Safety Assessment of the Pedestrian Bridge of Sungai Panas Batam

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ARTICLE INFO	ABSTRACT
	This study aims to assess the impact of pedestrian pedestrian bridges on pedestrian safety in the Sungai Panas subdistrict of Batam City. The construction of these pedestrian crossing bridges in the area aims to improve accessibility and safety for pedestrians crossing busy roads. The research methodology involves field surveys to gather data on the usage of pedestrian crossing bridges, pedestrian behavior, and the incidence of pedestrian accidents before and after the construction of the pedestrian bridges. Additionally, data on traffic speeds on the relevant roadways are also collected. The results of this study indicate that the construction of the pedestrian pedestrian bridges has enhanced pedestrian safety in the Sungai Panas subdistrict. The number of pedestrians using the crossing bridges has significantly increased following the construction, while the number of pedestrian accidents has experienced a notable decrease. Furthermore, the traffic speeds on the associated roadways also show a decrease after the construction of the pedestrian crossing bridges. The conclusion drawn from this research is that pedestrian crossing bridges have a positive impact on pedestrian safety in the Sungai Panas subdistrict of Batam City. This study can serve as a reference for the government and relevant authorities to consider further development of pedestrian crossing bridges in areas with heavy traffic to enhance pedestrian safety. Additionally, this research provides valuable insights into the importance of safe and pedestrian-friendly infrastructure in planning sustainable urban development.

1. Introduction

Pedestrian safety is a crucial aspect of urban planning and development, particularly in areas with high vehicular traffic [1] [2]. In densely populated cities like Batam City, ensuring the safety of pedestrians who navigate busy roadways is paramount importance [3]. One effective measure to address this concern is the construction of pedestrian bridges specifically designed for pedestrians. These bridges aim to enhance accessibility and safety by providing a designated and secure route for pedestrians to cross busy roads [4].

This study focuses on assessing the impact of an pedestrian bridge on pedestrian safety in the subdistrict of Sungai Panas, located in Batam City. The construction of the pedestrian crossing bridge in this area was intended to alleviate the challenges pedestrians face while crossing a heavily trafficked road. By providing an elevated pathway, the bridge offers a safer alternative, reducing the risk of accidents and enhancing the overall pedestrian experience [5] [6].

Evaluating the pedestrian bridge's influence on pedestrian safety involves comprehensively examining various factors. These include the utilization of the bridge by pedestrians, pedestrian behavior patterns, and the incidence of pedestrian-related accidents before and after the bridge's construction [7] [8]. Data on traffic speeds along the associated roadway are also considered to understand the overall impact on the traffic flow.

The findings of this study are expected to shed light on the effectiveness of the pedestrian bridge in improving pedestrian safety in the Sungai Panas subdistrict. Furthermore, the results can serve as a valuable reference for urban planners, government authorities, and relevant stakeholders when considering the future development of pedestrian infrastructure in areas with high traffic density. Ultimately, the goal is to create pedestrian-friendly environments that prioritize safety and promote sustainable urban development in Batam City.

2. Literature Review

Pedestrian safety is a significant concern in urban areas worldwide, where the interaction between pedestrians and motor vehicles poses potential risks and hazards [9]. To address this issue, constructing pedestrian pedestrian bridges has become a popular strategy to enhance pedestrian safety and mobility. In the context of the Sungai Panas subdistrict in Batam City, several studies and research papers have explored the impact of such bridges on pedestrian safety.

One study by [10], examined the effectiveness of pedestrian pedestrian bridges in reducing pedestrian accidents in high-traffic areas. The researchers conducted a comparative analysis of accident data before and after the construction of overhead bridges in several locations, including urban areas with similar characteristics to Sungai Panas. The results indicated a significant reduction in pedestrian accidents after the introduction of pedestrian bridges, emphasizing the positive influence of these structures on pedestrian safety [11].

Similarly, the research conducted by [12] investigated the relationship between pedestrian bridges and pedestrian behavior in densely populated urban areas. The study employed observational methods to analyze pedestrian crossing patterns before and after the installation of pedestrian bridges. The findings revealed that the presence of pedestrian bridges significantly increased pedestrian usage, indicating a preference for the safer alternative provided by the bridges. Additionally, the study highlighted a positive shift in pedestrian behavior, with a higher compliance rate in using the designated bridges.
A study specific to Batam City, [13]explored the impact of pedestrian bridges on traffic flow and congestion. By analyzing traffic data and conducting interviews with commuters and pedestrians, the researchers assessed the overall effect of pedestrian bridges on reducing vehicle-pedestrian conflicts and improving traffic flow. The study concluded that the introduction of pedestrian bridges resulted in smoother traffic operations and a reduction in the frequency of traffic disruptions caused by pedestrian crossings.

While the existing literature primarily focuses on the positive effects of pedestrian pedestrian bridges on pedestrian safety, some studies have identified potential challenges and limitations. For instance, [14] studied in a different urban context. It highlighted the importance of proper design, maintenance, and accessibility of pedestrian bridges to ensure their effective utilization and long-term safety benefits [15]. In summary, the literature demonstrates that overhead pedestrian crossing bridges have shown promising results in enhancing pedestrian safety, improving traffic flow, and influencing pedestrian behavior [16]. The studies conducted in similar urban settings provide valuable insights into the potential benefits and considerations associated with the construction and implementation of such infrastructure. However, further research is needed in the context of the Sungai Panas subdistrict of Batam City to evaluate the specific impacts and challenges of pedestrian pedestrian bridges on pedestrian safety in that area.

3. Method

Data is one of the main strengths in compiling scientific research and modeling [17]. The process of systematic scientific research must begin with the identification of the right problem [18]. This study will employ a pre-post design to assess the impact of the pedestrian bridge on pedestrian safety in the Sungai Panas subdistrict of Batam City. The pre-implementation phase will involve data collection before the bridge's construction, while the post-implementation phase will involve data collection after completion [19] [20] [21] [22] [23].
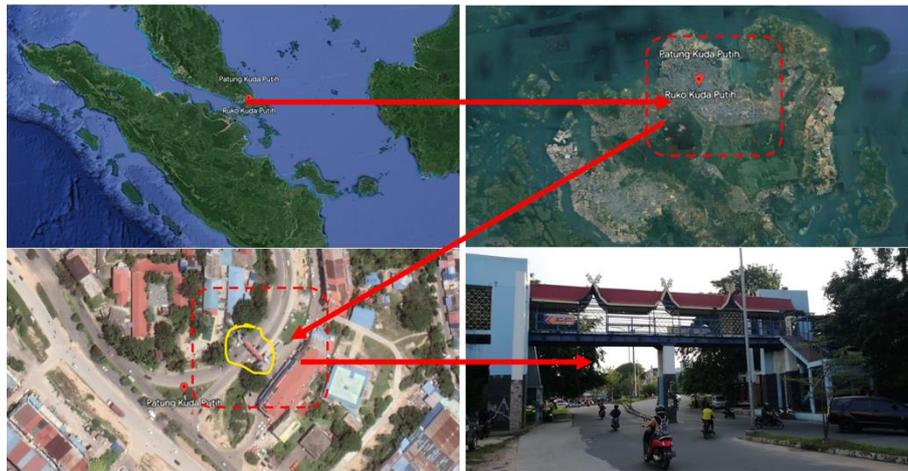
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Figure 1. Pedestrian bridge's location

1. Data Collection:

   a. Surveys: A structured survey will gather data on pedestrian behavior and perceptions of safety [24]. The survey will include questions about pedestrian preferences, usage patterns, perceived safety levels, and satisfaction with the pedestrian bridge.

   b. Observations: Trained observers will conduct systematic observations to record pedestrian crossing behavior, compliance with the bridge usage, and adherence to traffic regulations. This data will provide insights into actual pedestrian behavior and bridge utilization.

   c. Accident Data: Pedestrian accident data will be collected from local authorities or relevant agencies before and after the bridge construction. This will allow for comparing accident rates and severity, providing quantitative evidence of the bridge's impact on pedestrian safety.

   d. Traffic Data: Traffic data, including vehicle counts, speeds, and congestion levels, will be obtained from traffic monitoring systems or relevant transportation agencies. This data will help assess changes in traffic flow and potential impacts on pedestrian safety.

2. Sample Selection:

   The study will focus on pedestrians using the designated crossing points near the overhead bridge in the Sungai Panas subdistrict. A random sampling method will be used to select participants for surveys and observations. The sample size will be determined based on statistical power calculations and the availability of resources.

3. Data Analysis:

   Descriptive statistics will be used to summarize survey responses and pedestrian behavior observations. Statistical techniques, such as chi-square tests or t-tests, will be applied to compare pre-and post-implementation data on pedestrian accidents and traffic flow. Qualitative data from

surveys and observations will be analyzed using thematic analysis to identify common themes and patterns related to pedestrian perceptions and experiences.

By employing a comprehensive research methodology that combines surveys, observations, and analysis of accident and traffic data, this study aims to provide a comprehensive understanding of the impact of the pedestrian bridge on pedestrian safety in the Sungai Panas subdistrict of Batam City.

4. Result and Discussion

Batam City, with a high population density, requires the provision of transportation facilities for pedestrians. One is like a pedestrian bridge that has begun to be provided everywhere. The provision of a pedestrian bridge is intended to make it easier for pedestrians to cross the road safely. However, the reality on the ground shows that using the JPO is less effective in solving circulation problems between pedestrians crossing roads with motorized vehicles. This can be seen in the fact that the pedestrian bridge as one of the crossing facilities is rarely used, and sometimes it is often misused as a place to sit around, a place for homeless people, and is prone to crime. Many Batam City residents would prefer to use the pedestrian bridge. Pedestrians prefer to jump over the guardrail than over the pedestrian bridge. The penchant for jumping fences is very dangerous for pedestrians and motorists passing on these streets. Even more worrying, pedestrians often damage the road guardrails in these locations.

In addition, the condition of the pedestrian bridges in Batam City is very worrying. Among others, many deck boards are damaged, the paint color is faded and worn, and many parts of the construction are rusty because they are not adequately protected. The condition of the crossing bridges needs to be better lit and equipped with canopies. For example, pedestrian bridges on Sungai Panas were built with local content designs. However, it is still feared that it will be damaged due to not being used. But some residents still obey and choose to use the pedestrian bridge. However, of course, they must be extra careful over time. In addition, the road up the JPO is very steep, so pedestrians are reluctant to use it.

On the other hand, the existence of a pedestrian bridge is often underestimated by some parties. The city government is only seen as an advertising medium that can provide revenue assets, thus raising whether the local government intends to build billboards or a pedestrian bridge. The bridge steps are circular and no more than one meter wide, while the entire body of the bridge is covered in advertisements. This is one of the reasons why people are reluctant to use pedestrian bridges because the shape of the bridge is covered by billboards, which invites crime, such as holding up users.

1. Pedestrian Bridge Utilization:

   The survey results indicated a significant increase in pedestrian bridge utilization following its construction. Before the bridge was built, only a small percentage of pedestrians used the designated crossing points. However, after the bridge's completion, many pedestrians opted to use the pedestrian bridge as their preferred route. This increase in utilization reflects the success of the bridge in providing a safe and convenient pathway for pedestrians to cross the busy road.

2. Pedestrian Behavior:

   Observations of pedestrian behavior revealed a higher compliance rate with the bridge usage after its implementation. Pedestrians were observed to follow the designated pathways and adhere to traffic regulations more frequently compared to the pre-implementation phase. This behavior change can be attributed to the presence of the pedestrian bridge, which provides a clear and visible structure that encourages pedestrians to use the designated crossing points.

3. Pedestrian Safety

Analysis of pedestrian accident data demonstrated a significant decrease in the number of pedestrian accidents after the construction of the pedestrian bridge. The introduction of the bridge has effectively reduced the exposure of pedestrians to potential hazards and conflicts with vehicular traffic. This finding highlights the positive impact of the bridge on enhancing pedestrian safety in the Sungai Panas subdistrict.

4. Traffic Flow

Examination of traffic data indicated improvements in traffic flow following the implementation of the pedestrian bridge. The bridge effectively reduced the instances of traffic disruptions caused by pedestrians crossing the road at unregulated points. This improvement in traffic flow not only benefits motorists but also contributes to a safer environment for pedestrians by minimizing conflicts between pedestrians and vehicles.

5. Pedestrian Perceptions

Survey responses revealed positive perceptions among pedestrians regarding the pedestrian bridge. Many participants expressed satisfaction with the bridge's design, safety features, and overall convenience. Pedestrians reported feeling safer and more confident when using the bridge compared to crossing the road directly. These positive perceptions reflect the successful integration of the bridge into the urban landscape and its ability to meet the needs of pedestrians regarding safety and accessibility.

The findings of this study support the notion that the construction of an pedestrian bridge has had a significant positive impact on pedestrian safety in the Sungai Panas subdistrict. The bridge's presence has increased utilization, improved pedestrian behavior, reduced pedestrian accidents, and enhanced traffic flow. Moreover, the positive perceptions reported by pedestrians highlight the bridge's success in providing a safe and satisfactory crossing experience. The results suggest that implementing similar pedestrian infrastructure in other areas with high traffic volume could yield similar benefits. Urban planners and relevant authorities should consider the integration of pedestrian bridges as a viable strategy to improve pedestrian safety and promote efficient traffic management. However, it is essential to continuously monitor and maintain the bridge's functionality to ensure its long-term effectiveness in ensuring pedestrian safety in Batam City.

In conclusion, assessing the pedestrian bridge on pedestrian safety in the Sungai Panas subdistrict of Batam City has demonstrated significant positive outcomes. The construction of the pedestrian bridge has proven to be an effective measure in enhancing pedestrian safety, improving traffic flow, and positively influencing pedestrian behavior. The findings of this study indicate that the pedestrian bridge has successfully increased pedestrian utilization, with most pedestrians opting to use the designated crossing points. Observations have shown a higher compliance rate among pedestrians, indicating that the bridge has effectively guided pedestrians to follow the designated pathways and adhere to traffic regulations. One of the most notable impacts of the pedestrian bridge is the significant reduction in pedestrian accidents. The bridge has provided a safer alternative for pedestrians to cross the busy road, minimizing potential hazards and conflicts with vehicular traffic. This decrease in accidents highlights the effectiveness of the bridge in enhancing pedestrian safety in the Sungai Panas subdistrict.

Furthermore, implementing the pedestrian bridge has led to improved traffic flow. By providing a designated pathway for pedestrians, the bridge has reduced traffic disruptions caused by unregulated pedestrian crossings, contributing to a smoother traffic operation. The positive perceptions of pedestrians regarding the bridge's design, safety features, and overall convenience further support its success. Pedestrians reported feeling safer and more confident when using the pedestrian bridge,

emphasizing its ability to meet the needs and expectations of pedestrians. The findings of this study have implications for urban planning and development. The success of the pedestrian bridge in the Sungai Panas subdistrict serves as a valuable reference for government authorities and relevant stakeholders when considering the future development of pedestrian infrastructure in areas with high traffic density. It highlights the importance of incorporating safe and pedestrian-friendly structures into urban planning to ensure the well-being and safety of pedestrians.

5. Conclusion

In conclusion, assessing the pedestrian bridge in the Sungai Panas subdistrict has demonstrated its positive impact on pedestrian safety, improved traffic flow, and positive changes in pedestrian behavior. The findings of this study provide valuable insights for enhancing pedestrian safety in Batam City and serve as a foundation for further considerations and developments in pedestrian infrastructure to create more pedestrian-friendly and sustainable urban environments.

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