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# The Measurement Method for Planning Green Campus Based on Bicycle

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**ABSTRACT**

Although there are small buses and Damri (state-owned company bus) public transportation that some students use, the majority of traffic at the Indralaya Campus of Sriwijaya University consist of to support an eco-friendly college environment, the institution suggests enhancing bicycle riding as an alternative. The main purpose of this study is to develop strategic, secure and comfortable bike lanes and evaluate potential bicycle users' interest. Bicycle Level of Service (LOS) was assessed using Vissim software under three scenarios. The results show that many road segments achieved LOS A. Scenario 2, which is based on the shortest public route, is identified as the best possible bicycle lane plan for city bikers. Out of 100 respondents who were interviewed, including students, faculty personnel and employees; about 80% were in favor of implementing bicycle lanes implementation on campus.

## 1. Introduction

Transportation is the process of moving, transporting, or redirecting objects from one place to another, where these objects can be more beneficial elsewhere or serve specific purposes [1]. Humans are the agents responsible for executing transportation movements, making it a crucial aspect of life, particularly for Sriwijaya University students. Generally, the transportation means preferred by Sriwijaya University students involve private vehicles as the primary mode to commute to campus. However, a small percentage also utilizes public transportation such as small buses and Damri (a mode usually operated by a stated-own company in Indonesia). Nevertheless, some students may opt for non-motorized vehicles like bicycles due to their perceived economic advantages, as there is no need to purchase fuel for their operation.

Sriwijaya University has outlined plans to establish a green campus environment known as Green Campus [2]. This concept envisions a campus that incorporates low-emission energy practices, resource conservation, and enhanced environmental quality [3–7]. The advantages of creating a green campus include the reduction of air pollution resulting from private and public transportation on campus, thereby fostering an environmentally friendly environment that is clean and comfortable

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for the activities of lecturers, students, and employees [3,6,8,9]. Consequently, Sriwijaya University aims to promote the use of bicycles as a substitute for private vehicles and public transportation on campus [2].

To facilitate safe and comfortable bicycle activities, dedicated bicycle lanes are essential, similar to those already in place on other campuses promoting environmentally friendly and sustainable transportation [6,9–11]. However, the current challenge is the absence of dedicated lanes for bicycle users at Sriwijaya University. Therefore, it is imperative to implement special lane planning for bicycle users to create an environmentally friendly campus that ensures both security and comfort [12,13].

While several studies have addressed green campus planning in Indonesia, supported by the Ministry of Environment and Forestry [8], there is a noticeable dearth of research on bicycle modes within green campus implementation. This is in contrast to numerous studies that highlight bicycles as environmentally friendly vehicles [10,14]. Thus, this study aims to develop a comprehensive plan for bicycle lanes to support the Green Campus initiative at Sriwijaya University's Indralaya Campus.

## 2. Description of Research Area

Sriwijaya University which is situated in the Indralaya district will be the best example to analyze how efficient planning for a Green Campus with emphasis on bicycle implementation can be achieve. Sriwijaya University is one of the leading educational establishments in South Sumatra and comprises extensive territory that offers numerous Faculties, Administrative Offices, Campus Territories, and Recreational Spaces for the students. Sustainable transportation is a stewardship goal of the university, which, although a minor topic in a broader discourse on environmentalism and carbon footprint reduction is essential.

When it comes to the bicycle lanes integration, the Indralaya campus can be considered ideal: this campus has a large area and has comparatively flat ground, making; the implementation of bicycle lanes straightforward. Currently, the bulk of infrastructure provisions for transport are tilted towards motorized transport modes with communal transport modes given limited consideration. This makes it a good study area for evaluating the likely effects of implementing special bike lanes on the traffic density, traffic safety and the feasibility to access and maneuverability on the road.

To provide the theoretical framework for this study and to implement a measurement method suited for the planning of a Green Campus with an emphasis on bicycle use, this study focuses on Sriwijaya University as the case study area. Its concentrates on assessing the current state of transportation, identifying direct and indirect preferences, and conducting a Vissim simulation to identify the best arrangements for bike routes. By identifying and examining these factors, the study is expected to assist in establishing best and efficient practice for incorporating bicycle infrastructure within the university campus and enhance the environment in line with Sustainable Development Goals.

## 3. Methodology

### *3.1 Analysis of Interest and Desire for Bicycle Lanes on the Sriwijaya University Campus*

This research employs two common methodologies for analysis: the revealed preference method and the stated preference method. The revealed preference method involves researchers providing respondents with methods that mostly refer to actual conditions based on observational data [15]. This method analyzes respondents' choices based on existing results, identifying factors influencing their responses or selections [16]. This describes a situation where the respondents’ choices are deduced by analyzing what can be seen and inferred in the field. It identifies variables that may affect their responses or the choices they make.

Applied to the actual conditions of individuals regarding their interest and desire for bicycle lanes at Sriwijaya University, this method is valuable in collecting data based on existing facts. Thus, this method is carried out for the specific purpose of fact-finding and improving comprehensiveness of knowledge. The survey technique, utilizing a questionnaire, involves real respondents (Sriwijaya University students and lecturers) present at the research location. Questions and answers are structured in a simple manner to enhance understanding [17].

Furthermore, the stated preference method adopts a direct approach with respondents concerning research on different responses. This method aids in providing an overview of transportation planning, particularly in the context of this bike path research [16,18]. It is used to support the research endeavor and inform understanding of transportation planning for bike paths [19]. It is applied by giving different types of questionnaires to the respondents and asking them to rate, rank and comment on different scenario of students and lecturers. This method entails giving specific issues to the respondents and comparing their reactions to an actual situation by imagining some scenarios. It employs an approach that involves hypothesis creation and testing through the use of an experimental design. Moreover, it extensively uses experimental design more extensively to formulate hypotheses, which are then presented to Sriwijaya University students and lecturers through various questionnaires, including rating, ranking, and others.

Applying the two theories to ‘self-interest and perceived control’ of bicycle lanes at Sriwijaya University, involves only responses from the real subjects (students, lecturers, and employees) of the research location. A structured questionnaire is used to gather these responses.

### *3.2 Data Collection Procedures*

This study relied on both revealed preferences and stated preference methods to capture level of interest and willingness to have bicycle lanes around Sriwijaya University accurately. In the revealed preference method, the research data is gathered from respondents through a self-administered survey questionnaire for lecturers and students of Sriwijaya University. This method primarily concerns the collection of data regarding the responses made by the respondents in accordance with the conditions present at the time of the survey. By examining the real-life attitudes and practices of the respondents, the study seeks to establish the key factors that determine their choice and their concern for bicycle lanes [20,21].

Besides the revealed preference method, the study also uses the stated preference method to determine future potential behavior and preference. The hypothetical situations used in the questionnaires are developed to influence the responses of the respondents. In these scenarios participants are required to rate and rank them, providing clear insight into how they would likely react to various transportation planning strategies and the proposed bicycle lanes specifically. This approach proves helpful in capturing diverse responses as possible from the student population, thus making the assessment of their transportation needs and preferences on the campus more accurate.

Combining revealed preference, and stated preference methodologies esures that the study gathers accurate and sufficient information not only on the current behavior of the respondents but also on their potential behavior. This combination provides a strong basis for analysis and planning, ensuring safe and comfortable bicycle facilities to Sriwijaya University.

### *3.3 Bike Lane Planning Analysis*

The Bicycle Level of Service (BLOS), often known as the bicycle service level, involves analyzing the method used in planning bicycle lanes to determine the level of bicycle service at the intended location of the bicycle lane [22–24]. The summarized information within the Bicycle Level of Service (BLOS) category is presented in Table 1.

**Table 1**
Category bicycle level of service by [22]

| Bicycle level of service | BLOS |
|---|---|
| A | ≤ 1,5 |
| B | > 1,5 and ≤ 2,5 |
| C | > 2,5 and ≤ 3,5 |
| D | > 3,5 and ≤ 4,5 |
| E | > 4,5 and ≤ 5,5 |
| F | > 5,5 |

To obtain a bicycle service level value, the Vissim simulation is employed in this study. The simulation generates essential values, including Qlen (vehicle queue length), Qmax (maximum vehicle queue length), and LOS (bicycle service level) [25–27]. To access the output in Vissim, one must navigate to the evaluation menu, select result lists, then choose the result node, and the value will be displayed. Furthermore, the bicycle service level value in Vissim is determined based on the direction of movement for each bicycle user [13,22,27–30]. In this research, the movement direction is aligned with the cardinal directions corresponding to the faculty and destination building of the bicycle users. This systematic approach ensures a comprehensive analysis of the bicycle service level at the planned locations of the bicycle lanes, contributing valuable insights to the overall planning process as shown in Figure 1.

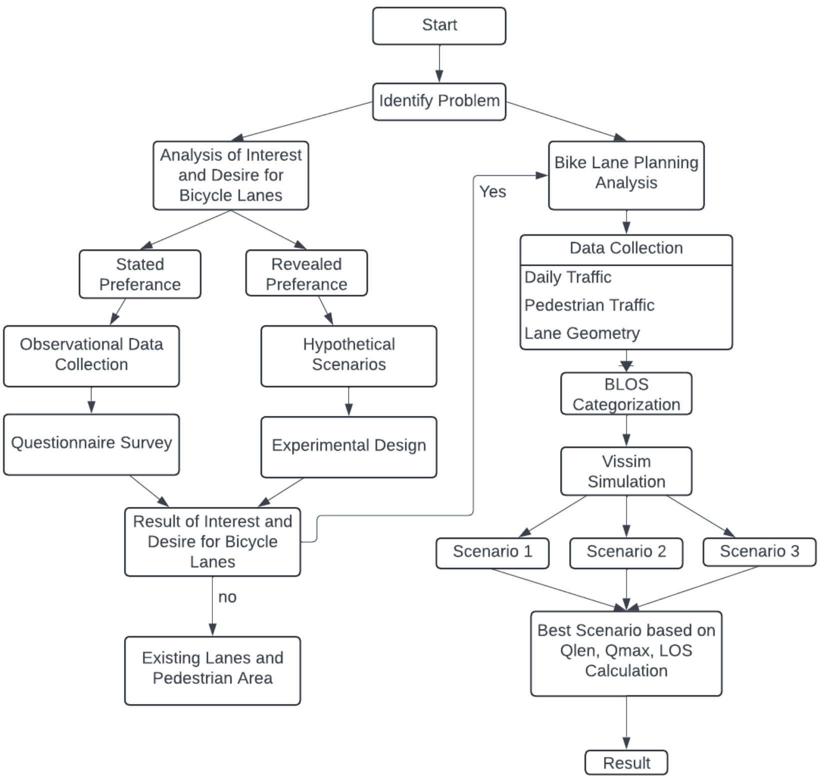


**Fig. 1.** Research Flowchart

## 4. Result

### *4.1 Demographic Data*

Gathering demographic data involves documenting data of respondent's characteristics such as gender, age, status, and other social factors. This study used a questionnaire distributed to the respondents to analyze their interest in and the desire of having bicycle lanes in the UNSRI Indralaya campus. The demographic data are showed in Table 2 below.

**Table 2**
Demographic Data

| Attributes | Sample number | Frequency (%) | Cumulative (%) |
|---|---|---|---|
| Gender | | | |
| Male | 40 | 40 | 40 |
| Female | 60 | 60 | 100 |
| Age (years old) | | | |
| 15-20 | 29 | 29 | 29 |
| 20-25 | 61 | 61 | 90 |
| 25-30 | 3 | 3 | 93 |
| 30-35 | 2 | 2 | 95 |
| 36 and over | 5 | 5 | 100 |
| Status | | | |
| Lecturer | 5 | 5 | 5 |
| Student | 90 | 90 | 95 |
| Employees/staff | 5 | 5 | 100 |
| Faculty | | | |
| Faculty of Economy | 6 | 6 | 6 |
| Faculty of Computer Science | 2 | 2 | 8 |
| Faculty of Social and Political Science | 2 | 2 | 10 |
| Faculty of Medical | 1 | 1 | 11 |
| Faculty of Teacher Training and Education | 9 | 9 | 20 |
| Faculty of Public Health | 8 | 8 | 28 |
| Faculty of Mathematics and Natural Sciences | 8 | 8 | 36 |
| Faculty of Law | 1 | 1 | 37 |
| Faculty of Agriculture | 2 | 2 | 39 |
| Faculty of Engineering | 56 | 56 | 95 |
| College of Language | 3 | 3 | 98 |
| Others | 2 | 2 | 100 |
| Distance from the respondent's residence to the university (km) | | | |
| < 5 | 39 | 39 | 39 |
| 5 - 15 | 24 | 24 | 63 |
| 16 - 30 | 11 | 11 | 74 |
| > 30 | 26 | 26 | 100 |
| Total Respondent | 100 | | |

### *4.2 Statistical Analytical Data*

The Pearson validity test serves as the foundation for evaluating the correlation between variables, comparing the calculated correlation coefficient (r-count) with the critical value from the Pearson correlation Table (r-Table). The validity assessment is determined by the following criteria [31]:

i. If the calculated correlation coefficient (r-count) is greater than the critical value (r-Table), the result is deemed valid.
ii. If the calculated correlation coefficient (r-count) is less than the critical value (r-Table), the result is considered invalid.

To illustrate, when conducting the Pearson validity test with a sample size (N) of 100 at a significance level of 5%, the critical r-Table value is 0.195. This implies that if the calculated r-count value exceeds 0.195, the results are considered valid, while values below 0.195 indicate an invalid correlation. The outcomes of the validity test data analysis are presented in Table 3.

Moreover, in the context of reliability testing, as outlined by Kline (2016) [32,33], a questionnaire is deemed reliable when the Cronbach's alpha value exceeds 0.6. The criteria for evaluating reliability are established as follows:

i. A Cronbach's alpha value greater than 0.6 is considered indicative of reliability.
ii. A Cronbach's alpha value below 0.6 is indicative of unreliability.

The results of the data analysis from the reliability test are presented comprehensively in Table 3. This Table serves as a visual representation of the Cronbach's alpha values, enabling a clear assessment of the reliability of the questionnaire used in the study.

**Table 3**
Result validity test

| Dimension | Variable | r-calculate | r-Table | Cronbach Alpha | Conclusion |
|---|---|---|---|---|---|
| Revealed Preference (RP) | RP01 | 0,704 | 0,195 | 0,902 | Valid & Reliable |
| | RP02 | 0,754 | 0,195 | 0,898 | Valid & Reliable |
| | RP03 | 0,691 | 0,195 | 0,902 | Valid & Reliable |
| | RP04 | 0,788 | 0,195 | 0,896 | Valid & Reliable |
| | RP05 | 0,793 | 0,195 | 0,896 | Valid & Reliable |
| | RP06 | 0,722 | 0,195 | 0,90 | Valid & Reliable |
| | RP07 | 0,707 | 0,195 | 0,901 | Valid & Reliable |
| | RP08 | 0,771 | 0,195 | 0,898 | Valid & Reliable |
| | RP09 | 0,612 | 0,195 | 0,909 | Valid & Reliable |
| | RP10 | 0,646 | 0,195 | 0,904 | Valid & Reliable |
| | RP11 | 0,804 | 0,195 | 0,895 | Valid & Reliable |
| Stated Preference (SP) | SP | 1 | 0,195 | 1 | Valid & Reliable |

### *4.3 Bike Lane Planning*
#### *4.3.1 Scenario 1, existing condition*

The first scenario in the study uses existing conditions. Node analysis was conducted at four intersections on campus, selecting the intersections with the busiest activity. Scenario 1, the existing condition can be seen in Figure 2, Table 4-7.

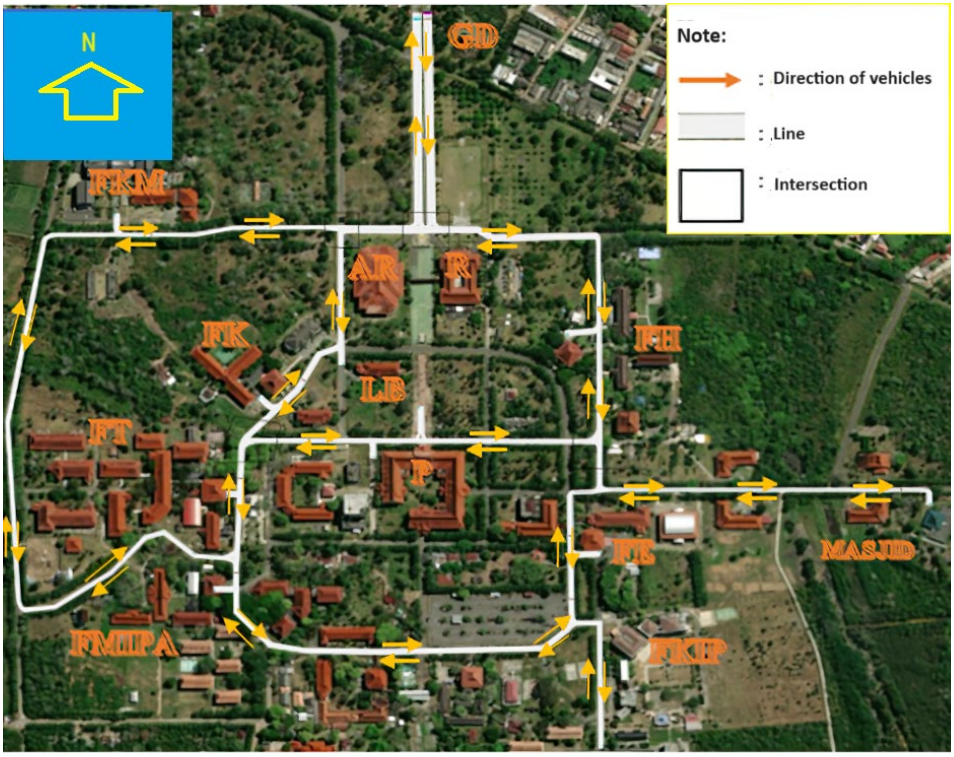


**Fig. 2.** Scenario 1, existing condition

**Table 4**
LOS values of scenario 1 at the Main Interchange

| Movement | QLEN (m) | QMAX (m) | LOS |
|---|---|---|---|
| U-T | 5,73 | 69,28 | A |
| U-B | 6,16 | 68,51 | A |
| T-U | 0,98 | 50,82 | A |
| T-B | 0,92 | 51,55 | A |
| B-U | 0,37 | 24,6 | A |
| B-T | 0,38 | 24,57 | A |
| Average | 2,42 | 69,28 | A |

**Table 5**
LOS values of scenario 1 at Interchange 1

| Movement | QLEN (m) | QMAX (m) | LOS |
|---|---|---|---|
| B-S | 5,84 | 85,92 | A |
| T-B | 5,84 | 85,92 | A |
| B-T | 0 | 0 | A |
| S-T | 0,51 | 36,88 | A |
| Average | 2,12 | 85,92 | A |

**Table 6**
LOS values of scenario 1 at Interchange 2

| Movement | QLEN (m) | QMAX (m) | LOS |
|---|---|---|---|
| T-U | 0 | 0 | A |
| T-S | 0 | 0 | A |
| U-T | 6,22 | 100,35 | A |
| U-S | 6,22 | 100,35 | A |
| S-T | 0,54 | 27,96 | A |
| S-U | 0,54 | 27,96 | A |
| Average | 2,26 | 100,35 | A |

**Table 7**
LOS values of scenario 1 at Interchange 3

| Movement | QLEN (m) | QMAX (m) | LOS |
|---|---|---|---|
| U-B | 2,74 | 58,23 | A |
| U-S | 2,74 | 58,23 | A |
| B-U | 0 | 0 | A |
| B-S | 0 | 0 | A |
| S-U | 1,15 | 44,4 | A |
| S-B | 1,15 | 44,4 | A |
| Average | 1,3 | 58,23 | A |

### *4.3.2 Scenario 2, shortest route of bike lane*

In the second scenario (Figure 3, Table 8-11), the software Vissim is used to model the shortest route for a bike lane on a public road. Because using a bicycle requires physical effort, the bicycle path in this scenario is designed to follow the shortest route of the bicycle path while still providing access to several faculties on the Sriwijaya University Indralaya campus.


**Fig. 3.** Scenario 2, Shortest route of bike path

**Table 8**
LOS values of scenario 2 at the Main Interchange

| | Movement | QLEN (m) | QMAX (m) | LOS |
|---|---|---|---|---|
| Light Vehicles | U-T | 2,75 | 29,61 | D |
| | U-B | 0,94 | 27,02 | A |
| | T-U | 0,19 | 24,6 | B |
| | B-U | 0,2 | 24,57 | A |
| | B-T | 0,18 | 24,59 | A |
| Bicycle | U-T | 0,17 | 24,53 | A |
| | U-U | 279,5 | 298,01 | A |
| | U-B | 279,5 | 298,01 | A |
| | B-T | 279,5 | 298,01 | A |
| | B-U | 2,34 | 59,26 | A |
| | T-U | 5,44 | 90,51 | A |
| | T-B | 5,44 | 90,51 | A |
| | Average | 32,41 | 298,01 | A |

**Table 9**
LOS values of scenario 2 at Interchange 1

| | Movement | QLEN (m) | QMAX (m) | LOS |
|---|---|---|---|---|
| Light Vehicles | T-B | 2,01 | 62,99 | A |
| | T-S | 1,97 | 59,1 | A |
| | B-T | 0 | 0 | A |
| | S-T | 0,35 | 33,86 | A |
| Bicycle | B-S | 127,95 | 201,3 | A |
| | B-T | 0 | 0 | A |
| | T-S | 132,41 | 156,45 | A |
| | T-B | 140,38 | 156,45 | A |
| | T-T | 140,38 | 156,45 | A |
| | S-S | 2,48 | 56,81 | A |
| | S-B | 2,48 | 56,81 | A |
| | S-T | 2,48 | 56,81 | A |
| | Average | 44,4 | 201,3 | A |

**Table 10**
LOS values of scenario 2 at Interchange 2

| | Movement | QLEN (m) | QMAX (m) | LOS |
|---|---|---|---|---|
| Light Vehicles | T-U | 0 | 0 | A |
| | T-S | 0 | 0 | A |
| | U-T | 1,17 | 39,88 | A |
| | U-S | 1,41 | 32,21 | A |
| | S-T | 0,16 | 25,38 | A |
| | S-U | 0,31 | 28,26 | A |
| Bicycle | T-S | 0 | 0 | A |
| | S-U | 0 | 0 | A |
| | U-S | 272,19 | 362,39 | A |
| | U-T | 272,19 | 362,39 | A |
| | Average | 30,58 | 362,39 | A |

**Table 11**
LOS values of scenario 2 at Interchange 3

| | Movement | QLEN (m) | QMAX (m) | LOS |
|---|---|---|---|---|
| Light Vehicles | U-B | 0,82 | 46,2 | A |
| | U-S | 0,82 | 46,2 | A |
| | B-U | 0 | 0 | A |
| | B-S | 0 | 0 | A |
| | S-U | 0,17 | 24,6 | A |
| | S-B | 0,17 | 24,6 | A |
| Bicycle | S-S | 413,39 | 501,77 | A |
| | S-B | 413,39 | 501,77 | A |
| | U-B | 413,39 | 501,77 | A |
| | B-U | 6,96 | 111,49 | A |
| | T-B | 6,96 | 111,49 | A |
| | B-S | 6,96 | 111,49 | A |
| | S-U | 0 | 0 | A |
| | U-B | 0 | 0 | A |
| | U-U | 0 | 0 | A |
| | Average | 60,19 | 501,77 | A |

### *4.3.3 Scenario 3, Routes adjacent to the pedestrian line*

In the third scenario (Figure 4, Table 12-15), the bike lane is designed to run adjacent to the pedestrian path (pedestrian) on the Sriwijaya University campus. This scenario models the bicycle path by using half of the existing pedestrian path. By applying a route adjacent to the pedestrian path, a one-way bicycle lane was created because there are only a few lanes on several roads on the Sriwijaya University campus.

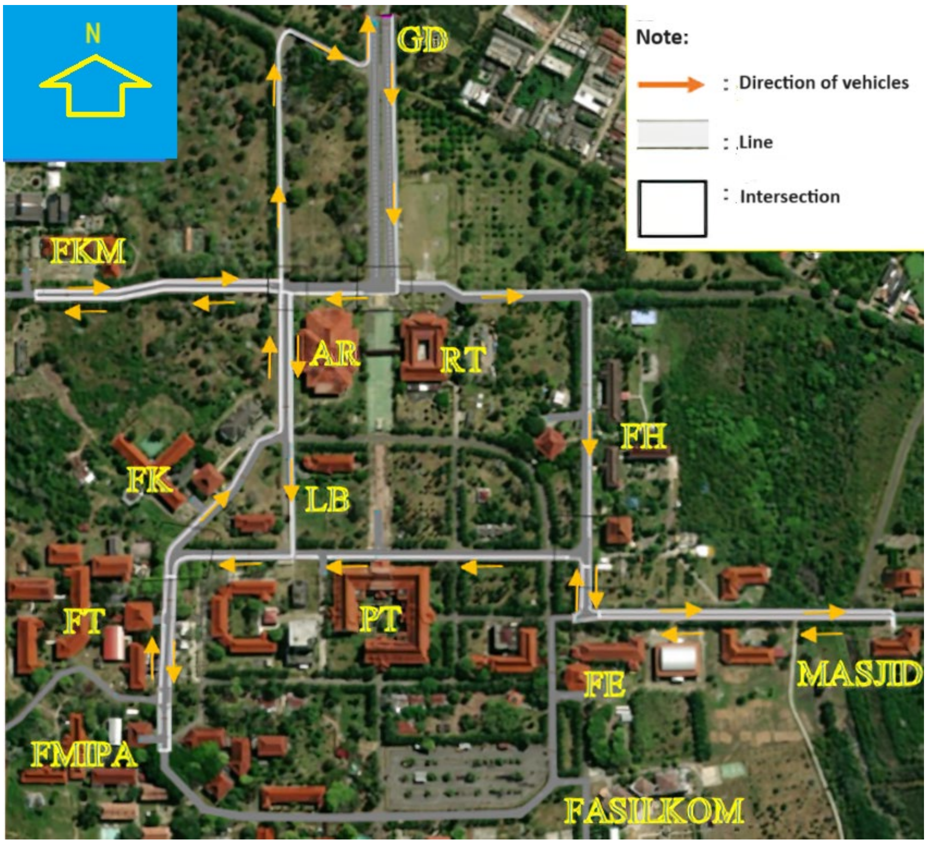


**Fig. 4.** Scenario 3, route adjacent to pedestrian

**Table 12**
LOS values of scenario 3 at Main Interchange

| | Movement | QLEN (m) | QMAX (m) | LOS |
|---|---|---|---|---|
| Light Vehicles | U-T | 2,33 | 28,32 | C |
| | U-B | 0,31 | 24,72 | A |
| | T-U | 0,32 | 23,75 | C |
| | T-B | 0,36 | 23,74 | A |
| | B-U | 0,1 | 23,58 | A |
| | B-T | 0 | 0 | A |
| Bicycle | U-T | 280,43 | 298,01 | A |
| | U-B | 280,43 | 298,01 | A |
| | Average | 40,55 | 298,01 | A |

**Table 13**
LOS values of scenario 3 at Interchange 1

| | Movement | QLEN (m) | QMAX (m) | LOS |
|---|---|---|---|---|
| Light Vehicles | T-B | 0,71 | 28,47 | A |
| | T-S | 0,17 | 23,7 | A |
| | B-T | 0 | 0 | A |
| | S-T | 0,21 | 29,53 | A |
| Bicycle | B-U | 12,42 | 158,1 | A |
| | T-S | 121,99 | 138,02 | A |
| | T-B | 137,06 | 155,54 | A |
| | S-U | 290,28 | 440,42 | A |
| | S-B | 302 | 461,23 | A |
| | Average | 96,09 | 461,23 | A |

**Table 14**
LOS values of scenario 3 at Interchange 2

| | Movement | QLEN (m) | QMAX (m) | LOS |
|---|---|---|---|---|
| Light Vehicles | T-U | 0 | 0 | A |
| | T-S | 0,91 | 25,98 | A |
| | U-T | 0,07 | 23,66 | A |
| | U-S | 0,91 | 25,98 | B |
| | S-T | 0,53 | 34,14 | A |
| | S-U | 0,53 | 34,14 | C |
| Bicycle | T-S | 370,83 | 501,77 | A |
| | T-U | 370,83 | 501,77 | A |
| | S-U | 318,61 | 501,77 | A |
| | Average | 115,16 | 501,77 | A |

**Table 15**
LOS values of scenario 3 at Interchange 3

| | Movement | QLEN (m) | QMAX (m) | LOS |
|---|---|---|---|---|
| Light Vehicles | U-B | 0,51 | 33,88 | A |
| | U-S | 0,77 | 24,97 | A |
| | B-U | 0 | 0 | A |
| | B-S | 0,77 | 24,97 | A |
| | S-U | 0,19 | 23,74 | A |
| | S-B | 0,19 | 23,74 | A |
| Bicycle | S-S | 408,04 | 501,77 | A |
| | U-B | 408,04 | 501,77 | A |
| | S-B | 178,39 | 501,77 | A |
| | Average | 97,98 | 501,77 | A |

## 5. Discussion

In the stated preference analysis, cost factors and travel time are critical for each respondent when choosing which mode of transport to use. There are two options for comparing travel time and cost in planning bike lanes, namely private vehicles and bicycles. The results of the stated preference analysis can be seen in Table 16.

**Table 16**
Results of data stated preference on cost and travel time

| Attribute | Cost | Travel Time | Number of Options |
|---|---|---|---|
| Bicycle | Rp0 | 25 minutes | 19 |
| Private Vehicles | Rp3.000 | 7 minutes | 59 |
| Private Vehicles | Rp4.000 | 10 minutes | 13 |
| Private Vehicles | Rp1.000 | 4 minutes | 3 |
| Private Vehicles | Rp5.000 | 15 minutes | 2 |
| Private Vehicles | Rp2.000 | 5 minutes | 4 |

Based on Table 16, it is evident that most respondents preferred the option with a cost of Rp3,000, and a travel time of 7 minutes. This choice likely reflects a balance between affordability and convenience, indicating that these factors are crucial in influencing transportation preferences among Sriwijaya University students and staff.

Furthermore, selecting the best scenario should be done using a comparison between three parameters: smooth traffic, safety of bicycle users, and ease of access. By comparing these three parameters, we can easily determine which scenario is optimal for the Sriwijaya University Indralaya campus. The selection of the best scenarios can be seen in Table 17.

**Table 17**
Best Scenario Selection

| Parameters | Scenario | | |
|---|---|---|---|
| | Scenario 1, existing conditions | Scenario 2, shortest route | Scenario 3, routes coexist with pedestrian |
| Smooth traffic | (5)<br>Has LOS A | (2)<br>It has LOS A, but there are LOS B and LOS D at the Main Interchange | (2)<br>It has a LOS A, but there are two LOS C at Main Interchange and LOS B and LOS C at Interchange 2 |
| Safety of bicycle users | (0)<br>This condition has a higher accident rate because bike lanes and other vehicles are still incorporated | (4)<br>This condition is very safe for bicycle users because it already has a special bicycle lane on campus | (4)<br>This condition is very safe for bicycle users because it already has a special bicycle lane on campus |
| Accessibility | (1)<br>Cyclists on this path have access to the entire faculty but the bike path coincides with other vehicles | (4)<br>Cyclists can access to the entire faculty easily and closer | (1)<br>Cyclists cannot access all faculties due to limited pedestrian routes |
| Total value | 6 | 10 | 7 |

Based on Table 17 there are three scenarios that have been modeled, and it is known that various LOS values are obtained in each scenario. In scenario 1, all the LOS values obtained are LOS A. In scenario 2, the LOS values obtained vary, with the Main Interchange there are LOS D and LOS B values. In scenario 3 at the Main Interchange has LOS C, and Interchange 2 has LOS B and LOS C.

The results of this study are consistent with previous research on cost and time attributes being the primary determinants of the mode choice in transportation. Furthermore, existing research conducted by [22,26,34], has also argued that transportation cost and proximity are decisive factors influencing the choice of means of transport in urban areas. For instance [12,13,35], asserted that if commuters could reduce their daily travel costs or the time they spent on the road, most individuals would be willing to travel by bike.

Additionally, when adopting the Bicycle Level of Service, the findings are supported by [22], [36], who stated that LOS is a critical component when assessing the effectiveness of bike lanes. Our argument in this study that scenario 2 provides the most favourable conditions in terms of traffic flow, safety benefits and accessibility supports arguments elsewhere that dedicated bike lanes on major corridors improve cyclist safety and give superior access to destinations [12,13,37]. Thus, it is concluded that the best scenario for bicycle lane planning in this study is scenario 2, which received the highest scores in the Table Selection of the best scenario, as determined by considering several parameters.

## 6. Conclusion and Future Research Directions

### *6.1 Conclusion*

In analyzing the existing conditions in Scenario 1, it has been observed that service requirements are classified under LOS A with no cues or delay. However, the scenario where bicycles and vehicle operate within the same lane does not ensure safety and comfort for bicycle users, highlighting a significant drawback. Conversely, Scenarios 2 and 3, which include dedicated bicycle lanes, shows a range of LOS ranging from A to D. Most movements maintain a service level A, as observed from the queue lengths. specifically, in Scenario 2, the Main Interchange recorded LOS D for the U-Turn movement, and in Scenario 3, LOS C was observed for both U-Turn and T-U movements indicating varying degrees of congestion affecting cyclists.

Regarding the planning of bicycle lanes, 80% of participants supported this initiative based on questionnaire responses. This high level of agreement demonstrates the willingness of students and staff to shift from private cars or public transport to bicycles, which significantly mitigate air pollution and promote a Green Campus initiative. However, further investigation is needed to gain deeper insights into these findings and provide a comprehensive context for this strong support.

In the stated preference analysis, respondents chose Rp3,000 as the cost and 7 minutes for travel time as the most suitable option for their current transportation needs. This choice underscores the factors typically considered when selecting a mode of transport to use, that is the cost and convenience merit.

### 6.2 *Future Directions for Research*

Future research should focus on evaluating the impact of dedicated bicycle lanes on the other of traffic flows within in campus environments, particularly in terms of safety and environmental benefits. Additionally, exploring the reasons behind the opposition of the remaining 20 percent of respondents to bicycle lanes could provide valuable insights for addressing their concerns and enhancing acceptance. Further studies could also investigate how other sustainable transport modes and the interrelationship of all the implemented strategies could also contribute towards the achievement of the Green Campus status.

In summary, the conclusions drawn from this study strongly support the implementation of dedicated bicycle lanes accross Sriwijaya University, aligning with the global trend towards urban bike culture, safety improvements, and sustainability goals.

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