TRANSPORT PROBLEMS 2023 Volume 18 Issue 4
PROBLEMY TRANSPORTU DOI: 10.20858/tp.2023.18.4.04

Keywords: BRT; transportation problems; bicycle as a feeder

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PREFERENCES FOR BICYCLING AND CONNECTING TO BUS RAPID TRANSIT IN YOGYAKARTA, INDONESIA

Summary. The problem of limited interest in public transportation due to the restricted coverage of bus rapid transit (BRT) services can be addressed by enhancing door-to-door options. Providing feeder services to assist users in their journeys from start to finish is crucial to achieving this. One suggested feeder option is bicycles because they are faster than walking and eco-friendly. However, in Yogyakarta, there is currently no integration of bike lanes with BRT lanes, making it difficult to promote multimodal transportation. In addition to planning routes, it is important to consider the characteristics of BRT users when implementing multimodal transportation. This helps determine the BRT user category, enabling customized and prioritized service delivery. This study explores the factors that encourage users to use bicycles as feeders and offers insights into users' preferences for cycling facilities. Data were collected through a questionnaire distributed to 200 BRT users selected randomly over 30 days. Based on the model tested using multiple regression analysis, the most popular and confident travel destination for BRT users is their workplace. Moreover, BRT users prefer bicycle lanes that are separate and distinct from other vehicle lanes and convenient bicycle parking locations near bus stops. This research provides valuable recommendations for all stakeholders, particularly the government, to enhance and sustainably improve public transportation services.

1. INTRODUCTION

The problem of low public interest in using public transportation is caused by various factors, primarily the insufficient coverage of bus rapid transit (BRT) services, which makes them less appealing to the public. If not addressed, this issue can lead to more complicated transportation problems like traffic congestion and increased air pollution [1]. It is crucial to enhance BRT services rather than restricting private vehicle use to attract more public interest in public transport and reduce the reliance on private vehicles. Improving door-to-door services is essential and can be achieved by integrating different access modes with BRT services. Sustainable transportation options, such as walking and cycling, are cost-effective and eco-friendly. Utilizing bicycles and walking as transportation modes contributes to sustainable transport.

Yogyakarta has a strong bicycle culture, and many residents have been using bicycles for daily activities for years. This allows bicycles to be used as BRT feeders, connecting users from their starting point to the nearest bus stop. Other cities like New Delhi and Bogota have successfully integrated non-motorized vehicles as feeders [2]. However, bicycle and BRT routes need to be integrated. Furthermore, there must be a clear distinction between bicycle lanes and other vehicle lanes, reducing public interest

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in using bicycles for safety reasons. Connecting bicycle lanes to public transportation is one way to encourage more people to cycle [3–5]. Cycling and walking to bus stops can reduce congestion and air pollution [6]. Previous studies have also shown that using non-motorized vehicles as feeders can help reduce air pollution due to transportation. The benefits of using bicycles have been widely recognized [7], especially for short distances [8, 9]. They are not only beneficial for health but also economical in terms of travel costs [10,11] and are faster than other non-motorized vehicles such as rickshaws or walking [12].

Two approaches can be taken when using a bicycle as a feeder for public transportation: private bicycles or bike-sharing systems. Bike-sharing systems can serve as a starting point for integrating public transit and providing flexible mobility with low emissions. This can help alleviate congestion and reduce costs, resulting in a more connected transportation system [13, 14]. However, ensuring that facilities and services are available is crucial to avoid demand-related issues. To achieve this, understanding the integration and relationship between these two modes is essential to maximize their potential. Additionally, creating a socially constructed bicycle-friendly environment can increase the public perception of cycling [15, 16].

The success of public transportation integration relies on people's behaviors, socio-economic characteristics, and travel goals. Factors influencing bicycle use include route conditions and driving behaviors. Prioritizing bicycle infrastructure, especially in regions with low cycling interest, significantly affects bicycle use. Improving and expanding supporting facilities can boost public interest in using bicycles for transportation [17]. Community preferences also play a role in designing an optimal transportation system. This study analyzes factors affecting bicycle use as BRT feeders, considering dominant travel destinations and their relation to facility availability.

2. METHODS

This paper draws upon prior research to consider various variables from different angles. The researchers investigated how social demographic characteristics and travel-related factors influence the use of bicycles as feeders (Table 1). The respondents were individuals who expressed a willingness to use bicycles as feeders, constituting 75% of the total sample. Additionally, the researchers assessed user preferences for using bicycles as feeders by presenting images illustrating bicycle-related facilities. The implementation of this design was carried out along one of the most frequently used routes.

Previous research identified the bicycle paths chosen by the community by determining their preferences through images selected based on existing conditions [18]. The variables reviewed are bicycle lanes, bicycle parking locations, connected and separate bicycle lanes, and traffic capacity. Users reported preferring to use routes that are safe and separate from other transportation routes [18]. Factors of interest included age, gender [19], income, demographic elements, education, environmental quality [20], and weather [21].

At present, the primary transit system in operation in Yogyakarta is the BRT Trans Jogja. Data collection took place over 30 days, including all days of the week. Data were gathered by distributing 200 questionnaires to BRT users at all BRT stops in Yogyakarta using a simple random sampling method. A total of 25 variables were tested to develop this model, encompassing both user-specific attributes and characteristics of their journeys. User characteristics include age (categorized into productive and non-productive age groups), gender (with distinctions made between women and men), income (divided into low, middle, and high), job (students, private-sector employees, civil servants, entrepreneurs, and unemployed), and vehicle ownership (no vehicle, motorcycle, car, or bicycle). This approach ensured that all users had an equal chance of becoming respondents. The researchers also examined the existing conditions to evaluate the availability of facilities for using bicycles as feeders. Images were selected to identify preferences, reinforcing the rationale and implementation of user facilities in alignment with community aspirations. This research aims to provide valuable insights by aligning with the desires and needs of the local community.

3. RESULTS AND DISCUSSION

3.1. Descriptive Statistics

Table 1 displays the results of the descriptive statistics of the socio-demographic variables. The female population (58%) uses BRT more than the male population (42%). Most BRT users come from the productive age category (19-55 years) and work as students (52%) and private employees (17.3%). Regarding income, BRT users are dominated by those with low income, according to the city's RMW (40.6%). Most of them own vehicles, such as motorbikes (71.3%).

Table 1

Variables of the research

Variables	Attributes	Results
Socio-demographic characteristics	1. Age 2. Gender 3. Income 4. Occupation 5. Vehicle ownership	• Percentage and frequency of socio-demographic • Distribution of BRT users based on social demographic characteristics
Travel characteristics	1. Travel destination 2. Distance (origin-bus stop) 3. Travel time 4. First and last mile	• Origin and destination of BRT user
Analysis of socio-demographic and travel characteristics (to identify user characteristics)	Socio-demographic and travel characteristics	Analysis of individual variables that influence the use of a bicycle as a feeder
Preference for bicycle facilities	1. Bicycle systems 2. Bicycle parking 3. Location of bike park 4. Bike path 5. Other facilities	Implementation of preferences into the design

Regarding the purpose of their BRT trips, 12% use BRT for work, 38% for recreation, and 17.3% for visiting someone. When it comes to the mode of transportation, they use for the first mile (origin to bus stop) and the last mile (bus stop to destination), 54% walk, and this walk is typically for distances less than 1 km (54%) that take less than five minutes to cover (42%). This suggests that the distance between the starting point and the nearest bus stop is relatively short and easily covered on foot. However, those who need to travel more than 1 km (46%) and spend more than five minutes (58%) to reach the bus stop from their original location require an affordable access mode to bridge this gap and connect them to the transit point.

A descriptive statistical analysis reveals that most respondents are in the productive age group with average incomes below the minimum wage. Interestingly, there is a growing interest in using bicycles as feeders, particularly among students and private-sector employees, who typically use motorbikes as their primary mode of transportation. The data also highlights the modes used for the first and last mile traveled, with most users opting to walk. This choice is influenced by the relatively short distances between the bus stops and their origin or destination, as well as cost considerations. This aligns with previous research indicating that transportation costs can influence the choice of a more economical combination of transportation modes. Using an integrated transportation system can help minimize these costs [13, 14]. It is worth noting that, despite having access to faster vehicles, users still prefer using bicycles as BRT feeders. This is in line with previous research [20], which found that bicycle use increased along with its use as a feeder to public transportation.

Table 2

Descriptive statistics of social demography factor

Variables	Description of Variable	Percentage (%)	Number of Respondents
Age (years old)	Productive (18-55)	83.3%	167
	Non-Productive (< 18 and > 55)	16.7%	35
Gender	Male	41.3%	83
	Female	58.7%	117
Monthly income (rupiah)	(Low) Less than 1 mil	40.6 %	81
	(Middle) 1-2.5 mill	32.7%	65
	(High) 2.5-5 mill and more	26.6%	54
Employment	Student	52%	104
	Private sector	17.3%	35
	Civil Servant	9.3%	19
	Entrepreneur	10.7 %	21
	Doesn't work	10.7%	21
Vehicle ownership	No Vehicle	14%	28
	Motorcycle	71.3%	143
	Car	4.7%	9
	Bicycle	10%	20
Purpose of BRT use	To study	12%	24
	To Work	**14.7**%	**29**
	To see someone	**17.3**%	**35**
	For Recreation	**38**%	**76**
	Other	18%	36
Distance (kilometers)	<1	52.7%	105
	1-5	30.7%	61
	6-10	7.3%	15
	>10	9.3%	19
Travel time (minutes)	<5	40.7%	81
	10	36%	72
	20	9.3%	19
	30	4.7%	9
	>30	9.3%	19

3.2. Analysis of Factors Influencing the Use of Bicycles as Feeders

In the previous explanation, three primary travel purposes for using bicycles as feeders were identified: recreation, work, and visiting someone. Table 2 presents a multiple regression model that explores the relationship between socio-demographic and travel characteristics. A total of 25 variables were tested to develop this model, encompassing both user-specific attributes and characteristics of their journeys. User characteristics include age (categorized into productive and non-productive age groups), gender (with distinctions made between women and men), income (divided into low, middle, and high), job (students, private-sector employees, civil servants, entrepreneurs, and unemployed), and vehicle ownership (categorized as no vehicle, motorcycle, car, or bicycle). The characteristics of the user's journey were also considered, including the distance from the origin to the bus stop, which was categorized into <1 km, 1-5 km, 6-10 km and >10 km and travel time categories from the origin to the bus stop, which were classified as <5 minutes, 10 minutes, 20 minutes, 30 minutes, and >30 minutes.

After the data were collected and compiled, a multiple linear regression analysis was conducted to predict the impact of independent variables on the dependent variables. Twenty-five variables were tested using multiple regression analysis, with three dependent variables representing travel purposes: recreation, work, and visiting friends. The second model, which examined the purpose of work-related travel, revealed the most significant relationship between dependent and independent variables. In this model, the 21 selected independent variables collectively accounted for 46.9% of the influence on the dependent variable. The remaining variance was explained by variables not included in the model. Many of the variables tested showed a positive relationship with the use of bicycles as feeders, except for specific variables like non-productive age and male gender. Interestingly, respondents with incomes below the average minimum wage were more likely to use bicycles as feeders than those with higher incomes (β=0.96, p=0.821). Additionally, users in the productive age group (18-55 years) were more inclined to use bicycles as feeders than users in the non-productive age group (β=0.336, p=0.876).

The models of each travel purpose:

Travel Purpose	Model
To Work	$Y = 0.0731 + 0.683x20 + 0.413x2 - 0.378x6 - 0.308x17 - 0.292x13 - 0.276x12 + 0.272x19 - 0.257x10 - 0.229x21 + 0.179x16 + 0.156x7 + 0.113x8 + 0.092x5 + 0.057x1 + 0.033x9 - 0.046x11 + 0.028x18 + 0.13x4 + 0.006x3 + 0.004x14 + 0.002x15$
For Recreation	$Y = 0.378 + 0.81x5 - 0.56x2 - 0.56x3 + 0.55x20 - 0.53x1 + 0.454x6 + 0.37x18 - 0.334x11 - 0.26x17 - 0.25x9 + 0.22x4 - 0.220x13 + 0.199x10 - 0.193x16 + 0.16x19 + 0.119x15 + 0.112x21 - 0.109x14 + 0.106x12 + 0.039x7 + 0.035x8$
To See Someone	$Y = 0.79 - 0.79x5 - 0.644x1 - 0.621x2 + 0.570x13 - 0.47x15 + 0.435x14 + 0.419x1 + 0.340x11 + 0.322x6 + 0.248x7 - 0.23x20 + 0.220x - 0.204x16 - 0.194x17 - 0.145x19 - 0.143x21 - 0.132x8 + 0.129x3 + 0.101x18 + 0.047x9 + 0.029x10$

In the context of work-related travel (R-squared: 0.261), unemployed respondents tended to use bicycles as feeders more than those who were employed (β= 0.176, p= 0.261). Conversely, respondents with private vehicles in the form of cars tended to use bicycles less frequently than those who did not own vehicles (β=0.241, p=0.363). For cross-sectional research using survey data, an R-squared value in the range of 0.2-0.3 is considered adequate. According to the model (Table 4), factors that linearly influence BRT users' decisions to use bicycles as feeders for work purposes include gender, age, income, occupation, bicycle ownership, distance from the origin to the nearest bus stop, and travel time. The data indicate that most users influenced by these factors are males employed in various sectors, particularly those working in office settings such as civil servants and the private sector. Many of them own bicycles to support this mode of transportation. Another factor is the preference for using bicycles as feeders when the distance from their origin to the nearest bus stop is approximately six to 10 kilometers and the travel time falls within the range of 10 to 30 minutes.

In the context of using bicycles for recreation purposes (R-squared: 0.239), productive-age users tend to use bicycles more than non-productive-age users (β=0.256, p=0.028). In contrast to the previous model, users with higher incomes tend to make more trips than those with lower incomes (β=0.86, p=0.329). Additionally, individuals with private vehicles, such as cars, tend to use bicycles more frequently than those without vehicles (β = 0.184, p = 0.115). For recreational travel purposes, income, employment status, distance, and travel time from the origin to the destination are key factors influencing BRT users' decisions. Those who use bicycles as feeders for recreational purposes tend to have higher incomes, come from various professions, and cover distances of one to five kilometers within a travel time of up to half an hour.

Table 3
The result of multiple regression analysis concerning using bicycles as a feeder for travel purposes

Purpose	To Recreation			To Work			To See Someone		
Variables	**Standard Coefficient** [1]	**p-value**	**B (0.378)**	**Standard Coefficient** [2]	**p-value**	**B(0.073)**	**p-value**	**p value**	**B (0.793)**
				Age					
Productive (18-55)^{x1}	0.336	0.876	-0.53	0.256	0.028	0.570	0.338	0.059	-0.644
Non-Productive (<18 and > 55)^{x2}	-0.32	0.918	-0.56	0.237	0.084	0.413	0.313	0.50	-0.621
				Gender					
Female									
Male^{x3}	-0.56	0.524	-0.56	0.067	0.934	0.006	0.089	0.150	0.129
				Income					
Low Income ^{x4} (Dummy)	0.96	0.821	-0.22	0.073	0.855	0.013	0.096	0.822	0.22
Middle Income (Dummy)									
High Income ^{x5} (Dummy)	0.123	0.512	0.81	0.86	0.329	0.092	0.124	0.535	-0.79
				Employment					
Student ^{x6} (Dummy)	0.156	0.004	0.454	0.118	0.002	-0.378	0.157	0.042	-0.322
Private Sector ^{x7} (Dummy)	0.151	0.798	0.039	0.115	0.177	0.156	0.152	0.106	-0.248
Civil Servant ^{x8} (Dummy)	0.163	0.830	0.035	0.124	0.365	0.113	0.164	0.422	-0.132
Entrepreneur ^{x9} (Dummy)	0.168	0.830	-0.25	0.128	0.795	0.033	0.169	0.781	0.047
Doesn't Work ^{x10} (Dummy)	0.176	0.261	0.199	0.134	0.057	-0.257	0.177	0.871	0.029

Table 3 (continuation)

Purpose	To Recreation			To Work			To See Someone		
Variables	Standard Coefficient [1]	p-value	B (0.378)	Standard Coefficient [2]	p-value	B(0.073)	p-value	p value	B (0.793)
Vehicle Ownership									
No Vehicle ^{x11} (Dummy)	0.228	0.146	-0.334	0.173	0.791	-0.046	0.230	0.142	0.340
Motorcycle ^{x12} (Dummy)	0.211	0.617	-0.106	0.161	0.089	-0.276	0.212	0.051	0.419
Car ^{x13}(Dummy)	0.241	0.363	-0.220	0.184	0.115	-0.292	0.242	0.020	0.570
Bicycle ^{x14} (Dummy)	0.203	0.591	-0.109	0.154	0.979	0.004	0.204	0.034	0.435
Distance from origin to bus stop									
< 1 km (Dummy)									
1-5 km ^{x15} (Dummy)	0.103	0.251	0.119	0.078	0.976	-0.002	0.104	0.654	-0.47
6-10 km ^{x16} (Dummy)	0.180	0.286	-0.193	0.137	0.195	0.179	0.181	0.263	-0.204
> 10 km ^{x17} (Dummy)	0.209	0.899	-0.26	0.159	0.056	-0.308	0.210	0.359	0.194
Travelling Time from origin to bus stop									
< 5 minutes (Dummy)									
10 minutes ^{x18} (Dummy)	0.103	0.718	0.37	0.078	0.719	0.028	0.105	0.335	0.101
20 minutes ^{x19} (Dummy)	0.158	0.919	0.16	0.120	0.026	0.272	0.159	0.364	-0.145
30 minutes ^{x20} (Dummy)	0.275	0.842	0.55	0.209	0.001	0.683	0.276	0.422	-0.223
> 30 minutes ^{x21} (Dummy)	0.171	0.514	0.112	0.130	0.080	-0.229	0.172	0.406	-0.143

$p < 0.05$, Model 1 purpose to recreation (R square: 0.239); Model 2 purpose to Work (R square: 0.469); Model 3 purpose to see someone (R square: 0.197).

Concerning using bicycles to visit someone (R-squared: 0.197), productive-age users remain more dominant in this type of travel ($\beta = 0.338$, $p = 0.059$). Respondents with higher incomes also tend to travel more using bicycles ($\beta = 0.124$, $p=0.535$). Furthermore, they are more likely to own private vehicles such as cars ($\beta = 0.242$, $p=0.020$). Regarding employment status, those who do not have jobs use bicycles more frequently (β = 0.177, p = 0.871). In the context of friendly trips or meeting someone, the influencing factors for using a bicycle as a feeder include gender, income, occupation, vehicle ownership, distance, and travel time. Users who agree to use BRT for these purposes typically have low or below-average incomes, are self-employed or unemployed, and often own a vehicle. They choose BRT because the distance and travel time from the origin to the destination are relatively short. Four of the 25 variables tested fall into the "Exclude Variables" category. Preliminary estimates suggest that these four variables were excluded due to multicollinearity. These variables are female gender, middle income, distance from origin to bus stop less than one kilometer, and travel time less than five minutes. In regression analysis, several variables yielded different results compared to previous studies.

Based on the model and the purposes of travel, commuting to work is the destination with the most significant relationship, primarily involving users of productive age with low incomes. However, those who are not employed also make significant use of bicycles as feeders. This differs from previous results. For recreational and tourist travel, users who rely on bicycles more often tend to have higher incomes and own cars. This is not surprising, given that the prevalent use of bicycles in Yogyakarta is for tourism and recreational activities, often on weekends. Promoting the use of bicycles for commuting purposes requires increased awareness and the development of supporting facilities. According to the results, work-related travel represents the most strongly related model. Providing facilities that encourage bicycle use as feeders, especially for commuters, is essential to promote bicycle use and reduce air pollution in urban areas.

3.3. Bicycle Facilities Influencing Bicycle Use as a Feeder

The assessment of supporting facilities for bicycle use revealed that 75% of users are willing to use bicycles for commuting, work, or recreational purposes. However, they expressed concerns about the current availability of facilities, which they felt did not guarantee their safety and security as feeder bicycle users. This lack of safety and security stems from the frequent presence of other vehicle users encroaching on bicycle lanes, posing threats to cyclists.

In response to these concerns, user preferences were identified to determine the types of facilities that would encourage them to use bicycles as feeders. The results show that users favored the addition and improvement of bicycle lanes that are separate from other vehicle lanes. Furthermore, they expressed a stronger preference for using a bike-sharing system (54%) over personal bicycles. In terms of bicycle parking, they indicated a desire to have bicycle racks located around bus stops, eliminating the need for additional travel distance to reach the bus stop.

Fig. 1(a) depicts the current state of bicycle use facilities on one of Yogyakarta's busiest bicycle lanes, while Fig. 1(b) presents a road design integrating bicycle paths with BRT lanes and incorporating facilities aligned with user preferences. This comparison illustrates that several components, such as bicycle lanes and parking locations, do not align with user preferences. However, elements like vegetation and signs are considered appropriate.

Based on the users' choices (Table 5), here are more details about each design element:

- Bicycle paths: Users prefer separate bicycle lanes, and this design includes dedicated lanes for cyclists, separated from other vehicle lanes.
- Parking locations: Users want bicycle parking around bus stops for easy access. The design incorporates strategically placed bicycle racks near bus stops.
- Vegetation: The existing vegetation is appropriate, aligning with user preferences.
- Signs: Existing signage meets users' expectations and contributes to safety.
- Lighting: Adequate lighting enhances cyclists' safety and comfort.

Concerning social demographic characteristics, the availability of bicycle facilities indicates the need to add and improve bicycle lanes, particularly those separate from other vehicle lanes. Additional facilities are also essential to maintain the safety and comfort of cyclists. This aligns with previous research [21, 22] underscoring that cyclists prefer dedicated bicycle lanes separate from other vehicles. Furthermore, bicycle parking around bus stops is recommended to ensure convenience for bicycle owners going to a bus stop. Smart guard systems for bicycle parking are also encouraged to enable users to manage and protect their bicycles through applications. Other supplementary facilities, such as signs, vegetation, and lighting, enhance cyclists' safety and comfort, promoting the use of bicycles as feeders in the urban transportation network.

Table 4

Preference of User BRT about Bicycle Facilities

Variable	Percent (%)	Number of Respondents	Variable	Percent (%)	Number of Respondents
Bicycle Systems			**Bike Path**		
Bike-sharing	54%	108	Restricted by a portal	25%	50
Private bicycle	46%	92	Separated from other vehicle lanes	72%	144
Parking Type			Bordered by road markings	3%	6
Bike lockers	19%	38	**Addition of Supporting Facilities**		
Without roof	65%	130	Bicycle parking	89%	178
With roof	16%	32	Signs	67%	134
Parking Location			Bike path	73%	146
Near bus Stop	76%	152	Vegetation	55%	110
In BRT	24%	48			

(a) (b)

Fig. 1. Comparison of the existing conditions of bicycle facilities with the preferences of BRT users

Finally, the greatest contribution to using bicycles as feeders is related to the purpose of traveling to work. This is because using a combination of a bicycle and BRT costs much less than using a private vehicle. Facility improvements need to be made to further encourage bicycle use as feeders. This is in line with previous research showing a positive correlation between the availability of infrastructure and the use of bicycles [23, 24]. Urban planning policies need to consider such essential things along with the increasing aim of using bicycles for sustainable transportation. This relationship indicates that social factors and the availability of facilities positively influence the use of non-motorized vehicles in urban areas.

4. DISCUSSION AND CONCLUSIONS

This research provides valuable insights into the factors influencing bicycle use as feeders to the BRT system in Yogyakarta, focusing on user characteristics and their preferences for desired facilities.

Each of the three travel destinations analyzed as dependent variables reveals distinct user characteristics:

- Work travel: Users who commute to work are typically located in residential areas, predominantly male, and face distances of six to 10 kilometers from their origin to the nearest bus stop, with a travel time of approximately 30 minutes. These users may engage in multimodal trips, combining various modes of transportation to reach their destinations.
- Recreational travel: Users embarking on recreational trips are often of productive age, have high incomes, and own private vehicles, including cars. Their travel distances are relatively short, usually spanning one to five kilometers. These trips often involve families seeking more extensive transportation options, such as cars, to support their recreational activities.
- Visiting someone: Users of productive age who are not employed often travel to visit someone. Despite owning vehicles, these users opt for BRT due to the convenience of short distances and travel times. This category may include housewives and individuals with flexible schedules.

The analysis highlights the varying user characteristics associated with each travel destination. Consequently, it is crucial to tailor infrastructure and lighting facilities to accommodate these diverse user profiles. While Yogyakarta has recently launched initiatives to promote bicycles as feeder modes, there are still challenges hindering their full realization. One significant obstacle is related to the quality and adequacy of bicycle facilities. Inadequate infrastructure and safety concerns deter potential users. User preferences for desired bicycle facilities were explored to address these issues. Users expressed a preference for roofless bicycle parking around bus stops and bicycle lanes that are distinct from other vehicle lanes. Additionally, nearly 90% of users favored adding bicycle parking facilities around bus stops.

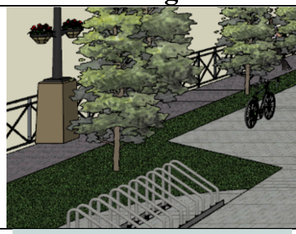
Across the three models and travel purposes, the primary influential factors encouraging BRT users to adopt bicycles as feeders include employment status, distance, and travel time from the origin to the bus stop. The purpose of traveling to work exhibits the strongest correlation with other explanatory variables. Four variables were excluded from the analysis, while two variables demonstrated a negative influence on bicycle use for commuting to work. Further research is needed to clarify these findings, particularly regarding the effectiveness of bicycles as BRT feeders. An essential implication of this study is related to the interconnectedness of employment, distance, and travel time, which significantly influence BRT users' decisions to use bicycles as feeders for various travel purposes. The availability of suitable facilities to support bicycle use is a critical factor, particularly in ensuring user safety and comfort. Users tend to prefer dedicated bicycle lanes and bicycle parking around bus stops. Given the escalating traffic congestion and air pollution, especially during weekends, prioritizing these aspects is crucial to promoting sustainable transportation and modifying travel behavior in the city.

While these findings provide valuable insights, future research can expand upon them by considering a broader range of characteristics and preferences, including road safety, regulatory factors, and city-specific attributes. Nonetheless, the current findings can be generalized to areas with similar characteristics as Yogyakarta, including the presence of a BRT system and the potential for bicycle use as a feeder mode to enhance urban transportation sustainability.

Acknowledgments

This research was funded in addition to the state revenue and expenditure budget (other than the APBN) of Diponegoro University for the 2023 fiscal year, as indicated in Decree of the Chancellor of Diponegoro University Number 182/UN7.A/HK/II/2023 on February 20, 2023, and Number 42/UN7.A/HK/IV/2023 on April 10, 2023, and SPK Number: 569-161/UN.7.D2/PP/IV/2023.

Table 5
Existing conditions, user preferences, and implementation designs of bicycle facilities in Yogyakarta

Variables	Existing	Preference	Design
Bike parking (without roof)			
Bike path			
Signs			
Vegetation			
Parking location	Not yet available parking locations around the bus, especially on the sample route.	Bike parking near bus stop (maks radius 200m)	

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Received 17.06.2022; accepted in revised form 27.11.2023