BRT and NMT users need to be carried out and a model needs to be designed using these results to assist planners and policy makers when implementing similar projects.

Keywords: public transport, non-motorised transport, accessibility, safety, infrastructure

2 INTRODUCTION

The need for sustainable public transport development is constantly growing. Sustainable transportation lessens environmental impacts and ensures that future generations are able to fulfil their own needs. One of the most important sustainable modes of transport is non-motorised transport (NMT). NMT will have to be adopted in South Africa due to the increase in population (Okoro and Lawani 2022). According to Salleh, Rahmat and Ismail (2014: 290), in order to influence a modal shift to NMT, the following five areas of improvement are required, “improved convenience and comfort for NMT users; improved transport options; building up attractive and liveable communities; improved basic mobility for nondrivers; and improved land-use efficiency”. Studies show the implementation of NMT and technology in transport has proven to not only improve economic development but also increases mobility (Okoro and Lawani 2022). Ekurhuleni has implemented a bus rapid transit (BRT) system which also has NMT infrastructure to connect users to various BRT stations.

Therefore, the paper starts off by identifying the different facets of NMT in PT. It then goes on to investigate South Africa’s Harambee BRT and NMT user experiences and behaviours. Finally, it draws on these experiences to state the implications on urban planning.

3 LITERATURE REVIEW

3.1 Accessibility

The traditional definition of accessibility according to Orellana et al. (2020: 3) is, “the access level of people to jobs and services given their spatial location and transportation options”. This understanding of access referred to urban and transportation planning. The four components that this definition encompassed were: land-use, transportation, temporal components, and individual characteristics. For the past few decades, these components have influenced accessibility models. This view of accessibility somehow overlooks or excludes

certain groups because of physical, economic and social conditions (Orellana et al. 2020: 3). The inclusive cities paradigm proposes universal access for all which means that every person should have a right to go wherever they want whenever they want to. It is about cities allowing people to live freely through walking, cycling or using a wheelchair. Universal access in cities is accepted globally in order to include people with disabilities. There are many theoretical studies covering the paradigm, however, though universal access designs might not add much to the total cost of projects, there is still a lack of practical implementation in urban and architectural designs (Orellana et al. 2020: 3).

3.2 Infrastructure

NMT infrastructure is one of the most integral components of an efficient transport system which leads to mobility and accessibility to everyday opportunities (Okoro and Lawani 2022: 68). Besides this, the provision and the upgrading of the NMT infrastructure comes along with many benefits such as the reduction in healthcare costs, the prevention of numerous diseases, improved wellbeing and increased life expectancy. This leads one to believe that the NMT infrastructure is an investment. Okoro and Lawani (2022: 68) go on to state that a sustainable NMT infrastructure has many environmental benefits which lessen the impacts of transport developments and provide a cleaner and healthier environment for an improved quality of life. Traditionally, key performance indicators for road transport infrastructure were determined using technical measures such as structural integrity, visual appearance and functional performance. Okoro and Lawani (2022: 68) believe that NMT users should be included in surveys. NMT infrastructure is considered sustainable when it benefits the functionality of the city, improves environmental impacts, contributes to the improved health of users, the enhancement of infrastructure, increased traffic calming measures and the reduction of related injuries and accidents (Okoro and Lawani 2022: 68).

Pedestrians find the journey of a trip just as important as the destination which is why it is imperative that an integrated pedestrian network is created. This should be attractive enough for pedestrians so that they use NMT to either access these pedestrian facilities or use them as a point or link connecting them to their destination. Cyclist facilities must provide smooth trips which refers to a dedicated space for cyclists at a safe distance away from motorists and pedestrians. The trip should have few stops, and barriers and any other hinderances need to be minimised to save time, effort and energy when cycling (Kamundu 2019: 29-30). Amenities should be provided to make pedestrian and cyclist trips a little easier and comfortable. These include seating, shelter, recreational open spaces, water provision (taps/fountains) and even signage (Kamundu 2019: 29-30).

3.3 Safety

The two aspects that can refer to safe NMT are protection from crime and being protected from accidents or injury. Crime is one of the main deterrents of NMT use, because private motorised vehicles and public transport are seen as more safe and secure modes of transportation. It is not the direct responsibility of planners to solve the issue of crime in relation to NMT, however, these solutions are required for the effective usage of NMT both during the day and specifically at night. Though planners can use various design principles to promote overall safety (Becker 2011: 10). NMT users, specifically pedestrians, are the most vulnerable in motor vehicle accidents due to their lack of protection (Venter 2017: 643). NMT users are also at risk of injury when private vehicle users approach at higher speeds, motorists under the influence of alcohol, and poor bicycle conditions. The issue of high speeds can be solved by enforcing a speed limit when approaching NMT users, strict laws, education and consistent controls in place to deal with drivers under the influence of alcohol. Poor bicycle conditions can be dealt with through bicycle users wearing reflector vests where lights are unavailable (Becker 2011: 9-10).

3.4 Sustainability

The traditional definition of sustainability according to White (2013: 213) is “development which meets the needs of the present without compromising the ability of future generations to meet their own needs”. This definition’s main focus is on health and community (Figure 14). It can also be noted that this is a form of “negative sustainability”, in that it seeks to keep the system going through the reduction of harmful actions (James and Magee 2016: 3). This form of sustainability just seeks to reduce negative effects of previous development or human practice that might affect the future. James and Magee (2016: 3) define “positive

sustainability” as, “practices and meanings of human engagement that make for life worlds that project and support ongoing natural and social flourishing”.

4 METHODOLOGY

Survey research participants were those that utilise the Harambee BRT and were chosen at random. Convenience sampling was used and data collection occurred along the route of the four different terminals as well as inside Harambee BRT buses and various stops along the Harambee BRT which were the Thembisa Hospital, Diesel, OR Tambo International Airport (ORTIA) and Airports Company of South Africa (ACSA) Super South. The sample size was 50 participants per day over four days at each terminal respectively. This study utilised survey questionnaire sheets which were administered face-to-face. The questionnaires consisted of closed-ended and multiple-choice questions. The questions pertained to user experiences of the Harambee BRT and NMT. The researcher, while conducting the survey research became an observer as a participant as terminals were not as busy. Research was then conducted at terminals and along the routes of the Harambee BRT in order to observe the entire experience. The researcher was able to interact with Harambee BRT users and get valuable information and insights that were not necessarily on survey questionnaires. Cross tabulations were used to analyse survey data. The data quantified responses from Harambee BRT users and provided accurate statistics on how feasible the provision of NMT actually was with the Harambee BRT.

Participant observations utilised random, convenience sampling. Participants were users of the Harambee BRT and were chosen at random and could participate if they were willing to be observed. Three participants per location, per day (Thembisa Hospital, ORTIA, ACSA Super South and Diesel) were chosen at random. There were a total of 12 participants who were observed. A thematic analysis approach was applied to the data obtained from participant observations and stakeholder interviews. Themes around participant observations were used to support and contrast user experiences relating to accessibility, infrastructure, safety and sustainability.

5 RESULTS

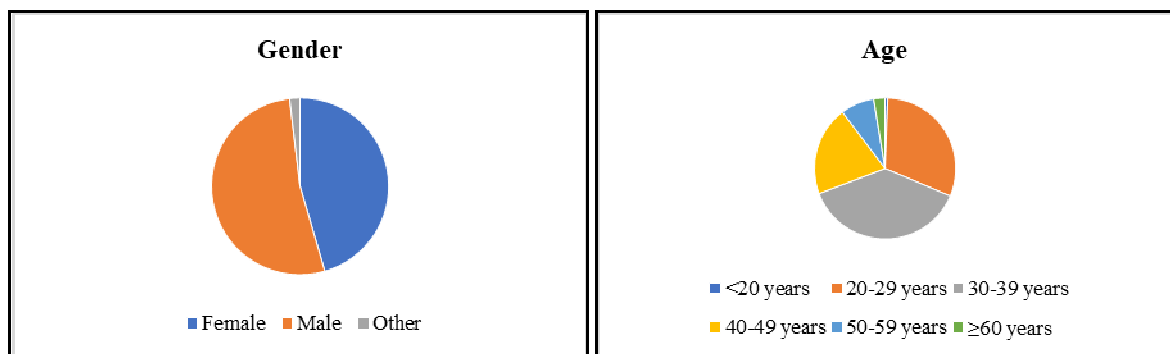
5.1 Introduction

The results explore user experiences based on a survey analysis, and participant observations then act as a support for user experiences. The discussion ties the overall results into one another and draws on previous studies of this nature to make valuable conclusions.

5.2 Surveys

5.2.1 Personal data

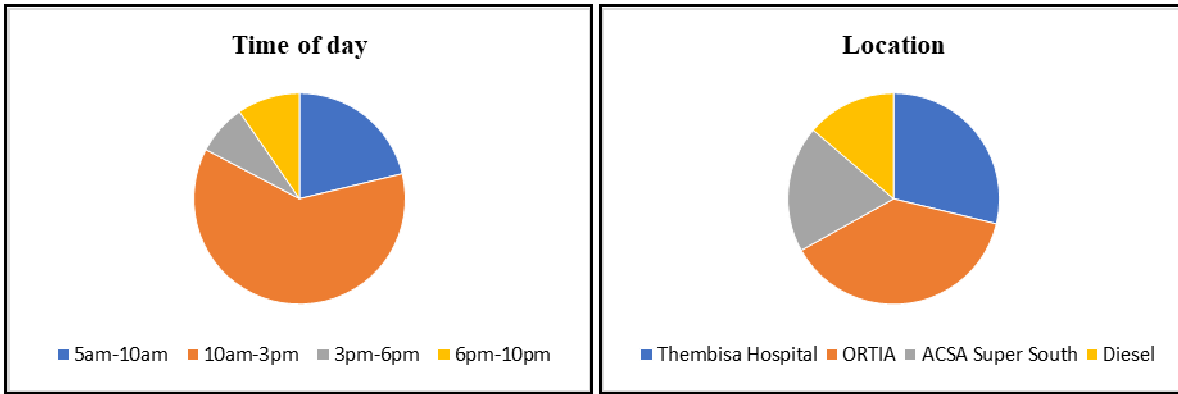
There were a total of 156 participants of which there were; 71 (45,5%) females, 82 (52,6%) males and 3 (1,9%) participants who identified as other (Graph 1).



Graph 1 (left): Gender of participants. Graph 2 (right): Age of participants

Of the total 156 participants, there was 1 (0,6%) participant less than 20 years; 48 (30,8%) participants 20 to 29 years; 59 (37,8%) participants 30 to 39 years; 32 (20,5%) participants 40 to 49 years; 12 (7,7%) participants 50 to 59 years and 4 (2,6%) participants 60 years and older (Graph 2).

The time of day that each survey took place was 33 (21,2%) surveys between 5am-10am; 96 (61,5%) surveys between 10am-3pm; 12 (7,7%) surveys between 3pm-6pm; and 15 (9,6%) surveys between 6pm-10pm (Graph 3).



Graph 3 (left): Time of day. Graph 4 (right): Location

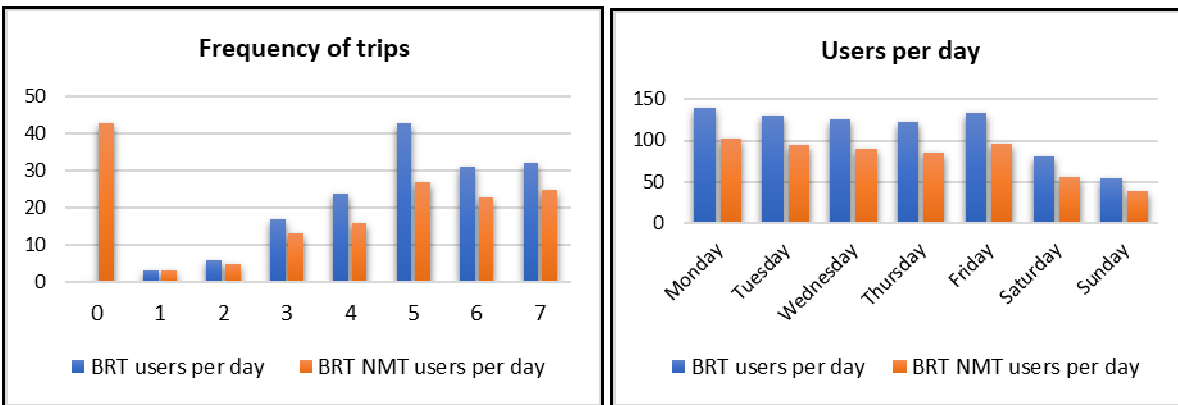
The locations where each survey took place were 42 (29,6%) surveys at Thembisa Hospital; 61 (39,1%) surveys at ORTIA; 31 (19,9%) surveys at ACSA Super South and 22 (14,1%) at Diesel (Graph 4).

5.2.2 Harambee BRT and NMT statistics

All participants are users of the Harambee BRT. It was found that of the 156 BRT users, there were 112 (71,8%) who utilised the provided NMT, and 44 (28,2%) BRT users did not use the provided NMT.

Frequency of Harambee BRT and NMT trips per week

Of the 156 participants that use the Harambee BRT, there were 3 (1,9%) participants which use the BRT once a week; 6 (3,8%) participants which use the BRT twice a week; 17 (10,9%) participants which use the BRT three times a week; 24 (15,4%) participants which use the BRT 4 times a week; 43 (27,6%) participants which use the BRT 5 times a week; 31 (19,9%) participants use the BRT 6 times a week and 32 (20,5%) participants who used the BRT 7 times a week (Graph 5).



Graph 5 (left): Number of days a week Harambee BRT and NMT used. Graph 6 (right): Days of the week that the Harambee BRT and NMT are taken.

Of the 155 responses, 43 (27,7%) participants use the Harambee BRT NMT 0 days in the week; 3 (1,9%) use the NMT 1 day a week; 5 (3,2%) use the NMT 2 days a week; 13 (8,4%) use the NMT 3 days a week; 16 (10,3%) use the NMT 4 days a week; 27 (17,4%) use the NMT 5 days a week; 23 (14,8%) use the NMT 6 days a week and 25 (16,1%) use the NMT every day in the week (Graph 5).

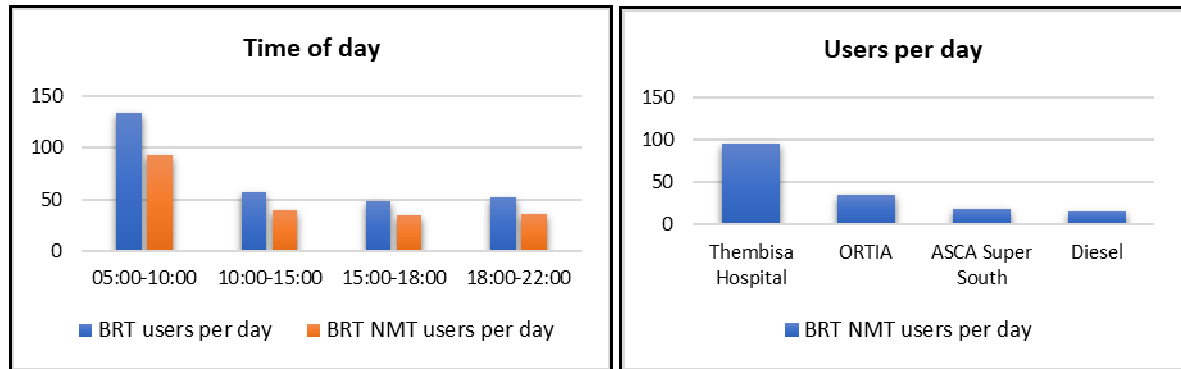
Days of the week that the Harambee BRT and NMT are taken

Of the 156 participants that use the Harambee BRT, there were; 140 (89,7%) participants which use the BRT on a Monday; 131 (84%) participants which use the BRT on a Tuesday, 126 (80,8%) participants which use the BRT on a Wednesday; 123 (78,8%) of participants which use the BRT on a Thursday; 133 (85,3%) participants which use the BRT on a Friday; 80 (51,3%) participants which use the BRT on a Saturday and 54 (34,6%) participants which use the BRT on a Sunday (Graph 6).

Of the 112 participants that use the Harambee BRT NMT, there were 103 (92%) participants which use the NMT on a Monday; 95 (84,4%) participants which use the NMT on a Tuesday; 90 (80,4%) participants which use the NMT on a Wednesday; 85 (75,9%) participants which use the NMT on a Thursday; 96 (85,7%) participants which use the NMT on a Friday; 56 (50%) participants which use the NMT on a Saturday and 39 (34,8%) participants which use the NMT on a Sunday (Graph 6).

Time of day that Harambee BRT and NMT are used

Of the 156 participants that use the Harambee BRT; there were 134 (85,9%) participants who use the BRT between 05:00-10:00; 57 (36,5%) participants use the BRT between 10:00-15:00; 48 (30,8%) participants use the BRT between 15:00-18:00 and 52 (33,3%) participants use the BRT between 18:00-22:00 (Graph 7).



Graph 7 (left): Time of day that Harambee BRT and NMT are used. Graph 8 (right): Location of NMT use.

Of the 112 participants that use the Harambee BRT NMT; there were 93 (83%) participants who use the NMT between 05:00-10:00; 40 (35,7%) participants use the NMT between 10:00-15:00; 35 (31,3%) participants use the NMT between 15:00-18:00 and 36 (32,1%) participants use the NMT between 18:00-22:00 (Graph 7).

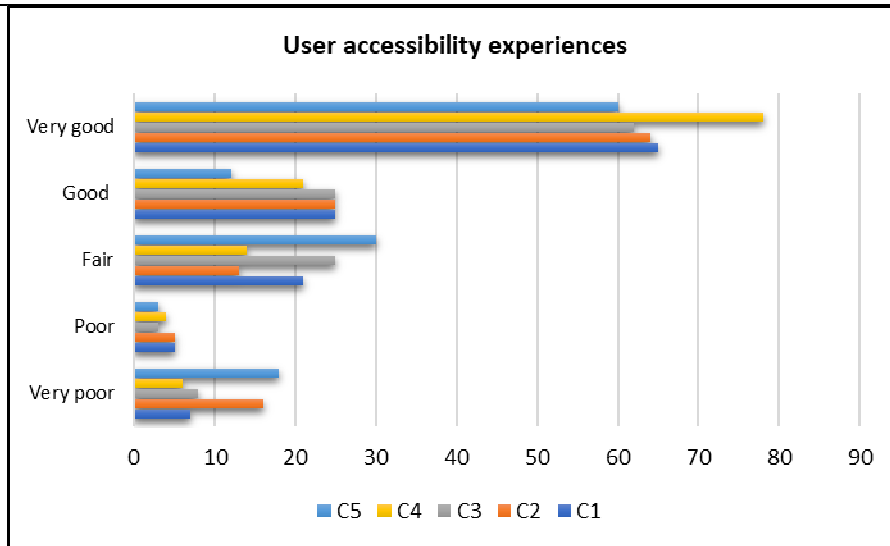
Location of NMT use

The locations of users per day were 96 users at Thembisa Hospital; 35 users at ORTIA; 19 users at ASCA Super South and 15 users at Diesel (Graph 8).

5.2.3 Accessibility of NMT

Participants were asked to rate how they felt about the purpose of their NMT trips (Graph 9: C1) in terms of whether or not the NMT was taking them to work, malls, hubs, etc. (somewhere of purpose). Of the 123 participants; 7 (5,7%) find the purpose of Harambee BRT NMT trips to be very poor; 5 (4,1%) find it poor; 21 (17,1%) find it fair; 25 (20,3%) find it good, and 65 (52,8%) find it very good. The provisions of which enable commuters to utilise the Harambee BRT NMT (ramps, signs, etc) were surveyed. Of the 123 participants, 16 (13%) find the provisions which enable all to use the Harambee BRT NMT very poor; 5 (4,1%) find it poor; 13 (10,6%) find it fair; 25 (20,3%) find it good, and 64 (52%) find it very good (Graph 12: C2). Participants feelings towards the fluidity of the Harambee BRT NMT in terms of the number of breaks in the NMT and whether or not they had to utilise other modes of transport were recorded (Graph 12: C3). Of the 123 participants, 8 (6,5%) find the overall fluidity of the Harambee BRT NMT to be very poor; 3 (2,4%) find it poor; 25 (20,3%) find it fair; 25 (20,3%) find it good; and 62 (50,4%) find it very good.

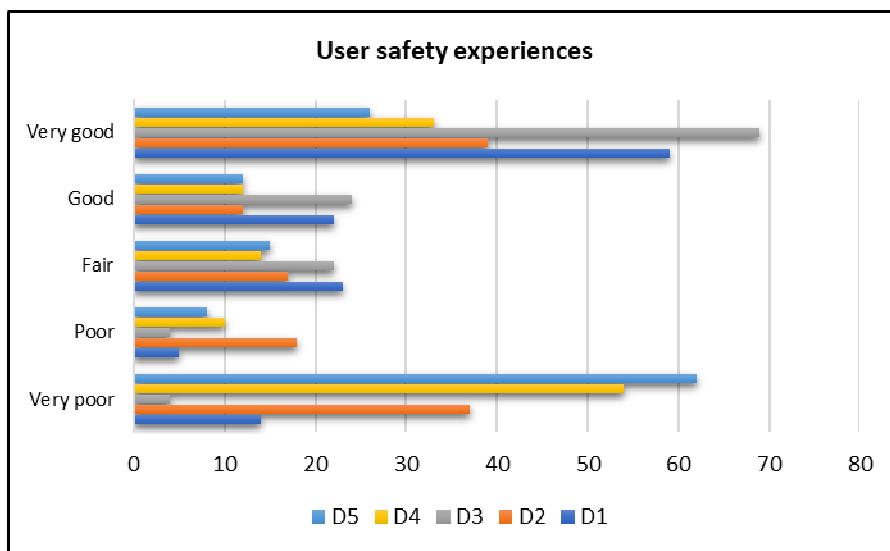
The Harambee BRT NMTs pick-up and drop-off points ease of accessibility were surveyed among users (Graph 9: C4) and of the 123 participants 6 (4,9%) find the pick-up and drop-off points accessibility of the Harambee BRT NMT very poor; 4 (3,3%) find it poor; 14 (11,4%) find it fair; 21 (17,1%) find it good and 78 (63,4%) find it very good. Participants shared their experiences of Harambee BRT NMT trip lengths with short trips being positive and long trips being negative (Graph 12: C5). Of the 123 participants; 18 (14,6%) find the Harambee BRT NMT trip lengths very poor; 3 (2,4%) find it poor; 30 (24,4%) find it fair; 12 (9,8%) find it good and 60 (48,8%) find it very good.



Graph 9: User accessibility experiences

5.2.4 Safety of NMT

The amount of lighting along the Harambee BRT NMT was surveyed among participants (Graph 10: D1) and of the 123 participants; 14 (11,4%) find the lighting along the Harambee BRT NMT very poor; 5 (4,1%) find it poor; 23 (18,7%) find it fair; 22 (17,9%) find it good and 59 (48%) find it very good. Participants’ experiences in terms of the patrolling of security guards; whether it be on foot or in patrol vehicles at Harambee BRT NMT was recorded (Graph 13: D2). Of the 123 participants; 37 (30,1%) find patrolling of security along the Harambee BRT NMT very poor; 18 (14,6%) find it poor; 17 (13,8%) find it fair; 12 (9,8%) find it good and 39 (31,7%) find it very good. The overall layout of the Harambee BRT NMT in terms of whether corners are visible, and the layout is practical was measured (Graph 13: 3). Of the 123 participants; 4 (3,3%) find the overall layout of the Harambee BRT NMT very poor; 4 (3,3%) find it poor; 22 (17,9%) find it fair; 24 (19,5%) find it good and 69 (56,1%) find it very good.

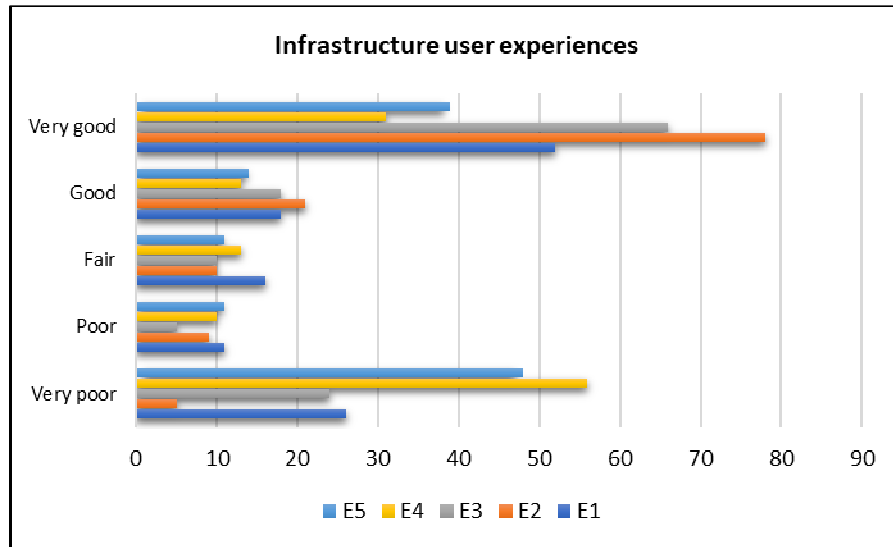


Graph 10: User safety experiences

The prevalence of self-help desks available (Graph 10: D4) to Harambee BRT NMT users reported that; of the 123 participants; 54 (43,9%) find the availability of self-help desks at the Harambee BRT NMT very poor; 10 (8,1%) find it poor; 14 (11,4%) find it fair; 12 (9,8%) find it good and 33 (26,8%) find it very good. Harambee BRT NMT users expressed their experiences on the number of cameras provided along the NMT route (Graph 13: D5). Of the 123 participants; 62 (50,4%) find the number of cameras provided along the Harambee BRT NMT very poor; 8 (6,5%) find it poor; 15 (12,2%) find it fair; 12 (9,8%) find it good and 26 (21,1%) find it very good.

5.2.5 Infrastructure of NMT

In terms of the number and quality of seating and rest stops provided at the Harambee BRT NMT (Graph 11: E1); it was reported of the 123 participants that 26 (21,1%) find the number and quality of seating and rest stops at the Harambee BRT NMT very poor; 11 (8,9%) find it poor; 16 (13%) find it fair; 18 (14,6%) find it good and 52 (42,3%) find it very good. Participants were asked about the materials used on the Harambee BRT NMT paving and whether or not it is compatible for NMT use (Graph 14: E2). Of the 123 participants; 5 (4,1%) find it very poor; 9 (7,3%) find it poor; 10 (8,1%) find it fair; 21 (17,1%) find it good and 78 (63,4%) find it very good. The quality of the barrier separating motorists and Harambee BRT NMT users was investigated (Graph 14: E3). Of the 123 participants; 24 (19,5%) find the quality of the Harambee BRT NMT barrier very poor; 5 (4,1%) find it poor; 10 (8,1%) find it fair; 18 (14,6%) find it good and 66 (53,7%) find it very good.



Graph 11: User infrastructure experiences

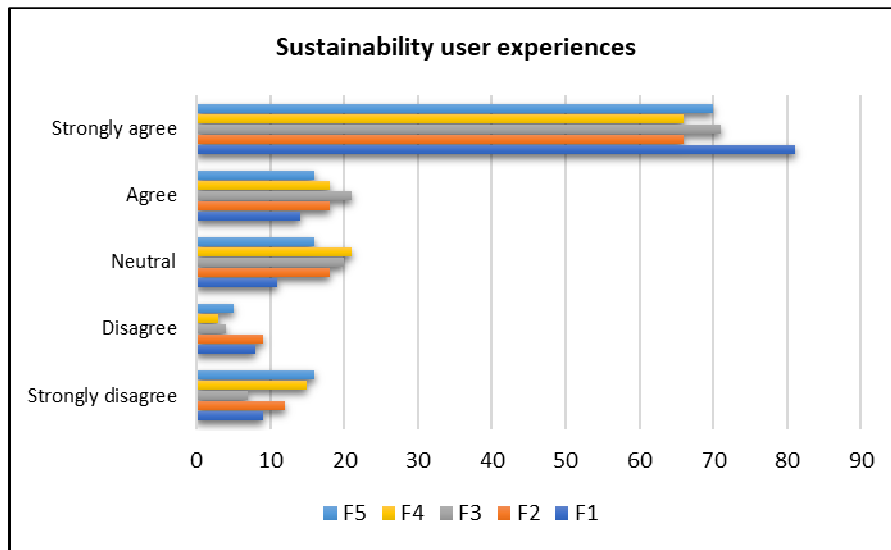
The provision of water at Harambee BRT NMT rest stops was surveyed and participants expressed their experiences (Graph 11: E4). Of the 123 participants; 56 (45,5%) find the provision of water at Harambee BRT NMT rest stops very poor; 10 (8,1%) find it poor; 13 (10,6%) find it fair; 13 (10,6%) find it good and 31 (25,2%) find it very good. Participants were surveyed on the provision of shelter along the Harambee BRT NMT (Graph 14: D5) and it was reported, of the 123 participants; 48 (39%) find the provision of shelter along the Harambee BRT NMT very poor; 11 (8,9%) find it poor; 11 (8,9%) find it fair; 14 (11,4%) find it good and 39 (31,7%) find it very good.

5.2.6 Sustainability of NMT

The monetary benefits from using the Harambee BRT NMT were investigated (Graph 12: F1). Of the 123 participants; 9 (7,3%) participants strongly disagree with receiving monetary benefits from using the Harambee BRT NMT; 8 (6,5%) participants disagree; 11 (8,9%) participants are neutral; 14 (11,4%) participants agree, and 81 (65,9%) participants disagree. Participants were surveyed on the health benefits of using the Harambee BRT NMT (Graph 15: F2). Of the 123 participants; 12 (9,8%) participants strongly disagree with receiving health benefits through the use of the Harambee BRT NMT; 9 (7,3%) participants disagree; 18 (14,6%) participants are neutral; 18 (14,6%) participants agree, and 66 (53,7%) participants disagree. In terms of the environmental benefits of using the Harambee BRT NMT, it was reported, of the 123 participants; 7 (5,7%) participants strongly disagree with there being environmental benefits through the use of the Harambee BRT NMT; 4 (3,3%) participants disagree; 20 (16,3%) participants are neutral; 21 (17,1%) participants agree, and 71 (57,7%) participants disagree.

Participants were asked whether there would be a reduction in motorised vehicle usage through the use of the Harambee BRT NMT (Graph 12: F4). Of the 123 participants; 15 (12,2%) participants strongly disagree with reduction in motorised vehicle usage through the use of the Harambee BRT NMT; 3 (2,4%) participants disagree; 21 (17,1%) participants are neutral; 18 (14,6%) participants agree, and 66 (53,7%) participants strongly agree. Participants were asked to rate how they felt about the Harambee BRT NMT use aiding in

climate change mitigation and of the 123 participants; 16 (13%) participants strongly disagree that the Harambee BRT NMT use aids in climate change mitigation; 5 (4,1%) participants disagree; 16 (13%) participants are neutral; 16 (13%) participants agree, and 70 (56,9%) participants disagree.



Graph 12: User sustainability experiences (Source: Author 2022)

5.3 Participant Observations

5.3.1 Participant details

There were 12 participants who were observed, 3 at Thembisa Hospital, 3 at ORTIA, 3 at ACSA Super South and 3 at Diesel.

The gender of the participants was chosen at random, 6 females and 6 males.

The age distribution of participants was between 20-29 years, 5 between 30-39 years, 4 between 40-49 years and 1 participant over the age of 60 years.

The time of day that participants were observed was, 3 between 05:00-10:00; 3 between 10:00-15:00; and 6 between 15:00-18:00. The 3 participants between 05:00-10:00; and 3 between 10:00-15:00 were observed from Thembisa Hospital and ORTIA respectively as the Harambee BRT runs more frequently the entire day to and from both locations, whereas the 6 participants between 15:00-18:00 were observed from ACSA Super South and Diesel because the Harambee BRT only runs through these locations in the morning and afternoon.

5.3.2 Thembisa Hospital

Purpose of trip: All 3 participants were using the BRT to get to different locations, while 2 participants were using the BRT from Thembisa Hospital to get to work (ORTIA and Alex Shopping Centre) and mentioned that they only use the BRT for work purposes. The 1 participant uses the BRT.

Safety: Out of the 3 participants, 2 mention the safety of the NMT, both of these think that there is sufficient lighting, however, only 1 finds that patrolling of security is frequent.

Harambee BRT: 1 participant states that there is not access to stations (stations are closed) and 1 gets a lift home after using the BRT so this participant is not aware of whether or not the stations are inaccessible.

Harambee BRT NMT: 1 participant uses the NMT for health reasons, 2 use the NMT because it is free, and 1 participant uses the NMT because they are elderly and the paving used on the NMT lane is easy on the participant to walk on.

Payment: 2 participants use the Ekucard because it is cashless, however, 1 participant forgets to check the balance on their Ekucard and 1 just buys tickets as the concept of the Ekucard is difficult.

5.3.3 ORTIA

Purpose: All 3 participants were leaving work (ORTIA) to go home, 1 only uses the Harambee BRT for work purposes, 1 only uses the NMT when using the Harambee BRT and 1 only uses the NMT sometimes as this participant has a permanent leg injury.

Safety: All 3 participants feel that the NMT is safe and has sufficient lighting and patrolling, however, 1 participant only feels unsafe when cars try to use the NMT lane.

Harambee BRT: 1 participant uses the Harambee BRT because it is always on time and buses frequent the route/stop, 1 uses the Harambee BRT because it is affordable (cheap) and 1 makes mention that they have not used the Harambee BRT rest stops (located at stations).

Harambee BRT NMT: 2 participants use the NMT for health reasons, 1 mentions that they have to still take a taxi home after using the NMT, while another lives close by, and the NMT takes the participant straight home, 1 participant notes that the NMT paving is good/suitable.

Payment: 2 participants only use the Ekucard because going cashless makes them feel safe and 1 uses the Ekucard but says it is hard to remember to load money onto it, so the participant resorts to buying tickets.

5.3.4 ACSA Super South

Purpose: All 3 participants use the Harambee BRT NMT for work from Emperors Palace to home. All 3 state that they only use the Harambee BRT for work purposes only.

Safety: All 3 participants feel that there is not enough lighting and 2 state that they do not see patrol vehicles.

Harambee BRT: 1 participant uses the Harambee BRT because it is cheap, 1 reports that the Harambee BRT rest stops are always closed and 1 mentions a lack of seating. 2 were anxious waiting for the bus to arrive because of the lack of lighting and the fact that buses are not as frequent and 1 does not mind waiting for the Harambee BRT because the participant has a friend to wait with for the bus.

Harambee BRT NMT: 2 participants still need a lift home after using the Harambee BRT NMT because they live quite far away; 1 uses the NMT for convenience and 1 uses the NMT because it is free and helps the environment.

Payment: All 3 participants use the Ekucard to avoid waiting in lines during the morning rush to buy tickets.

5.3.5 Diesel

Purpose: All 3 participants use the Harambee BRT for work and were going from a trucking company, foundry and logistics company in Isando.

Safety: All 3 participants feel that there is not enough lighting, 2 note that there are no patrol vehicles and 1 has heard of a mugging and does not see many other women in the area which is why the participant does not use the NMT.

Harambee BRT: 1 participant uses the BRT because it is reliable and on time, 1 feels that the Harambee BRT is cheaper than other modes of transport, however, 1 notes that using a taxi is cheaper and drops the participant closer to home. 1 needs a lift from the Harambee BRT stop because the participant lives too far away from the nearest stop. 1 participant notes that the Harambee BRT stops do not have shelters, while 2 do not mind waiting for the Harambee BRT; however, 2 participants fear getting mugged waiting for the BRT when it gets later/darker.

Harambee BRT NMT: 2 participants feel safe enough to use the NMT, 1 thinks that the NMT is convenient for the participant's taxi to fetch them from the stop. 1 does not use the NMT because the participant heard about a mugging, so the participant gets a lift home from the Harambee BRT station.

Payment: 2 participants use their Ekucards because they feel safer not buying tickets and carrying money to buy tickets, while 1 prefers to buy tickets whenever the participant requires it as they are not a frequent user.

6 DISCUSSION

The results from both the user experiences and participant observations are further analysed and conclusions drawn below. Each theme is further broken down and discussed with the aid of contrasting or similar case studies.

6.1 Participant demographics

The gender split of participants was reasonable with their just being 11 more males (82) than females (71) and 3 participants who identify as other. Due to there being a negligible difference in the numbers, results obtained represent all genders fairly. It can be deduced that the 20-49 years' age bracket use the Harambee BRT (participant observations support this with majority of participants using the BRT for work purposes), with a sizable number of users over 50 years (10,3%) and the lowest number coming from the under 20 years' age bracket. The majority of surveys took place between 5am-3pm, while the least number of surveys were done between 3pm-6pm. The aim of the study was to survey around 50 participants per location, however, ORTIA and Thembisa Hospital saw the largest number of participants (103) and ACSA Super South and Diesel saw the lowest number (53).

6.2 Harambee BRT and NMT use

There were 156 Harambee BRT users surveyed. Of this, it was found that 112 BRT users also use the Harambee BRT NMT and only 44 do not. The highest number of days in a week that the Harambee BRT is used ranges from 5-7 days and the lowest ranges from 1-4 days. The highest number of days in a week that the Harambee BRT NMT is used is 0 days, then ranging from 5-7 days and the lowest ranges from 1-4. Both the Harambee BRT and NMT see the highest number of users between Monday-Friday, with the lowest number being over the weekend which is Saturday and Sunday. Participant observations corroborate with results, as most trips are work related (majority Monday-Friday). The reason for majority of trips being work related could be that majority of students attend universities in neighbouring municipalities (City of Tswane and City of Johannesburg) as Ekurhuleni is yet to open its first university which is still under construction. The highest number of Harambee BRT and NMT trips occur between 5am-10am, while, 10am-10pm has around the same low number of users. The highest number of participants use the NMT in Thembisa, followed by ORTIA, ACSA Super South and Diesel. Participant observations suggest that the majority of trips start and end in Thembisa which supports the results obtained.

6.3 Accessibility

User experiences indicate that the majority find the overall accessibility of the NMT to be 'very good' in terms of the NMT providing purpose trips, ramps and other provisions to accommodate all users, such as the fluidity of the NMT, accessible pick-up and drop-off points and trip length. Participant observations also corroborate with this response in that a user over the age of 65 years, states that the paving used in NMT walkways is much easier to walk on. In support of this finding, a study in Zaragoza, Spain, states that the elderly (>65 years old) are less likely to walk as much as those younger (<65 years old) which excludes older users. However, in the case of the Harambee BRT NMT, paving plays an important role in increased NMT use by older users (Arranz-López et al. 2019: 644-649).

6.4 Safety

User experiences were quite mixed in terms of safety, with lighting and the overall layout of the Harambee BRT NMT appearing to be 'very good'. However, the patrolling of security was almost split between two extremes of 'very good' and 'very poor'. User experiences were 'very poor' for the provision of self-help desks to report issues and cameras at multiple locations of the NMT. Observations indicate that the aspect of safety is different depending on the areas. For example, Thembisa Hospital and ORTIA seem to have no issues with safety, however, at ACSA Super South and Diesel, all participants raised issues of safety concerns. A study undertaken in China found that crime affects the number of users willing to use NMT, but China then adopted the system of guanxi to try and remedy the situation (Day 2016: 313-315).

6.5 Infrastructure

User experiences seem to indicate that the seating and rest stops provided, paving and barriers separating the NMT from the roadway are 'very good'. The majority of users find the water provision at rest stops and shelter provision 'very poor'. However, a considerable number feel that the seating and rest stops provided are 'very poor' and shelter provision 'very good'. Users expressed the opinion that they have not yet been able to access seating and shelter at Harambee BRT stations as they remain closed and under construction. This result is supported by two studies, one in Rajkot, Vizag and one in Minneapolis, United States of America both conclude that there is increased NMT use when there is an improvement in NMT

infrastructure (Tiwari, et al. 2016: 289-290; Hankey et al. 2012: 315). Participants do find the usage of Ekucards to make using BRT services seamless going straight from using the NMT into buses without having to wait for tickets.

6.6 Sustainability

User experiences found that participants ‘strongly agree’ with the monetary benefits from using the NMT, health benefits from using the NMT, environmental benefits from using the NMT, reduction in the use of private motorised transport and climate change mitigation. Participant observations corroborate survey results, as the most common themes around the use of the Harambee BRT NMT is because it is free, and participants feel that walking/cycling makes them healthier. A case study was made of Italian cities during the COVID-19 pandemic. This found that allocating space to walking and cycling (sustainable mobility) with social distancing protocols led to the promotion of active lifestyles which proved to be very successful and changed the way urban spaces are planned (Barbarossa 2020: 17).

7 CONCLUSION

Given the fact that majority of BRT users make use of the provided NMT, it can be deduced that planners are to incorporate NMT into their public transport plans not just exclusively to BRT plans. It proves that integrated public transport networks can work if executed strategically and considering user experiences of a working project. Urban planners need to address certain aspects around safety (camera provision, patrolling and help desks) and infrastructure (barriers protecting NMT users from motor vehicles and shelter provision) when implementing such projects. More urban planning research around the expectations of BRT and NMT users need to be carried out and a model needs to be designed using these results to assist planners and policy makers when implementing similar projects.

It can be concluded that a lot of the Harambee BRT and NMT trips are work related. Most Harambee BRT users utilise the provided NMT, and the majority of trips start and end in Thembisa. When looking at the accessibility aspect of the Harambee BRT NMT, users were very happy with the provisions in place to make the NMT accessible to all. They were, however, pleased with some aspects such as the amount of lighting provided and layout of the NMT, but displeased with aspects such as camera provision, patrolling of guards and a desk to report issues. Users found infrastructure such as seating and paving along the NMT to be excellent, however, some found the barriers protecting them from road users, water and shelter provision were not up to standard. Harambee BRT NMT users found the aspect of sustainability to be positive when using the NMT. Further research exploring the urban fabric and trip purposes could provide valuable insight into travel behaviour of participants.

8 REFERENCES

- ARRANZ-LÓPEZ, A., SORIA-LARA, J.A., WITLOX, F. AND PÁEZ, A: Measuring relative non-motorised accessibility to retail activities. *International Journal of Sustainable Transportation*, 13(9), pp.639-651, 2019.
- BARBAROSSA, L: The post pandemic city: Challenges and opportunities for a non-motorised urban environment. An overview of Italian cases. *Sustainability*, 12(17), p.7172, 2020.
- BECKER, T: Obstacles for non-motorised transport in developing countries-a case study of Nairobi, Kenya. In *European Transport Conference 2011 Association for European Transport (AET) Transportation Research Board*, 2011.
- DAY, K: Built environmental correlates of physical activity in China: A review. *Preventive Medicine Reports*, 3, pp.303-316, 2016.
- HANKEY, S., LINDSEY, G., WANG, X., BORAH, J., HOFF, K., UTECHT, B. AND XU, Z: Estimating use of non-motorised infrastructure: Models of bicycle and pedestrian traffic in Minneapolis, MN. *Landscape and Urban Planning*, 107(3), pp.307-316, 2012.
- JAMES, P. AND MAGEE, L: Domains of sustainability. *Global Encyclopedia of Public Administration, Public Policy, and Governance*; Springer International Publishing: Cham, Switzerland, pp.1-17, 2016.
- KAMUNDU, E: Challenges and Opportunities for Sustainable Urban Mobility (Non-Motorised Transport): A Case Study of Eveline Street in the Windhoek Municipality, Namibia (Master's thesis, Faculty of Engineering and the Built Environment), 2019.
- OKORO, C. AND LAWANI, K: Optimising sustainable mobility: A performance assessment of non-motorised transport infrastructure in Johannesburg, South Africa. *Journal of the South African Institution of Civil Engineering*, 64(2), pp.67-76, 2022.
- ORELLANA, D., BUSTOS, M.E., MARÍN-PALACIOS, M., CABRERA-JARA, N. AND HERMIDA, M.A: Walk'n'roll: mapping street-level accessibility for different mobility conditions in Cuenca, Ecuador. *Journal of Transport & Health*, 16, p.100821, 2020.
- SALLEH, B.S., RAHMAT, R.A.A.O. AND ISMAIL, A: Research Article A Study on Non-Motorised (NMT) Activities for Urban Environment. *Research Journal of Applied Sciences, Engineering and Technology*, 7(2), pp.290-295, 2014.

TIWARI, G., JAIN, D. AND RAO, K.R: Impact of public transport and non-motorised transport infrastructure on travel mode shares, energy, emissions and safety: Case of Indian cities. Transportation research part D: Transport and environment, 44, pp.277-291, 2016.

VENTER, K: Driver perception of non-motorised transport users: A risk in traffic?, 2017.

WHITE, M.A: Sustainability: I know it when I see it. Ecological Economics, 86, pp.213-217, 2013.