

Analysis Of Interest in Using Special Bus Transportation in Kuta as A Solution to Overcome Congestion Due to Vehicle Volume Exceeding Road Capacity

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Abstract

Traffic congestion in Kuta, Bali, is getting worse as the number of vehicles increases beyond the road capacity. Although various traffic engineering management efforts have been made, the congestion problem has not been resolved effectively. This study aims to analyze public interest in using special bus transportation as an alternative transportation to reduce congestion in Kuta. The stated preference survey method was used to collect data from respondents who are road users in the Kuta area. The results of the study showed that there was public interest in using special bus transportation, which was 83.3% (or 375 out of 450 respondents), especially among tourists. Factors such as comfort, environmental friendliness, and more affordable fares were the main considerations for respondents. With adequate support from the government and transportation service providers, this special bus transportation has the potential to be an effective solution to reduce congestion in Kuta. This study recommends the implementation of a trial of special bus services on busy routes and integration with other public transportation systems.

Keywords: traffic jam, special bus transportation, Kuta, traffic engineering, user interest.

INTRODUCTION

Traffic congestion in the Kuta area, Bali, is an increasingly worrying transportation problem that urgently needs to be resolved. Where Bali in 1970-2000 entered the fifth phase of the Butler model, which was marked by rapid tourism growth (Salam, Samudra, Suradika, & Sumada, 2024). Kuta, as one of the most popular tourist destinations in Bali, Indonesia, has extraordinary appeal for both domestic and foreign tourists. This area offers a variety of adequate entertainment, shopping, and accommodation facilities, so it is always crowded throughout the year. However, Kuta's popularity has serious consequences for traffic conditions in the area. The increase in the number of vehicles, both from local residents who do their daily activities and tourists who come for vacations, has caused severe congestion at many main road points. The roads connecting the centers of economic activity, tourism, and housing are becoming increasingly congested, especially during rush hour and the holiday season. This problem is exacerbated by the limited capacity of the existing roads. Kuta's road infrastructure, which was originally designed to accommodate fewer vehicles, is now unable

to accommodate the increasing volume of vehicles that continues to increase from year to year. A number of traffic engineering management measures have been implemented by authorities to reduce the impact of congestion, such as rearranging traffic flow, implementing a one-way system, and developing new parking areas. However, these efforts often only provide temporary solutions and have not been able to effectively address the root of the problem.

The impact of this congestion is not only felt by road users in terms of longer travel times but also has an impact on the quality of life of the Kuta community as a whole. Other negative impacts include increased exhaust emissions that worsen air quality, increased stress levels among road users, and disruption of economic and tourism activities. Several studies also show that prolonged congestion can have a negative impact on increasing exhaust emissions (Suartawan, Sukmayasa, & Mardikawati, 2022) and have an impact on the image of Bali tourism, which has long been known as a tourist paradise. Therefore, more innovative and sustainable transportation solutions are needed to reduce congestion in Kuta, taking into account the growth in the number of vehicles and the mobility needs of the community in the future.

Based on initial survey data, it is known that the level of traffic density in Kuta shows a significant increase, especially towards evening and is worse during the holiday season. During this period, the roads in Kuta experience a much higher traffic load than normal days, with vehicles moving slower and travel times getting longer. The decrease in average vehicle speed reflects the severe level of congestion, where many main road points are unable to flow vehicles efficiently. Where the road capacity in Kuta is at service level F and will experience overcapacity conditions that result in congested traffic flow and congestion (Purnama, Budiastawa, Perdana, & Suartawan, 2024). This situation causes serious disruption to the mobility of local residents and tourists, which ultimately has a negative impact on comfort, productivity, and economic activity in the area. In addition, prolonged congestion also has an impact on the environment because increased greenhouse gas emissions from vehicles stuck in traffic jams contribute to the decline in air quality in Kuta. This condition is not only detrimental to the health of the local community but also worsens Kuta's image as an environmentally friendly tourist destination.

In facing these challenges, the local government and stakeholders continue to seek more sustainable and effective solutions to overcome traffic congestion in Kuta. One proposed alternative is the use of special bus transportation designed to serve busy routes in this area. This special bus transportation is expected to be an attractive alternative for private vehicle users by offering more efficient, timely, and comfortable transportation services. With this transportation option, most private vehicle users are expected to switch to public transportation, thereby reducing the volume of vehicles on the road and helping to smooth traffic flow. Where the majority of vehicles are dominated by private vehicles (Hidayat, Mardikawati, Oktopianto, & Shofiah, 2021). However, to achieve optimal results, a deep understanding of the interests and preferences of the community regarding the use of public transportation is needed, as well as careful planning in terms of integration with existing transportation systems. The implementation of this special bus transportation requires careful planning, including determining strategic routes, effective scheduling, and integration with other existing public transportation systems. Thus, this planning focuses on meeting the needs of the community and tourists as a form of infrastructure maintenance (Stratford & Byrne, 2024). Widespread socialization is also needed to increase public awareness and interest in the use of this bus transportation. Thus, special bus transportation can be one of the long-term

sustainable solutions to overcome congestion and environmental problems in Kuta while improving the quality of life of the community and tourists visiting this area.

This study focuses on the analysis of public interest, both local residents and tourists, in using special bus transportation in Kuta as one of the solutions to overcome the increasingly severe traffic congestion problem in the area. With the surge in vehicle volume that is not comparable to road capacity, special bus transportation is expected to be a more efficient and environmentally friendly transportation alternative. However, the success of implementing this bus transportation is highly dependent on public interest and acceptance of the service. Therefore, this study aims to understand the preferences and perceptions of road users towards special bus transportation by exploring the factors that influence their decision to switch from private vehicles to public transportation. The results of the study are expected to provide valuable insights for local governments and related stakeholders in designing more effective transportation policies. In addition, this study can also provide recommendations on how to increase public awareness of the benefits of using public transportation, such as through socialization campaigns or special incentives for early adopters. Overall, this study is expected to support local government efforts in creating a more sustainable and environmentally friendly transportation system in Kuta. By reducing dependence on private vehicles and encouraging the use of public transportation, traffic congestion can be significantly reduced, which in turn will improve the quality of life of local residents and tourists. This research also provides an important contribution to transportation planning in other tourist areas facing similar challenges and can be used as a model for developing future transportation policies.

METHOD

This research method uses a quantitative approach with a stated preference survey as the main instrument for collecting data. The population in this study includes local Kuta residents and tourists who are in the area. The research sample was taken randomly using the accidental sampling technique, where respondents happened to be at the survey location. There is no target number of respondents in the stated preference survey, but the minimum target for a good sample is between 75 - 100 people (Masliyah & Sundari, 2022). The survey was conducted in the North Kuta area, along the planned Kuta Special Bus route, as in Figure 1.



Figure 1. Stated Preference Survey Location of Interest in Using Kuta Special Buses

Based on Figure 1, it is known that the Kuta Special Bus route starts from Central Park Kuta along Kuta Beach and returns to Central Park Kuta. The questionnaire used in the survey consisted of closed and open questions designed to explore respondents' interests, preferences, and perceptions of special bus transportation. The aspects studied included respondent demographics (including gender, age, educational background, occupation, and income) and travel data in the Kuta area (including intensity of transportation activities, travel purposes, travel costs, travel time, and current mode of transportation). In addition, questions related to the reasons for using or not using public transportation were also included to understand the barriers and motivations of users.

The collected data were analyzed descriptively using frequency statistics to describe the patterns of respondents related to their interests and preferences. Further analysis was conducted using correlation tests to see the relationship between certain factors (i.e., respondents' demographic information and travel data in the Kuta area) and the interest in using special bus transportation. To strengthen the results of the analysis, short interviews were also conducted with several selected respondents to gain qualitative insights into their views on this special bus transportation. The results of these interviews were then analyzed thematically and used to complement the results of the quantitative analysis.

RESULT AND DISCUSSION

Respondent Characteristics

The respondents of the survey of interest in using the Kuta Special Bus amounted to 450 people (from a target of respondents between 75 and 100 people). The characteristics of the respondents are as in Figure 2. The characteristic data consists of data: gender, age, income, last education, and occupation.



Figure 2. Characteristics of Respondents to the Survey of Interest in Using Kuta Special Buses

Based on Figure 2, it is known that the majority of respondents were male, as many as 289 people (or 64.9%). Most respondents were aged 25-39 years, as many as 241 people (or 53.6%). In terms of the last education, more than half, namely 243 people (or 54%), had a bachelor's degree. The respondents' jobs were dominated by private employees as many as 203 people (or 45.1%), and the average monthly income was mostly in the range of 3-5 million rupiah as many as 142 people (or 31.6%). Thus, it is known that the majority of respondents are tourists who have a fairly high level of education, which may affect their preference for a more efficient and comfortable mode of transportation. Where the factors that influence the

choice of transportation mode are age, occupation, origin, time of visit, reasons for choosing the mode, travel distance, travel costs, and length of travel (Dewi, Dwipayanti, Maulana, Suyasa, & Mardikawati, 2023). From the income side, it reflects the potential for sufficient purchasing power to switch to new modes of transportation (Rahmalia, Riyanto, & Darsono, 2020).

Travel Data in Kuta Area

In Figure 3, the travel data made by respondents in the Kuta area is described. This travel data consists of the following data:



Figure 3. Respondents' Travel Data in the Kuta Area Currently

Based on Figure 3, it is known that the majority of respondents travel 1-2 times a week for as many as 205 people (or 45.6%), with the main purpose of recreation for as many as 254 people (or 56.4%). Most respondents currently use motorcycles as a mode of transportation for as many as 220 people (or 48.9%), and the main reason for choosing the current mode of transportation is because of the shorter travel time. As many as 182 people (or 40.4%) of respondents spend more than 20 thousand rupiah per trip on transportation, and as many as 289 people (or 64.2%) of respondents complete the trip in less than 1 hour. The majority of respondents, namely 67.1%, only need less than 5 minutes to reach their private vehicles. Thus, fast travel time and low cost seem to be key factors in transportation mode preferences. This is in accordance with the results of the study that the greater the difference in travel costs and the difference in travel time, the probability of train passengers switching to using the Patas Bus will continue to increase (Safitria, Putra, & Hasanuddin, 2020).

Readiness to Switch Modes

The results of the study indicate that there is significant interest from the community, especially for tourists, in using special bus transportation in Kuta as an alternative transportation. Of the 450 respondents who participated in the survey, 83.3% (or 375 people) stated their willingness to switch from private vehicles to special bus transportation if the service is available with adequate quality. The data diagram of willingness to switch modes is in Figure 4.

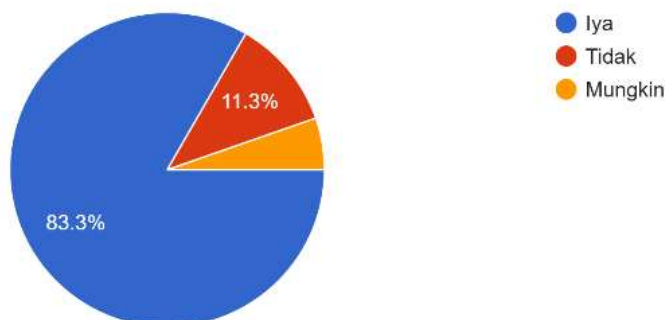


Figure 4. Diagram Of Willingness to Switch Modes Survey of Interest in Using Kuta Special Buses

The willingness to switch to the Kuta Special Bus is quite high; as many as 375 people (or 83.3%) of respondents showed their interest. The main reason for this willingness is the comfort offered by the bus, including comfortable seats and maintained cleanliness. Environmentally friendly factors are also an important consideration, where the use of electric buses is considered to be able to reduce greenhouse gas emissions and air pollution. The cost efficiency offered by the Kuta Special Bus, with cheaper fares than private vehicles, is an additional attraction for respondents who want to save on their transportation expenses. These results indicate a significant opportunity for the adoption of the Kuta Special Bus as an alternative mode of transportation that can meet the needs of the community, especially those who have a preference for comfort, cost efficiency, and environmental sustainability. Where this comfort is one of the dominant factors according to the preference for choosing a mode of transportation in Bali (Mardikawati, Masyuni, & Nugraha, 2023).

However, there were 51 people (or 11.3%) who stated that they were reluctant to switch to Kuta Special Bus. People are reluctant to switch to Kuta Special Bus for several main reasons. First, trans buses are considered less practical and flexible. Respondents' concerns about the limited fleet and bus stops cause passengers to have to spend more time to reach the bus stop, wait for the bus, and experience a slow journey because they share the lane with other vehicles. This is different from private vehicles that allow direct travel with more flexible stops. In addition, concerns that bus lanes also do not cover some areas, making it difficult for passengers to access. Second, the inefficient bus travel time is also a consideration. Large and less agile buses have difficulty moving quickly on busy roads like in Kuta, so travel times tend to be longer. Finally, the presence of buses is actually considered to worsen congestion. Bus lanes that are mixed with other vehicles cause mixed traffic, which further worsens the traffic situation, coupled with the large size of the buses, which also narrows the road space. Based on the results of the analysis above, mitigations need to be carried out to increase public interest in using Kuta special buses, namely: Adequate availability of fleet and bus stops; There needs to be an analysis of passenger area needs, so that it can meet the transportation needs of the community in Kuta; The need for traffic engineering management or road user management (demand) as a mitigation of the implementation of buses that cause congestion; There needs to be an analysis of the size of special Kuta buses which will later be implemented according to road capacity.

Relationship of Certain Factors

Next, the relationship between the choice of willingness to change modes to Kuta Special Bus and the characteristics of respondents is seen. The relationship between these certain factors can be analyzed using the Chi Square test with the help of SPSS software (Dewi,

Dwipayanti, Maulana, Suyasa, & Mardikawati, 2023). The results of the analysis with the Chi Square test are in Table 1.

Table 1. Relationship between Choice Factors of Willingness to Change Mode and Respondent Characteristics

No.	Respondent Characteristics	Chi-Square Value	Asymptotic Significance	Information
1	Gender	0.405	0.817	No connection
2	Age	2.493	0.869	No connection
3	Educational Background	13.194	0.105	No connection
4	Job	27.293	0.002	There is a relationship
5	Average Monthly Income	28.205	0.000	There is a relationship
6	Frequency of travel in the Kuta area in a month	6.479	0.150	No connection
7	Purpose of traveling in Kuta Area	4.495	0.810	No connection
8	Modes (vehicles) commonly used for travel in the Kuta area	19.865	0.011	There is a relationship
9	The main reason for wanting to use this mode (vehicle)	17.167	0.071	No connection
10	The cost usually incurred for a single trip in the Kuta area	9.798	0.279	No connection
11	Travel time in Kuta Area	16.487	0.011	There is a relationship
12	Time required to reach the mode (vehicle)	13.387	0.010	There is a relationship

Based on Table 1, it is known that gender, age, educational background, frequency of travel in the Kuta area in a month, purpose of traveling in the Kuta area, main reason for wanting to use the mode (vehicle), the cost usually incurred for one trip in the Kuta area has no relationship with the choice to change modes. Meanwhile, occupation, average monthly income, mode (vehicle) usually used for travel in the Kuta area, length of travel time in the Kuta area, time required to reach the mode (vehicle) is related to the choice to change modes. Where the number of respondents who agree to move to the Kuta Special Bus in Figure 5.

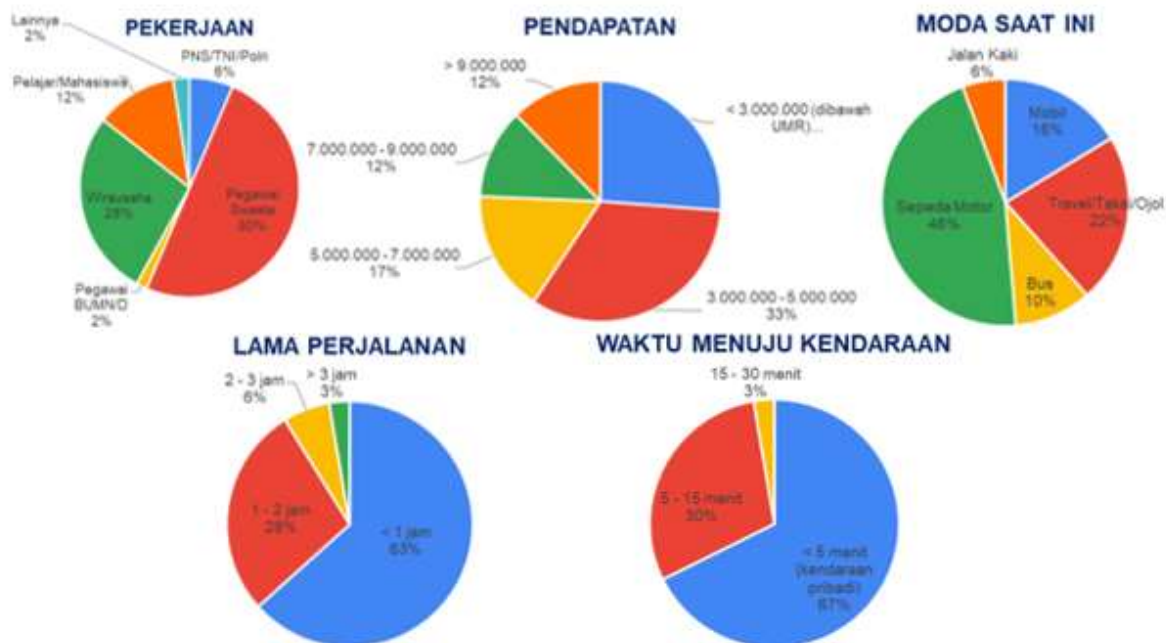


Figure 5. Characteristics of Respondents Willing to Switch to Kuta Special Bus

The number of respondents who are willing to move is 374 people. Based on Figure 5, the characteristics of respondents who are willing to move and are the most dominant are as follows: The most dominant occupation is private employee, totaling 187 people (or 50% of the total respondents who answered yes). Income with the most dominant value of IDR 3,000,000 to IDR 5,000,000, totaling 124 people (or 33% of the total respondents who answered yes). The mode currently used with the most dominant value is motorcycle, totaling 171 people (or 46% of the total respondents who answered yes). Travel time with the most dominant value is less than 1 hour, totaling 237 (or 63% of the total respondents who answered yes). Time to vehicle with the most dominant value is less than 5 minutes (using private vehicle), totaling 253 people (or 67% of the total respondents who answered yes).

Furthermore, the characteristics of respondents who do not agree to switch modes are in Figure 6.



Figure 6. Characteristics of Respondents Who Are Not Willing to Switch to Kuta Special Buses

The number of respondents who were unwilling to move was 51 people. Based on Figure 6, the characteristics of respondents who were unwilling to move and were the most dominant were as follows: The most dominant occupation is entrepreneurship, totaling 27 people (or

53% of the total respondents who answered not willing). Income with the most dominant value of Rp 7,000,000 to Rp 9,000,000, totaling 13 people (or 25% of the total respondents who answered not willing). The mode currently used with the most dominant value is a motorcycle, totaling 35 people (or 69% of the total respondents who answered not willing). Travel time with the most dominant value is less than 1 hour, totaling 33 (or 65% of the total respondents who answered not willing). Time to vehicle with the most dominant value is less than 5 minutes (using private vehicles), totaling 36 people (or 71% of the total respondents who answered not willing). Based on the analysis results, several factors can be identified that have the potential to influence respondents' decisions to change transportation modes in the Kuta area. There are 374 respondents who are willing to change modes, with the most dominant characteristics including work as private employees, monthly income of IDR 3,000,000 to IDR 5,000,000, use of motorcycles as the current mode of transportation, travel time less than 1 hour, and time to a vehicle less than 5 minutes. In contrast, of the 51 respondents who are not willing to change, the dominant characteristics include work as entrepreneurs, income of IDR 7,000,000 to IDR 9,000,000, use of motorcycles, travel time less than 1 hour, and time to a vehicle less than 5 minutes.

To follow up on these findings, several steps that can be taken are as follows: Marketing Segmentation: Marketing segmentation is intended so that the products offered are more preferred by target consumer groups (Zlatanova & Pazheva, 2024). Developing a more targeted marketing strategy with a focus on groups of tourists, private employees, and motorcycle users because they show a higher willingness to change modes. Tariff Adjustment: Reviewing the offered transportation mode rates to be more competitive, especially for those with middle monthly incomes (IDR 3,000,000 to IDR 5,000,000). Accessibility Development: Increasing ease of access to new transportation modes, for example, by ensuring that the mode is easily accessible in a short time (less than 5 minutes) from the user's location. In addition, integration with existing modes is a form of sustainable transportation to increase efficiency, affordability, and reach (Etukudoh et al., 2024). Educational Campaign: Conducting educational and socialization campaigns targeting tourists and motorcycle users, with an emphasis on the benefits of switching modes, such as efficiency of travel time and costs. This campaign is intended to increase comfort and awareness of safe driving while traveling (Mardikawati et al., 2024). Collaboration with the Private Sector: Collaborating with private companies to provide incentives for their employees who switch modes, for example in the form of transportation subsidies or other facilities. This is possible where Kuta, as a tourist destination, is certainly an economic center that gathers many employees every day to work. By implementing these steps, it is hoped that it will increase the number of users who are willing to change modes of transportation, thereby reducing congestion and increasing travel efficiency in the Kuta area.

CONCLUSION

Based on the survey results and analysis, the majority of respondents showed high interest in switching to Kuta Special Bus as an alternative mode of transportation, with 83.3% of respondents stating their willingness. The dominant characteristics of respondents who were willing to switch were those who worked as private employees, had middle incomes, and used motorbikes with travel times of less than 1 hour. Factors such as occupation, income, usual mode of transportation, travel time, and accessibility of the mode had a significant relationship to the decision to switch modes. However, challenges remain, especially for respondents who are reluctant to switch, citing less flexibility and time efficiency compared to private vehicles. Therefore, measures such as increasing fleet availability, developing

accessibility, and educating about the benefits of using buses need to be implemented to increase adoption of Kuta Special Bus and overcome potential obstacles.

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