THE QUEST Journal of Multidisciplinary Research and Development
ISSN 1908-3211 (Online) | ISSN 1908-322X (Print)
P-ISSN: 1908-322X and E-ISSN: 1908-3211
Vol.3 No.2 (2024)
Received: 05-23/ Revised: 08-10/ Accepted:9-28-2024
https://neust.journalintellect.com/quest

Assessment of the Transportation and Mobility Impacts of Santa Rosa Bridge Rehabilitation on Student Commuters

Santos, John Vincent L.[1]*, Florencondia, Noel B.[2]

[1]*Holy Cross College, Sta. Rosa, N.E., Inc., Philippines, 3101*
[2]*Nueva Ecija University of Science and Technology, Philippines, 3100*
*Corresponding author's email: j.vince103@gmail.com

Abstract. This study assessed the transportation and mobility impacts of the Santa Rosa Bridge rehabilitation on student commuters, focusing on how this infrastructure project affects their daily travel experiences. The study employs a descriptive-comparative methodology, gathering data from 117 student commuters through a researcher-made questionnaire distributed online. Results reveal a significant increase in travel time, with more students experiencing delays of 1-2 hours or more. Additionally, the rehabilitation has led to decreased satisfaction with available transportation options and overall commuting experiences, as evidenced by a decline in weighted mean scores across all transportation and mobility constructs. The study concludes that the rehabilitation project has adversely affected student commuters, disrupting their routines and reducing the reliability of their commutes. These findings highlights the need for proactive measures, such as alternative transportation options or temporary shuttle services, to mitigate the impact on student mobility during infrastructure projects.

Keywords: Infrastructure Rehabilitation; Mobility Disruption; Student Commuters; Transportation Impact; Transportation Policy

1. Introduction

Transportation is the backbone of modern economies, fostering social interactions, economic growth, and access to essential services (Navarro & Latigar, 2022). In the Philippines, a country defined by its archipelagic geography and diverse terrains, transportation infrastructure is vital for connecting communities and facilitating national development (De Mesa et al., 2023). Efficient transportation systems enhance the movement of goods, services, and people, driving trade, commerce, and investment (Allirani & Verma, 2022). Furthermore, they provide access to education, healthcare, and employment opportunities, making them essential for societal progress (Agaton et al., 2020).

THE QUEST Journal of Multidisciplinary Research and Development
ISSN 1908-3211 (Online) | ISSN 1908-322X (Print)
P-ISSN: 1908-322X and E-ISSN: 1908-3211
Vol.3 No.2 (2024)
Received: 05-23/ Revised: 08-10/ Accepted:9-28-2024
https://neust.journalintellect.com/quest

The Philippines' transportation landscape includes road networks, railways, maritime routes, and air travel, with road transport being the primary mode for daily commutes within and between cities. However, rapid urbanization and population growth have led to increased strain on these infrastructures, particularly road networks, which suffer from issues such as congestion, poor maintenance, and inadequate design (Fernando & Henry, 2023). Urban centers experience heavy traffic, lengthening travel times, and increasing fuel consumption, while the limited availability of public transit forces a reliance on private vehicles (Guno et al., 2021). These issues not only hinder economic activity but also pose safety risks and negatively affect commuters' quality of life (Karimi et al., 2021).

To address these challenges, the Department of Public Works and Highways (DPWH) has undertaken numerous projects aimed at modernizing and expanding transportation networks. These include road widening, bridge construction, and infrastructure rehabilitation to alleviate congestion and improve safety (Rivera, 2017). However, such projects can also bring temporary disruptions to businesses and daily commuters (Navarro & Latigar, 2022), affecting travel times, business operations, and environmental sustainability (D'Auria et al., 2022).

One prominent example is the ongoing rehabilitation of the Sta. Rosa Bridge in Nueva Ecija. Spanning 542.40 meters, this bridge serves as a critical link between municipalities and provinces along the Sta. Rosa-Tarlac Road. Due to its deteriorating condition, the bridge requires significant structural rehabilitation to ensure safety and continued functionality (Crawford, 2023). While this project promises long-term benefits, it has disrupted the daily commutes of thousands, including students who rely on this infrastructure for access to educational institutions.

Student commuters represent a particularly vulnerable demographic impacted by transportation disruptions (Whalen et al., 2013). Reliable and efficient transportation is essential for students to attend classes, participate in extracurricular activities, and fully engage in their academic pursuits. Delays or changes in transportation routes can have significant consequences for their academic performance and overall educational experience (Tigre et al., 2017).

In light of these challenges, this study focuses on the experiences of student commuters during the rehabilitation of the Sta. Rosa Bridge. It aims to

THE QUEST Journal of Multidisciplinary Research and Development
ISSN 1908-3211 (Online) | ISSN 1908-322X (Print)
P-ISSN: 1908-322X and E-ISSN: 1908-3211
Vol.3 No.2 (2024)
Received: 05-23/ Revised: 08-10/ Accepted:9-28-2024
https://neust.journalintellect.com/quest

assess changes in travel times, transportation modes, accessibility, safety concerns, and adaptations in daily routines (Page et al., 2021; Trček & Mesarec, 2022). Additionally, it seeks to determine the demographic profile of affected commuters and analyze any significant differences in their experiences before and during the rehabilitation. By doing so, this research provides insights that can guide local governments and policymakers in minimizing disruptions to commuters, especially students, during future infrastructure projects. Ultimately, the findings aim to contribute to the broader understanding of transportation challenges during major rehabilitations, offering practical recommendations to ensure sustained mobility and access to education even amidst significant disruptions.

2. Methodology

This study employed descriptive-comparative approaches to assess the impacts of the Sta. Rosa Bridge rehabilitation on student commuters. Descriptive research establishes baseline transportation and mobility patterns among student commuters before and during the rehabilitation (Miksza et al., 2023), while comparative analysis examines the differences in transportation habits pre- and post-rehabilitation (Esser & Vliegenthart, 2017; Miksza et al., 2023).

The research was conducted in Santa Rosa, Nueva Ecija, a municipality known for its diverse population of local and university students and its strategic location along key transportation routes like the Maharlika Highway. This makes it an ideal setting for exploring the broader implications of infrastructure projects on student mobility. By focusing on a location with ongoing rehabilitation projects, the study offers insights that are highly relevant to regional transportation planning and policy.

Using a voluntary response sampling method through online platforms, the study collected data from 117 student commuters, surpassing the minimum sample size requirement for a t-test based on G*Power analysis (Kang, 2021). The researcher-designed survey instrument covered demographics, transportation behaviors, and mobility patterns, providing comprehensive data for analysis

Statistical analyses including weighted mean and paired sample t-tests were performed to extract significant insights into the transportation and

THE QUEST Journal of Multidisciplinary Research and Development
ISSN 1908-3211 (Online) | ISSN 1908-322X (Print)
P-ISSN: 1908-322X and E-ISSN: 1908-3211
Vol.3 No.2 (2024)
Received: 05-23/ Revised: 08-10/ Accepted:9-28-2024
https://neust.journalintellect.com/quest

mobility changes caused by the bridge rehabilitation (He, 2019; Jamil & Khanam, 2023; Cleophas et al., 2016).

Ethical considerations were rigorously observed throughout the research. Participants were fully informed, gave consent, and were guaranteed confidentiality and anonymity, adhering to ethical standards for research integrity and participant protection (Sivasubramaniam et al., 2021; Rebers et al., 2016; Ali, 2023). These measures ensured the study's credibility while safeguarding participants' rights and privacy.

3. Results and Discussion

3.1 Pre-Rehabilitation Perceptions

Table 1 Weighted Mean Results Before the Rehabilitation

Transportation and Mobility Constructs	Before	
	Mean	VD
1. Travel Time and Patterns	3.35	SA
2. Transportation Modes/ Options	3.37	SA
3. Accessibility and Availability of Transportation Services	3.12	A
4. Transportation Safety	3.19	A
5. Daily Travel Routine	3.34	SA
General Weighted Mean	3.27	SA

Before the rehabilitation of the Santa Rosa Bridge, student commuters reported high levels of satisfaction with transportation and mobility, as all constructs scored above 3.0. Travel Time and Patterns (mean = 3.35) and Transportation Modes/Options (mean = 3.37) were rated highly, indicating general satisfaction with commuting conditions. Accessibility and Availability of Services (mean = 3.12) and Transportation Safety (mean = 3.19) were also viewed positively. This positive outlook extended to Daily Travel Routine (mean = 3.34), with a general weighted mean of 3.27 reflecting overall commuter satisfaction.

These findings are consistent with research indicating that the quality and predictability of commuting, rather than just travel time, play a crucial role in well-being and satisfaction (Wiese et al., 2023). The availability of diverse transportation options also contributed to satisfaction, as noted in studies emphasizing the link between high accessibility and positive commuter experiences (Monteiro et al., 2021; Friman et al., 2020).

THE QUEST Journal of Multidisciplinary Research and Development
ISSN 1908-3211 (Online) | ISSN 1908-322X (Print)
P-ISSN: 1908-322X and E-ISSN: 1908-3211
Vol.3 No.2 (2024)
Received: 05-23/ Revised: 08-10/ Accepted:9-28-2024
https://neust.journalintellect.com/quest

Safety was another significant factor, with the absence of incidents like theft or harassment contributing to commuters' positive perceptions (Minelgaitė et al., 2020). Well-organized and predictable routines also played a key role in maintaining satisfaction (Bergstad, 2011).

3.2 Perceptions During Rehabilitation

Table 2 Weighted Mean Results During the Rehabilitation

Transportation and Mobility Constructs	During	
	Mean	VD
1. Travel Time and Patterns	2.03	D
2. Transportation Modes/ Options	2.12	D
3. Accessibility and Availability of Transportation Services	2.09	D
4. Transportation Safety	2.18	D
5. Daily Travel Routine	2.10	D
General Weighted Mean	2.10	D

During the rehabilitation period, student satisfaction across all constructs declined, with all scores dropping below 3.0. Travel Time and Patterns (mean = 2.03), Transportation Modes/Options (mean = 2.12), Accessibility and Availability (mean = 2.09), Safety (mean = 2.18), and Daily Travel Routine (mean = 2.10) showed significant deterioration. The general weighted mean also fell to 2.10, indicating widespread dissatisfaction.

These results align with research showing that extended travel times and unpredictable commutes increase stress and reduce well-being (Zhang & Wang, 2023). The drop in satisfaction with Transportation Modes and Options reflects the challenges of limited alternatives during the rehabilitation (Monteiro et al., 2021). Reduced accessibility, as indicated by lower scores for Accessibility and Availability, also contributed to dissatisfaction, consistent with findings that accessibility is a key determinant of commuter perceptions (Woldeamanuel & Cyganski, 2011).

Concerns over Safety were heightened, with commuters reporting inadequate lighting and insufficient monitoring, further diminishing satisfaction (Friman et al., 2020). The disruption to Daily Travel Routines also mirrors studies showing that routine efficiency is critical for maintaining commuter satisfaction (Woldeamanuel & Cyganski, 2011).

THE QUEST Journal of Multidisciplinary Research and Development
ISSN 1908-3211 (Online) | ISSN 1908-322X (Print)
P-ISSN: 1908-322X and E-ISSN: 1908-3211
Vol.3 No.2 (2024)
Received: 05-23/ Revised: 08-10/ Accepted:9-28-2024
https://neust.journalintellect.com/quest

3.3 Difference in Transportation and Mobility Before and During Santa Rosa Bridge Rehabilitation

Table 3. T-test Results

Indicator	Treatment	Mean	t-value	ρ-value	Decision	Remarks
Travel Time and Patterns	Before	3.35	10.00	<0.001	Reject H0	Significant
	During	2.03				
Transportation Modes/ Options	Before	3.37	11.46	<0.001	Reject H0	Significant
	During	2.12				
Accessibility and Availability of Transportation Services	Before	3.12	8.90	<0.001	Reject H0	Significant
	During	2.09				
Transportation Safety	Before	3.19	9.74	<0.001	Reject H0	Significant
	During	2.18				
Daily Travel Routine	Before	3.34	10.43	<0.001	Reject H0	Significant
	During	2.10				
Transportation and Mobility	Before	3.27	10.99	<0.001	Reject H0	Significant
	During	2.10				

Table 3 shows a statistically significant decline in all transportation and mobility indicators during the rehabilitation period, with p-values less than 0.001 across all constructs.

Travel Time and Patterns dropped significantly from 3.35 to 2.03 (t-value = 10.00), revealing considerable disruptions in commuting experiences. This supports the need for better traffic management and measures to minimize delays during infrastructure projects (Moyano et al., 2021).

The mean for Transportation Modes and Options fell from 3.37 to 2.12 (t-value = 11.46), reflecting dissatisfaction with available alternatives. Introducing shuttle services or carpool options could mitigate these issues (Flores-Albornoz et al., 2023).

The decline in Accessibility and Availability from 3.12 to 2.09 (t-value = 8.90) further highlights the need for better communication about service disruptions and alternative routes (Jamei et al., 2022).

THE QUEST Journal of Multidisciplinary Research and Development
ISSN 1908-3211 (Online) | ISSN 1908-322X (Print)
P-ISSN: 1908-322X and E-ISSN: 1908-3211
Vol.3 No.2 (2024)
Received: 05-23/ Revised: 08-10/ Accepted:9-28-2024
https://neust.journalintellect.com/quest

Transportation Safety also saw a marked decrease from 3.19 to 2.18 (t-value = 9.74), emphasizing the need for improved safety measures such as better lighting and enhanced traffic control during rehabilitation (Dong et al., 2022).

Finally, the mean for Daily Travel Routine dropped from 3.34 to 2.10 (t-value = 10.43), underscoring the need for proactive planning and coordination to minimize the impact on regular commuting patterns (Wagner et al., 2024).

4. Conclusions

The rehabilitation of the Santa Rosa Bridge significantly impacted the transportation and mobility experiences of student commuters, as demonstrated by the contrast in perception levels before and during the project. Prior to the rehabilitation, students reported generally positive experiences, with high satisfaction across all key transportation constructs, such as travel time, transportation modes, accessibility, safety, and daily travel routines. However, during the rehabilitation, there was a marked decline in these areas, resulting in overall dissatisfaction with the commuting experience.

Statistical analysis confirmed that the differences in transportation and mobility perceptions before and during the rehabilitation were significant across all constructs. This emphasizes that there are severe disruptions caused by the rehabilitation, particularly in terms of increased travel time, limited transportation options, reduced accessibility, heightened safety concerns, and disruptions to daily travel routines.

The findings highlight the importance of comprehensive planning, communication, and proactive measures during infrastructure rehabilitation projects to minimize disruptions and maintain commuter satisfaction. By improving traffic management, offering alternative transportation options, enhancing safety measures, and providing real-time updates on transportation services, it is possible to mitigate the negative impacts of such projects and ensure a smoother experience for commuters.

Acknowledgements

I would like to express my deepest gratitude to my subject instructor, Dr. Feliciana Jacoba, for her invaluable guidance, support, and encouragement throughout the course of this study.

References

Agaton, C. B., Collera, A. A., & Guno, C. S. (2020). Socio-economic and environmental analyses of sustainable public transport in the Philippines. *Sustainability*, *12*(11), 4720.

Ali, M. (2023). Data Protection, Confidentiality and Anonymity. In *Information Systems Research: Foundations, Design and Theory* (pp. 189-198). Cham: Springer International Publishing.

Allirani, H., & Verma, A. (2022). Quality of life (QoL) effects of sustainable transport policy framework in developing economies. *Transportation in developing economies*, *8*, 1-13.

Bergstad, C. J., Gamble, A., Gärling, T., Hagman, O., Polk, M., Ettema, D., ... & Olsson, L. E. (2011). Subjective well-being related to satisfaction with daily travel. *Transportation*, *38*, 1-15.

Cleophas, T. J., Zwinderman, A. H., Cleophas, T. J., & Zwinderman, A. H. (2016). Paired continuous data (Paired T-test, Wilcoxon signed rank test). *Clinical data analysis on a pocket calculator: understanding the scientific methods of statistical reasoning and hypothesis testing*, 31-36.

Crawford, K. C. (2023). Perspective Chapter: Bridge Deterioration and Failures. In *Failure Analysis-Structural Health Monitoring of Structure and Infrastructure Components*. IntechOpen.

D'Auria, A., Cennamo, G. M., & Di Ruocco, I. (2022). Environmental Impact of Transportation Infrastructures: Integrated Methodologies for Preliminary Assessment. A Case-Study. In *Urban Regeneration Through Valuation Systems for Innovation* (pp. 119-139). Cham: Springer International Publishing.

De Mesa, R. Y. H., Marfori, J. R. A., Fabian, N. M. C., Camiling-Alfonso, R., Javelosa, M. A. U., Bernal-Sundiang, N., ... & Dans, A. M. L. (2023). Experiences from the Philippine grassroots: impact of strengthening primary care systems on health worker satisfaction and intention to stay. *BMC Health Services Research*, *23*(1), 117.

Dong, B. X., Shan, M., & Hwang, B. G. (2022). Simulation of transportation infrastructures resilience: a comprehensive review. *Environmental Science and Pollution Research*, *29*(9), 12965-12983.

Fernando, K. E. T., & Henry, M. (2023, March). Road Development Risks and Challenges in the Philippines. In *Proceedings of The 17th East Asian-Pacific Conference on Structural Engineering and Construction, 2022: EASEC-17, Singapore* (pp. 326-339). Singapore: Springer Nature Singapore.

Flores-Albornoz, J., Nirmala, M. M., Mukthar, K. J., Asnate-Salazar, E., Ramirez, E. H., & Raju, V. (2023). Unlocking Solution for Urban Transportation Woes: Addressing the Challenges of Modern City Living. In *AI and Business, and Innovation*

P-ISSN: 1908-322X and E-ISSN: 1908-3211
Vol.3 No.2 (2024)
Received: 05-23/ Revised: 08-10/ Accepted:9-28-2024
https://neust.journalintellect.com/quest

Research: Understanding the Potential and Risks of AI for Modern Enterprises (pp. 3-10). Cham: Springer Nature Switzerland.

Friman, M., Lättman, K., & Olsson, L. E. (2020). Public transport quality, safety, and perceived accessibility. *Sustainability*, *12*(9), 3563.

Guno, C. S., Collera, A. A., & Agaton, C. B. (2021). Barriers and drivers of transition to sustainable public transport in the Philippines. *World Electric Vehicle Journal*, *12*(1), 46.

He, F. (2019). Undergraduate Commuter Students: Challenges and Struggles. *Journal of Student Affairs, New York University*, *15*, 43-49.

Jamei, E., Chan, M., Chau, H. W., Gaisie, E., & Lättman, K. (2022). Perceived accessibility and key influencing factors in transportation. *Sustainability*, *14*(17), 10806.

Jamil, M. A., & Khanam, S. (2023). Influence of One-Way ANOVA and Kruskal-Wallis Based Feature Ranking on the Performance of ML Classifiers for Bearing Fault Diagnosis. *Journal of Vibration Engineering & Technologies*, 1-32.

Kang, H. (2021). Sample size determination and power analysis using the G* Power software. *Journal of educational evaluation for health professions*, *18*.

Karimi, H., Ghadirifaraz, B., Shetab Boushehri, S. N., Hosseininasab, S. M., & Rafiei, N. (2021). Reducing traffic congestion and increasing sustainability in special urban areas through one-way traffic reconfiguration. *Transportation*, 1-24.

Miksza, P., Shaw, J. T., Kapalka Richerme, L., Hash, P. M., Hodges, D. A., & Cassidy Parker, E. (2023). Quantitative Descriptive and Correlational Research. *Music Education Research: An Introduction*.

Minelgaitė, A., Dagiliūtė, R., & Liobikienė, G. (2020). The usage of public transport and impact of satisfaction in the European Union. *Sustainability*, *12*(21), 9154.

Monteiro, M. M., de Abreu e Silva, J., Ingvardson, J. B., Nielsen, O. A., & Pinho de Sousa, J. (2021). Public transport use and satisfaction by international students and researchers. *Sustainability*, *13*(15), 8417.

Moyano, A., Stępniak, M., Moya-Gómez, B., & García-Palomares, J. C. (2021). Traffic congestion and economic context: changes of spatiotemporal patterns of traffic travel times during crisis and post-crisis periods. *Transportation*, *48*(6), 3301-3324.

Navarro, A. M., & Latigar, J. S. (2022). *Road and Rail Transport Infrastructure in the Philippines: Current State, Issues, and Challenges* (No. 2022-34). PIDS Discussion Paper Series.

Page, N., Forster-Wilkins, G., & Bonetzky, M. (2021). The Impact of Student Timetables and Commuting on Student Satisfaction. New Directions in the Teaching of Physical Sciences, 16(1), n1.

P-ISSN: 1908-322X and E-ISSN: 1908-3211
Vol.3 No.2 (2024)
Received: 05-23/ Revised: 08-10/ Accepted:9-28-2024
https://neust.journalintellect.com/quest

Rebers, S., Aaronson, N. K., van Leeuwen, F. E., & Schmidt, M. K. (2016). Exceptions to the rule of informed consent for research with an intervention. *BMC medical Ethics*, *17*, 1-11.

Rivera, J. P. M. (2017). Road Safety Management of the Department of Public Works and Highways: Basis for Policy Recommendation. *SPUP Graduate School Research Journal*, *15*(1).

Sivasubramaniam, S., Dlabolová, D. H., Kralikova, V., & Khan, Z. R. (2021). Assisting you to advance with ethics in research: an introduction to ethical governance and application procedures. *International Journal for Educational Integrity*, *17*, 1-18.

Tigre, R., Sampaio, B., & Menezes, T. (2017). The impact of commuting time on youth's school performance. *Journal of Regional Science*, *57*(1), 28-47.

Trček, B., & Mesarec, B. (2022). Pathways to Alternative Transport Mode Choices among University Students and Staff—Commuting to the University of Maribor since 2010. Sustainability, 14(18), 11336.

Wagner, M., Shirgaokar, M., & Marshall, W. (2024). Understanding Everyday Travel Experiences and Transportation Infrastructure Challenges of People with Disabilities in Denver, CO. *Transportation Research Record*, 03611981231174400.

Whalen, K. E., Páez, A., & Carrasco, J. A. (2013). Mode choice of university students commuting to school and the role of active travel. *Journal of Transport Geography*, *31*, 132-142.

Wiese, C. W., Li, Y., Tang, Y., & Brown, T. I. (2023). The Unique Impact of Commuting Time, Quality, and Predictability on Worker Well-Being and Performance. *Occupational Health Science*, 1-33.

Woldeamanuel, M. G., & Cyganski, R. (2011, October). Factors affecting traveller's satisfaction with accessibility to public transportation. In *European Transport Conference, Glasgow*.

Zhang, X., Li, Q., & Wang, Y. (2023). Impact of Commuting Time on Employees' Job Satisfaction—An Empirical Study Based on China's Family Panel Studies (CFPS). *Sustainability*, *15*(19), 14102.