

# Assessment of Pedestrian Crossing Bridge Safety: Case Study Sungai Panas, Batam

Deon Libora<sup>1</sup>, Indrastuti<sup>2</sup>

<sup>1,2</sup>Faculty of Civil Engineering and Planning, Universitas Internasional Batam

Email correspondence: deonlibora01@gmail.com

---

## ARTICLE INFO

## ABSTRACT

### Keywords:

Overhead crossing bridge

Safety

Pedestrian

*This study aims to assess the impact of pedestrian overhead crossing 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 overhead crossing 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 overhead crossing 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 volumes of vehicular traffic [1] [2]. In densely populated cities like Batam City, ensuring the safety of pedestrians who navigate busy roadways is of paramount importance [2]. One effective measure to address this concern is the construction of overhead crossing 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 [3].

This study focuses on assessing the impact of an overhead crossing 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 faced by pedestrians 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] [4].

Evaluating the overhead crossing 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 [5], [6]. 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 overhead crossing 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 [7]. To address this issue, constructing pedestrian overhead crossing 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 [8] examined the effectiveness of pedestrian overhead crossing 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 like 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 [9].

Similarly, the research conducted by [10] 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 overhead crossing 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, [11] 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 overhead crossing bridges on pedestrian safety, some studies have identified potential challenges and limitations. For instance, [12] 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 overhead crossing bridges on pedestrian safety in that area.

### 3. Method

Data is one of the main strengths in compiling scientific research and modeling [13]. The process of systematic scientific research must begin with the identification of the right problem [14].

#### 1. Research Design

This study will employ a pre-post design to assess the impact of the overhead crossing 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.

#### 2. Data Collection:

- a. Surveys: A structured survey will gather data on pedestrian behavior and perceptions of the safety [15]. The survey will include questions about pedestrian preferences, usage patterns, perceived safety levels, and satisfaction with the overhead crossing 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.

#### 3. 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.

#### 4. 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 overhead crossing bridge on pedestrian safety in the Sungai Panas subdistrict of Batam City.

### 4. Result and Discussion

#### 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, the majority of pedestrians opted to use the overhead crossing bridge as their preferred route. This increase in utilization

reflects the bridge's success in providing a safe and convenient pathway for pedestrians to cross the busy road.



Figure 1. The overhead crossing bridge

#### 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 overhead crossing 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 pedestrian accidents after constructing the overhead crossing 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 benefits motorists and 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 overhead crossing bridge. Most participants expressed satisfaction with the bridge's design, safety features, and overall convenience. Pedestrians reported feeling safer and more confident when using the bridge than 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.

### 5. Conclusion

In conclusion, assessing the overhead crossing 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 overhead crossing 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 selected pathways and adhere to traffic regulations. One of the most notable impacts of the overhead crossing 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 overhead crossing 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 overhead crossing 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 overhead crossing 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. In conclusion, assessing the overhead crossing 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.

## Reference

- [1] A. R. A. I. & T. J. Pratama, "The Analysis of Pedestrian Service in Railway Station Area: A Case Tanah Abang Station, Jakarta A Case Tanah Abang Station, Jakarta," 2022.
- [2] S. J. S. A. J. G. P. M. Chaudhari Avinash, "Evaluation of pedestrian safety margin at mid-block crosswalks in India," *Safety Science*, Vols. Volume 119,, pp. Pages 188-198,, 2019,,
- [3] K. R. R. A. I. & Y. P. Pelangie, "Services Analysis of Pedestrian Facility in Office and Business Area: Case Study Jalan Wahid Hasyim, Jakarta. Citizen: Jurnal Ilmiah Multidisiplin Indonesia, 2(5), 804-814,," 2022.
- [4] C. I. R. A. I. & A. A. F. Novitasari, "The Level Performace Analysis of Service: A Case of Jalan I Gusti Ngurah RAI, Jakarta. I, 1(1), 471-480,," *Indonesian Journal of Multidisciplinary Science*, 2022.
- [5] Pengzhen Lu Prof. and Yutao Zhou Grad. Student and Qun Lu Lecturer and Jiahao Wang Grad. Student and Qingtian Shi Grad. Student and Dengguo Li Grad. Student, "Conceptual Design of the Pedestrian Bridge," *Structural Engineering International*, Vols. 32,, pp. 470-483,, 2022,.
- [6] Y. S. R. A. I. & T. M. Rahayu, "Analysis of Road Geometrics with ASSHTO Method (Solo-Yogyakarta-NYIA Kulon Progo Toll Road Section 1 Package 1.1 Solo-Klaten (STA 0+ 000-22+ 300). Citizen: Jurnal Ilmiah Multidisiplin Indonesia, 2(5), 944-," 2022.

- [7] A. W. R. A. I. & H. S. Rahmadhani, "The Perception of Travel Behavior on Public Transport Mode Choice: A Case of Depok-Jakarta Route. Citizen: Jurnal Ilmiah Multidisiplin Indonesia, 2(5), 896-905.," 2022.
- [8] A. R. A. I. & T. J. Pratama, "The Analysis of Pedestrian Service in Railway Station Area: A Case Tanah Abang Station, Jakarta A Case Tanah Abang Station, Jakarta. 2(5), 794-803.," *Citizen: Jurnal Ilmiah Multidisiplin Indonesia*, 2022.
- [9] L. S. S. M. P. C. N. C. M. Tabitha S. Combs, "Automated Vehicles and Pedestrian Safety: Exploring the Promise and Limits of Pedestrian Detection, " *American Journal of Preventive Medicine*, vol. 56, no. 1, pp. 1-7, 2019.
- [10] J. A. B. T. R. C. a. S. S. D. J. A. Boni, "A Study on causes of Road Accidents at Dhaka to Comilla Highway, " *www.engineeringjournal.info*, vol. 1, no. pp, pp. 9-15, 2018.
- [11] L. Blackburn, C. V. Zegeer and K. Brookshire, "Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations," 2018.
- [12] M. a. A. M. A. a. R. A. I. a. M. A. Isradi, "The Effectiveness of Users of the People's Crossing Bridge (JPO) at the Youth Center of the City of North Jakarta Administration during the COVID-19 Pandemic," *ARRUS Journal of Engineering and Technology*, 2022.
- [13] C. A. T. G. e. a. Campisi T, "The importance of assessing the level of service in confined infrastructures: Some considerations of the old Ottoman Pedestrian Bridge of Mostar," 2019.
- [14] T. L. F. A. a. C. A. A. A. P. M. Räsänen, "Pedestrian self-reports of factors influencing the use of pedestrian bridges," vol. 39, no. 5, pp. 969-973, 2007.
- [15] S. R. A. I. & H. S. Sony, "The Effectiveness Analysis of Bus Rapid Transit Services (A Case Trans Semarang, Indonesia), " *Citizen: Jurnal Ilmiah Multidisiplin Indonesia*, Vols. 2022,, pp. 712-719.
- [16] A. R. A. I. & A. A. F. Oktobrianto, "The Traffic Characteristic Analysis of Jalan Ciater Raya South Tangerang, Indonesia.," *Indonesian Journal of Multidisciplinary Science*, vol. 1, no. 1, pp. 437-450, 2022.
- [17] A. I. Rifai, S. P. Hadiwardoyo, A. G. Correia, P. Pereira, and P. Cortez, "The data mining applied for the prediction of highway roughness due to overloaded trucks," *International Journal of Technology*, 6(5), pp. 751-761., 2015.
- [18] A. I. Rifai, S. P. Hadiwardoyo, A. G. Correia and P. A. U. L. O. Pereira, "Genetic Algorithm Applied for Optimization of Pavement Maintenance under Overload Traffic: Case Study Indonesia National Highway," in *Applied Mechanics and Materials (Vol. 845)*, 2016.
- [19] D. D. W. D. S. H. Yan Feng, "Yan Feng, Dorine Duives, Winnie Daamen, Serge Hoogendoorn.," *Building and Environment*, Vols. 187,, 2021.,
- [20] A. I. H. S. P. C. A. G. P. P. & C. P. Rifai, "The data mining applied for the prediction of highway roughness due to overloaded trucks. gy, 6(5), " *International Journal of Technology*, pp. 751-761, 2015.