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Analysis of Road User Satisfaction with Road Congestion: A Case Study on Jalan Duyung in front of Batu Ampar Port

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ABSTRACT

Road congestion is a severe problem faced in many big cities worldwide. This study aims to analyze road users' satisfaction level with road congestion and the factors that contribute to their perceptions of Jalan Duyung in front of Batu Ampar Harbor in Batam City. Roads should be balanced with the adequacy and availability of transportation infrastructure and facilities to prevent traffic problems. Traffic lights aim to optimize and regulate traffic to run optimally. Based on research that has been done, traffic jams can have an impact on the economy, psychology, and productivity of road users.

1. Introduction

User roads around the world face the same problem, which is congestion. Then traffic and satisfaction user low road. Studies published in 2020 show that users' satisfaction with the roads in Harbor Front is below average, despite the quality of roads in the area. Research conducted at the Harbor Front has shown that factors like density, Then, cross, rate difficulty, maneuverability, and safety drive impact satisfaction on user road. Researchers have also found that density Then crosses own more impact significant than difficulty maneuvering in nature, determines the level of satisfaction user way and that safe Driving is also very influential to satisfaction user road. Because it is necessary to conduct more Lots exploratory research influencing factors of satisfaction users walking in front of the Harbor so you can understand the impact on mobility and safety drive. To increase satisfaction on user roads in Front of the Harbor, a strategy focused on improvement is needed in a quality way, control density, Then cross, and increase safety drive [1].

In Indonesia, user way ahead of the harbour experience low satisfaction. This is because of a need for more space on the road and congestion. Then, traffic occurs, and the lack of facility available path. Studies show that condition paths and availability of facility roads are influencing factors of satisfaction with user roads. Condition lousy road can cause congestion Then cross and danger for user road. When planning roads, special attention should be paid to rainwater drainage. Due to the nature of the asphalt mixture itself, stagnant water can easily damage the pavement layer. This condition is caused by the fact that asphalt does not have strong water-immersion properties [2]. Availability facility needs to be improved as well cause user road feels No convenient and less satisfied. Because that is important to ensure that condition roads and facilities are way ahead pel ab then fulfill the standard To increase satisfaction on user road. Besides that, developing roads and facilities with suitable paths with standards is also necessary to increase user road satisfaction [3].

Satisfaction user road in front of Batu Ampar Harbor has become the focus main various study international during the 2018-2022 years. Studies show that the condition road in front of Batu Ampar Harbor significantly impacts the level of satisfaction with the user road. The factor's most significant influence is the quality road. Besides that, the experience can influence the level of satisfaction user road.

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Enhancement quality equipment drive, like enhancement security and service, can increase satisfaction on user road. The latest study shows that enhancing quality roads in front of Batu Ampar Harbor impacts user road satisfaction. This is caused by increased quality infrastructure like additional track pedestrians, additional track cars, and installation lights. Then cross. So, quality roads in front of Batu Ampar Harbor can influence users' road satisfaction. Because that is an increase in quality way ahead, Batu Ampar Port is an essential step For increasing satisfaction on user road [4].

Constraint operation on the road In front of Batu Ampar Harbor during 2018-2022 has been a lower level of satisfaction among user road. Decline level satisfaction This is caused by several factors, like enhancement amount vehicles, traffic jams, Then cross, and settings, Then less traffic right. Besides, the road user also feels dissatisfied with the quality of equipment driven, like the availability of facility transportation general and additional track pedestrian. Regardless of the efforts that have done, the rate of satisfaction on the user road in front of Batu Ampar Harbor still needs to be higher. One method For increasing satisfaction is with bro increase quality way, availability of facility transportation general, and improvement quality equipment drive. With so, the expected level of satisfaction on user road in front of Batu Ampar Harbour can increase significantly [5].

Objective writing journal This is For know level satisfaction users on the road in front of Batu Ampar Harbour. Study This will collect data regarding the level of satisfaction with the user road in front of Batu Ampar Harbor from various aspects, incl the use of Then crosses, quality roads, security, comfort, and facilities. Result of the study This will be used To increase the quality of service road in front of Batu Ampar Harbour.

2. Literature Review

2.1 Road Performance

Roads function as vehicle infrastructure to move from one place to another, facilitating the accessibility of goods, services, and community activities. Roads are also expected to provide services to transportation and road users that are comfortable, safe, and efficient. Road conditions are also expected to be in the best possible condition. Therefore, poor road conditions can cause road user dissatisfaction in using the road infrastructure [6].

Various types of vehicles pass through the road; this causes a variety of behaviour in traffic situations; hefty vehicles that pass through the road are also traversed by conventional vehicles. Vehicle speed on a particular road is also an indicator of road flow. Roads with no barriers will cause the vehicle's speed to be fast. The time a road user reacts in situations such as traffic will also affect road performance [6].

Road roughness can be used to estimate road performance. Rough roads must be continuously monitored to accurately determine the condition of the road infrastructure. Knowledge of "Road Roughness" has long been recognized as an essential measure of safety and ride quality. There are many indicators of poor road performance. For example, accidents that occur and dissatisfaction with road users passing through the road indicate poor road performance [7].

One of the factors that affect road performance is traffic signs. Traffic signs are the primary interaction between the environment and the driver. Many studies state that traffic signs can be used to index the driver's reaction to the road. The function of traffic signs is to regulate the movement of vehicles to improve driver safety and road performance [8].

2.2 Traffic Lights

One way to control traffic so as not to cause congestion is to control traffic lights intelligently. Currently, some traffic lights are controlled by a predetermined fixed time plan and are designed not to observe

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actual traffic. The latest study proposes new rules that are handcrafted rules based on actual traffic data. However, this rule still cannot be done dynamically with real-time traffic. Traffic lights are considered very important for the continuity of the road so as not to cause congestion and accidents due to driver carelessness [9].

Its capacity is one of the most critical indicators describing road works' efficiency. Estimating its capacity is done by calculating the maximum number of vehicles that pass through the road in a specific time. Examining the results requires special attention not only in evaluating activities but also for their completion [10]. These results can be used as a benchmark for the government in overcoming congestion if congestion occurs and data on the performance of the traffic lights.

Sometimes, the traffic light control system is functioning or not functioning. However, there are many other cases, i.e. such as football events or high-traffic hour scenarios; the traffic light control system needs to be fixed. On the other hand, we will meet an experienced police officer who will immediately go down to manage the intersection by waving a signal. In this traffic scenario, a human operator observes traffic conditions in real-time, using his experience and long-term understanding of the intersection to manage traffic effectively [11].

In one of the cases in the world, traffic lights are modified to cure a motor disease, namely Cerebral Palsy. The traffic light is used to cure motor disease [12]. Therefore traffic lights are considered very important for a road. A comfortable and smooth road is a road that has a sound traffic light system. A good traffic light shows that an area that has it is an area that is comfortable for motorists to pass.

2.3 Road Safety

Road accidents result in an estimated 1.3 million deaths and around 50 million serious injuries yearly. The number of road deaths will continue to increase even though road safety continues to be improved. [13]. Therefore, one of the main objectives of organizing road transportation is to minimize the number of accidents and reduce the fatal accident rate. The most effective road safety management is management according to the goals set for the road system under consideration [14].

Central to road safety and other domains is identifying how to use scarce resources to the most significant advantage. In road safety, CBA is the most popular tool. [15] .Every factor that influences accidents is closely related to social welfare. Estimating the effect of interest is complicated by the many ways the number of accidents can vary [16].

Road safety is essential to the socio-economic agenda of countries around the world. The problem of road traffic collisions has become a concern of many countries, especially developing countries. The increasing population, inadequate road infrastructure, and ineffective safety policies and transport systems exacerbate road safety. This problem will further exacerbate the overburdened healthcare system [17].

Collaboration between government, society, and research institutions is necessary to achieve a higher level of road safety. This collaboration aims to implement an effective strategy based on the latest research results [18].The government can regulate policies and regulations that support road safety, while the public can contribute through awareness of traffic rules and responsible driving behavior. In addition, research institutions have an essential role in generating new knowledge and recommendations based on analysis of the latest road safety data and trends. Through strong collaboration between these three parties, it is hoped that joint efforts will be realized to achieve a higher level of road safety and reduce the number of accidents that occur [19].

3. Method

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A study was conducted on Jalan Duyung, located in Batu Ampar District, Batam City, Riau Archipelago Province, Indonesia. Jalan Duyung is one of the roads in front of Batu Ampar Harbor and Batu Ampar Ferry Port. The location map more clear can be seen in Figure 1.

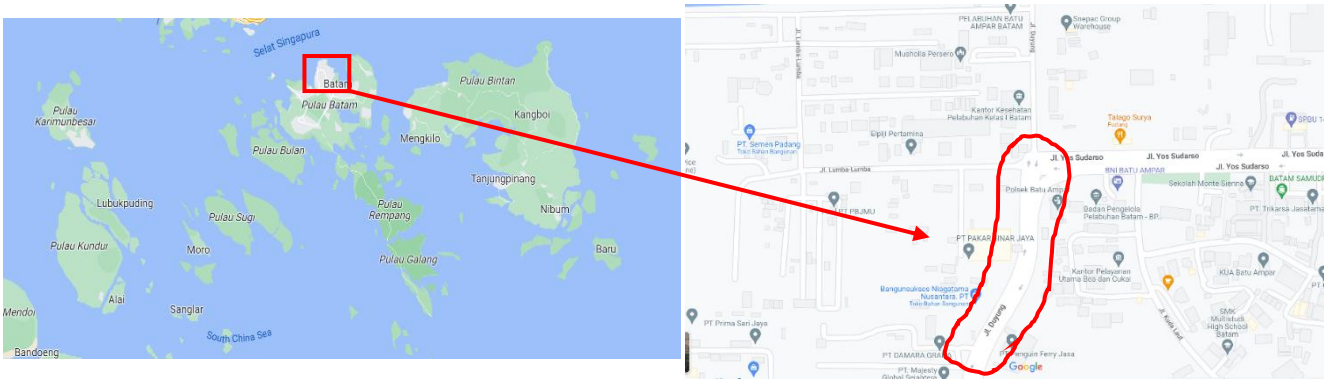

Figure 1. Location of Jalan Duyung

This study uses primary data collection methods involving observation, questionnaires, and documentation. The aim is to explore road users' perceptions of traffic jams using a questionnaire. The questionnaire uses the Likert Scale method, which is a scale used to measure perceptions, attitudes, or opinions of individuals or groups regarding an event or social phenomenon. [20].Data analysis in this study uses a quantitative and qualitative approach. Quantitative data analysis methods involve statistical and mathematical techniques to collect, organize and analyze numerical data to generate findings and conclusions [21]. Meanwhile, qualitative descriptive research aims to gain a deep understanding of a particular phenomenon or context [22].

Road user satisfaction analysis research was carried out to understand the level of user satisfaction with existing road infrastructure; this is very important for determining future road improvement policies and helping the government and related institutions to find out weaknesses in the transportation system and find solutions to overcome existing problems [23] [24] [25] [26] [27]. By understanding the level of user satisfaction, the government can improve the quality of road infrastructure and provide a better experience for road users.

4. Result and Discussion

4.1 Analysis of Road User Satisfaction Against Travel Time

In this study, a questionnaire regarding road user satisfaction with travel time was filled out by 50 respondents. The data collected from these respondents will become the basis for analysis related to road user satisfaction. The importance of travel time in analyzing road user satisfaction must be considered. Travel time is one of the critical factors influencing user satisfaction with the experience of using the road. The following table shows how satisfied road users are regarding travel time.

Table 1. Analysis of Road User Satisfaction Against Travel Time

What Type of Vehicle Do You Use?	How Disturbing Congestion Against Travel Time?					Total
	Verry Disturbing	Disturbing	Normal	Undisturbing	Very Undisturbing	
Private Vehicle	0	9	6	9	0	24
Public Transport	3	10	9	4	0	26
Total	3	19	15	13	0	50

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In analyzing data from respondents, it was found that as many as 38 percent of them felt annoyed because of the travel time they experienced when traffic jams occurred. These findings indicate that the length of travel time increases when stuck in traffic jams, to be a significant problem for most road users. As their travel time increases, this can result in discomfort, stress, and a negative impact on their time efficiency. This data underscores the importance of addressing congestion issues and finding practical solutions to reduce travel time for a better road user experience. To increase road user satisfaction, it is necessary to prioritize reducing congestion and improving infrastructure and traffic management to minimize excessive travel time.

4.2 Analysis of Road User Satisfaction on Travel Convenience

A total of 50 respondents have filled out a questionnaire related to the problem of road user satisfaction with comfort. The data collected from these respondents will become essential for analyzing road user satisfaction. The importance of convenience in analyzing road user satisfaction must be addressed. Convenience is one of the main factors that influence the level of user satisfaction with their travelling experience. When road users feel comfortable, they are more satisfied with their journey. The table below will show road users' satisfaction with comfort during traffic jams.

Table 2. Analysis of Road User Satisfaction on Travel Convenience

What Type of Vehicle Do You Use?	How Comfortable Are You Through Traffic?					Total
	Verry Comfortable	Comfortable	Normal	Uncomfortable	Very Uncomportable	
Private Vehicle	0	11	5	8	0	24
Public Transport	0	5	11	10	0	26
Total	0	16	16	18	0	50

Based on data analysis from respondents, it was found that as many as 36 percent of them stated that they felt uncomfortable going through traffic jams. These findings indicate that comfort is a significant problem for most road users experiencing traffic jams. This discomfort can be caused by various factors, such as the inability to move smoothly, high traffic density, uncomfortable temperature inside the vehicle, or high noise. This data emphasizes the importance of paying attention to the comfort of road users in dealing with traffic jams. Convenience is an essential aspect in analyzing road user satisfaction because a comfortable experience can help reduce the stress and discomfort that road users may experience.

4.3 Analysis of Road User Satisfaction on Road Performance

A total of 50 respondents have filled out a questionnaire related to the problem of road user satisfaction with road performance. The data collected from these respondents will become essential for analyzing road user satisfaction. The importance of road performance in analyzing user satisfaction must be addressed. Road performance includes speed, capacity, reliability, safety, and transportation efficiency. When road performance is good, road users tend to feel more satisfied with their trips. Factors such as short travel time, minimal congestion, availability of adequate infrastructure, and good traffic safety can all contribute to the satisfaction level of road users. The following table shows how satisfied road users are with road performance.

Table 3. Analysis of Road User Satisfaction on Road Performance

What Type of Vehicle Do You Use?	How Satisfied is the Road Performance in Congestion?					Total
	Verry Satisfied	Satisfied	Normal	Unsatisfied	Very Unsatisfied	
Private Vehicle	0	7	10	7	0	24
Public Transport	0	5	12	9	0	26

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Total	0	12	22	16	0	50

The analysis of the respondent's data found that as many as 44 percent of them stated that the road performance was average or mediocre. These findings indicate that most road users perceive road performance is not experiencing significant problems. They feel that speed, capacity, and road safety are acceptable. Nonetheless, it is essential to remember that these perceptions can differ between individuals and can be influenced by each respondent's personal experience. Although most respondents stated that walking performance was average, further analysis must be conducted to evaluate the factors influencing this perception. By understanding user perceptions and assessments of road performance, areas that need improvement or improvement can be identified to increase overall road user satisfaction.

4.4 Analysis of Road User Satisfaction with All Aspects of The Trip

In this study, as many as 50 respondents filled out questionnaires related to the problem of road user satisfaction with all aspects of the trip. The data collected from these respondents will provide valuable insights into analyzing overall road user satisfaction. Road users have various aspects to consider in assessing their satisfaction, including comfort, safety, efficiency, speed, accessibility, and infrastructure quality. By analyzing the inputs of 50 respondents, users' preferences, needs, and expectations for their trips can be identified. A comprehensive understanding of all these aspects will assist in designing appropriate solutions and improvements to increase overall road user satisfaction. The following table will show how satisfied road users pass through the area.

Table 4. Analysis of Road User Satisfaction with All Aspects of the Trip

What Type of Vehicle Do You Use?	How Satisfied is the Road Performance in All Aspect?					Total
	Verry Satisfied	Satisfied	Normal	Unsatisfied	Very Unsatisfied	
Private Vehicle	0	10	10	4	0	24
Public Transport	0	11	9	6	0	26
Total	0	21	19	10	0	50

Based on the analysis of the respondent's data, it was found that as many as 42 percent of them stated that they were satisfied with all aspects of traveling when experiencing traffic jams. This finding shows that most road users are satisfied with various aspects of their trip despite the congestion. This indicates that even though they are stuck in traffic jams, they still have a positive perception of comfort, safety, efficiency, speed, accessibility, and quality of existing infrastructure. This high level of satisfaction indicates the potential to improve the experience of road users in congested conditions through more effective solutions. To increase road user satisfaction, it is necessary to conduct further analysis to identify the factors contributing to this level of satisfaction and implement strategies to improve and improve the overall travel experience when congestion occurs.

From the results of the data analysis, travel time plays a vital role in road user satisfaction. The findings show that increased travel time due to congestion is a significant problem for most road users, resulting in inconvenience, stress, and impaired time efficiency. Therefore, overcoming the problem of congestion and finding practical solutions to reduce travel time is very important in increasing road user satisfaction. Efforts to reduce congestion and improve travel efficiency should be a priority in traffic planning and management, as well as improving road infrastructure. Reducing travel time and providing a better travel experience is expected to increase overall road user satisfaction and increase efficiency and comfort in using the road.

From the results of the data analysis, comfort plays a vital role in road user satisfaction. The findings show that as many as 36 per cent of respondents felt uncomfortable going through traffic jams. This

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indicates that comfort is a significant problem for most road users experiencing traffic jams. This discomfort can be caused by various factors, such as the inability to move smoothly, high traffic density, uncomfortable temperature in the vehicle, or high noise levels. This data emphasizes the importance of paying attention to the comfort of road users in dealing with traffic jams. Comfort is essential in analyzing road user satisfaction because a comfortable experience can help reduce the stress and discomfort that road users may experience. Therefore, it is necessary to increase comfort during travel, such as improving road infrastructure, better traffic management, and using technology that pays attention to the comfort of road users to increase overall satisfaction and positive experience.

Based on the data analysis, road performance plays a crucial role in road user satisfaction. The findings reveal that a significant proportion, precisely 44 percent, of the respondents perceive the road performance as typical or average. This suggests that most road users do not currently perceive any significant issues or problems with road performance. They find the roads' speed, capacity, and safety acceptable. However, it is essential to note that individual perceptions may vary, and personal experiences can influence these perceptions. Despite the overall perception of average road performance, further analysis is required to identify the factors influencing this perception. Understanding user perceptions and evaluations of road performance is essential in identifying areas for improvement and enhancing overall road user satisfaction. Addressing any shortcomings and implementing effective strategies can enhance road performance and provide a better experience for road users.

5. Conclusion

From the data analysis, road users' satisfaction with all aspects of their trip significantly determines their overall satisfaction. The findings indicate that a substantial percentage, precisely 42 per cent, of the respondent's expressed satisfaction with various aspects of their travel experience, even when faced with traffic congestion. This suggests that road users prioritize not only one specific aspect but consider the holistic experience, including comfort, safety, efficiency, speed, accessibility, and the quality of infrastructure. Despite encountering traffic jams, the positive perception of road users regarding these aspects indicates the potential to enhance their overall satisfaction. Further analysis is required to identify the contributing factors to this high satisfaction level and devise effective strategies for improving the travel experience during congested conditions. By addressing these factors and implementing appropriate solutions, road authorities can strive to provide road users a more satisfying and enjoyable journey.

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