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Road User Perception of Street Lighting and Traffic Signs: A Case of Jalan Jaka Kusuma

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ABSTRACT

Road lighting and traffic signs are essential in ensuring traffic safety. Adequate road lighting and traffic signs can create a sense of security and comfort for road users. Conversely, the lack of lighting and traffic signs can create discomfort or even increase the risk of danger and crime on the road. In this case, the case on one of the roads in Jatitujuh had inadequate road lighting and traffic signs, causing road users to feel uncomfortable when driving. This study examines the perceptions of road users in Jalan Jaka Kusuma towards road lighting and traffic signs and their impact on driving safety. The research location was conducted on one of the roads in Jatitujuh, Majalengka, West Java, more precisely on Jalan Jaka Kusuma, Desa Panongan - Jatitujuh. Perceptual analysis is the qualitative methodology used in this study. Respondents' level of importance and satisfaction with street lighting and traffic signs were measured from not important to extremely important and from not satisfied to very satisfied on a scale of 1 to 5. The Importance Performance Analysis (IPA) approach was used to process the data. The 40 respondents' data was split up according to their age, gender, and the type of vehicle they were using to cross the Jalan Jaka Kusuma-Jatitujuh. The questionnaire results show that the men and women who cross Jaka Kusuma road are 50% each; most people who cross Jalan Jaka Kusuma are ≤ 20 years old, and most vehicles used are motorbikes. The results showed that road users' perceptions of the level of importance of street lighting and traffic signs averaged 4.94, which indicates very importance, while its performance only reached an average of 2.39, which means it requires improvement; there is a gap of -2.55 between interests and satisfaction.

1. Introduction

Road lighting and traffic signs are essential in ensuring traffic safety. Traffic safety is a complex global issue that attracts many countries' attention. One of the top eight causes of death worldwide is traffic accidents. Many nations have implemented strategies and regulations to prevent RTCs and the injuries and fatalities they cause (Fisa, Musukuma, Sampa, Musonda, & Young, 2022). One of the most common causes of death in the world is traffic accidents, with most occurring at night due to a lack of adequate street lighting and minimal traffic signs. Currently, road traffic accidents (RTAs) cause 1.35 million deaths each year, and they can result in up to 50 million injuries. In other terms, RTAs claim the lives of almost 3,700 people monthly (Fountas, Fonzone, Gharavi, & Rye, 2020). One important factor affecting driving safety is the quality of road infrastructure, including street lighting and traffic signs.

In Indonesia, highway building rapidly expands, and private automobile use is skyrocketing (Purnama, Rifai, & Nasrun, 2022). Traffic safety issues in Indonesia are also a serious concern, with many accidents occurring at night or on poorly lit roads. This stems from the fact that most drivers have poor night vision, which, combined with inadequate road visual guidance, leads to a comparatively high nighttime

death rate (Ackaah, Apuseyine, & Afukaar, 2020). Insufficient road infrastructure, such as poor road lighting or unclear traffic signs, is a significant factor in Indonesia's high number of accidents. These factors can influence driver behavior, such as disobeying traffic signs or driving in unsafe conditions. Road users' awareness of the importance of paying attention to traffic signs must also be improved.

In addition to reducing the risk of accidents, adequate street lighting and traffic signs can also avoid road crime. Road crime has become an increasingly worrying issue in many major cities worldwide. Such crimes often occur in poorly lit areas or on quiet streets, where perpetrators feel more free to act without being detected. Road crimes not only threaten physical safety but also create fear and discomfort for road users. When a city is well-planned, its traffic system functions well (Nurhasanah & Pamadi, 2024). Therefore, better infrastructure improvements, especially in terms of street lighting and traffic signage, are critical to the sustainability of the traffic system. Decreased crime is one of the presumed advantages of lighting on subsidiary roads (Fotios, Robbins, & Farrall, 2021).

Problems related to road lighting and traffic signs are also felt in areas that still have limited infrastructure. This happens on the road in Jatitujuh, precisely on Jalan Jaka Kusuma, Panongan Village - Jatitujuh, which is the absence of traffic signs and adequate road lighting. This condition causes road users to feel uncomfortable and worried about safety when driving because it can pose a risk of accidents and crime, especially at night. One element influencing road safety when driving is road illumination (Setyaningsih & Candra, 2023). Therefore, managing lighting and placement of traffic signs is crucial to improving road safety.

This study aims to examine the perceptions of road users on Jalan Jaka Kusuma, Desa Panongan - Jatitujuh, towards road lighting and traffic signs and their impact on driving safety. When it comes to transportation, traffic safety is crucial since it has the potential to impact people's lives (Asil, Toroghi, & Bargegol, 2022). This study aims to identify the factors that influence motorists' perceptions of the quality of street lighting, traffic signs' presence, and their relationship with crash rates. By understanding these perceptions, this research can provide recommendations to improve the quality of street lighting and traffic sign placement to make roads safe for all road users. The most crucial element for road users is traffic signs, which naturally contribute to drivers' safety and security (Fatimah & Rifa'i, 2024).

2. Literatur Review

2.1 Lighting

Lighting is the system or process of providing artificial light to improve visibility, safety, and comfort in dark conditions or lack of natural light. Urban street lights are crucial hardware components of the road lighting system (JIA & WU, 2022). The primary purpose of lighting is to enable users of a space, be it a street, building, or open space, to see objects around them and reduce potential hazards associated with limited vision. Inadequate lighting often contributes to increased accidents in areas with limited visibility, such as highways at night or inside buildings that are not well-lit. Road users are more at risk when there is inadequate street lighting (Candra & Savitri, 2024). Therefore, good lighting is essential to make the space safe and comfortable.

Street lighting significantly impacts road users, especially in terms of traffic safety. Road lighting is one of the most important things to improve safety when driving at night (Sumantri, Rifai, & Ferial, 2022). Good lighting on roads helps motorists recognize road conditions, traffic signs, and other potential hazards more clearly, reducing the risk of accidents. He would have been likelier to spot traffic with more excellent lighting (Raynham, Unwin, Khazofa, & Tholia, 2020). This shows that the quality of street

lighting not only affects visibility but also shapes safer driving behavior. This confirms the importance of adequate street lighting to maintain public safety and prevent accidents caused by limited visibility.

In addition to providing safety benefits, road lighting is critical to the operation of the traffic system. Adequate lighting can create a sense of security, reduce anxiety, and encourage social and economic activity, especially in public areas. Poor lighting, on the other hand, can create discomfort or even increase the risk of road hazards and crime. Welsh and Farrington's 2008 meta-analysis of the scholarly literature on street lighting, which is primarily created by criminologists, skillfully explains that, according to thirteen research conducted in the United States and the United Kingdom, adding street lighting lowers crime by 27% (Chalfin, Hansen, Lerner, & Parker, 2022). Therefore, efficient maintenance of the road lighting system is essential for safe roads. It is thought that road lighting will lower the amount of crimes and accidents (Reta & Savitri, 2024).

In terms of psychology, good street lighting also impacts road users' feelings of trust and alertness. Because lighting systems affect people's moods and behaviors and nighttime city life, they are crucial to the evolution process (Scorpio et al., 2020). Adequate lighting serves not only to reduce accident rates but also to increase feelings of safety. Bright lighting of important road areas, such as intersections and pedestrian passages, has a positive impact on users' perceptions that these areas are safer, even at night. One element that has a significant effect on road users' safety is well-chosen street and sidewalk lighting (Zima & Ciepłucha, 2023). Therefore, efficient maintenance of the street lighting system is essential for protecting road users.

2.2 Traffic Sign

Traffic signs are markers installed to organize, direct, and warn road users to drive or walk safely. Adequate traffic signs are very effective in helping motorists follow the rules and improve road safety. Inadequate signs can confuse motorists, potentially leading to accidents. Inappropriate traffic signals can result in traffic jams and delays in travel times at intersections (Egan & Rifa'i, 2024). Indonesian traffic congestion is a complex issue to solve because of the high volume of cars that exceeds the capacity and management of the roads (Rahayu, Rifai, & Akhir, 2022).

The presence of traffic signs also affects motorists' behavior in obeying traffic rules. Traffic signs serve as visual reminders that direct motorists to follow the rules, such as speed limits, stopping restrictions, or warnings about dangerous road conditions. The purpose of traffic signs and visual engineering devices placed above or beside roads is to inform drivers. Because they are typically made with superior optical qualities, drivers can see and recognize them with ease (Aldoski & Koren, 2023). Drivers who pay attention to and understand traffic signs are more likely to adjust their speed, be careful at intersections, or obey other rules to reduce the risk of accidents. Hence, the importance of clarity and accuracy of traffic signs in shaping safer driver behavior. Therefore, traffic signs are an important part of road infrastructure (Babić, Babić, Fiolic, & Ferko, 2022).

The types of traffic signs fall into different categories, including warning, command, prohibition, and guide signs. Each category has a specific purpose and function to regulate traffic flow and prevent violations. Command signs contain commands that require motorists to perform particular actions, such as stopping or reducing speed. Prohibition signs have the primary function of prohibiting or limiting specific actions that can interfere with the safety and smooth running of traffic, for example, no parking. Meanwhile, guide signs provide information or directions to motorists regarding the direction or route to be followed along the road. Through a variety of driving aids, the linked environment gives drivers access to nearby traffic information, which is anticipated to enhance driving habits and help prevent potentially dangerous situations. Among many other things, these driving aids include enhanced

information about potential invisible hazards, lane-changing and car-following assistance, and speed advice (Ali, Sharma, Haque, Zheng, & Saifuzzaman, 2020).

In addition to helping guides, traffic signs benefit pedestrians by providing clear directions and warnings. The role of traffic signaling devices must be able to reduce confusion and congestion, especially during rush hours (Firmansyah, Rifai, & Taufik, 2022). Signs such as "Zebra Crossing" help pedestrians to cross the road more safely. These signs are essential in pedestrian-heavy areas, such as at intersections or in front of schools, where pedestrian safety needs to be prioritized. Good traffic sign placement can improve pedestrian safety, lowering the possibility of collisions between drivers. To reduce the number of road accidents, drivers must be able to recognize, understand, and obey traffic signs and road markings (Dewi, Chen, Zhuang, Jiang, & Yu, 2023).

2.3 Road User Safety

Safety is achieved through the prevention and reduction of risks that could jeopardize the safety of individuals or communities. Traffic comprises three elements: automobiles, roads, and people (Dwiani & Pamadi, 2024). Road safety centers on protecting people on the road, including passengers, drivers, and pedestrians, from accidents that can occur due to various things, such as vehicles, road conditions, and driver behavior. Communities must be safe from crime and traffic accidents so people can walk there (Kim, Lee, & Kim, 2023). Road user safety is an important issue that requires attention from various parties, including the government and the community. One of the main aspects of road safety is the reduction of traffic accidents that can threaten the safety of road users.

Factors such as road lighting and vehicle speed greatly affect traffic safety. Therefore, using vehicle speed signs and improving road infrastructure can be strategic steps to make roads safe. Implementing measures for traffic signaling features such as traffic signs is one of the most economical ways to improve road safety (Babić, Babić, Cajner, Sruk, & Fiolić, 2020). Poor road conditions and lack of street lighting and traffic signs can threaten safety. Therefore, the improvement and maintenance of road infrastructure, such as lighting and placement of traffic signs, are essential for motorist safety. While it can significantly create road safety, recognizing and categorizing traffic signs is a complex process (Khan, Park, & Chae, 2023).

Road user behavior also plays a significant role in creating safe driving. Road user negligence, such as violating traffic signs or driving while drowsy, is one of the contributing factors to accidents. However, careless driving, particularly breaking traffic laws, can occasionally result in dangerous conduct (Iamtrakul, Chayphong, Mako, & Phetoudom, 2023). A person's driving skills, discipline, and alertness also affect road safety. In addition, riders should also wear safety equipment, such as helmets or seat belts, to minimize injuries in the event of an accident. Therefore, safety awareness and self-control while driving are necessary to reduce the risk of accidents.

It is essential for every road user always to maintain a respectful attitude on the road. Drivers should respect the rights of pedestrians and other road users. Road safety is a shared responsibility. No human operates a vehicle in a vacuum; in social traffic situations, they must negotiate with other drivers to accomplish their objectives (Wang, Wang, Zhang, Liu, & Sun, 2022). With mutual care and cooperation, safety for road users will be achieved. Safety is not just about following the rules but also about respecting the lives of others.

3. Method

This research uses qualitative methodology with perception analysis. Qualitative research is a research method used to understand social phenomena or human behaviour. This method centres on explaining and interpreting the experiences, views, or meanings given by individuals or groups in certain situations. The results of this study show how road users perceive traffic lighting and signs as an important part of road user safety.

Perception factors from Jalan Jaka Kusuma users in Panongan-Jatitujuh are used in this study. Information gathered from 40 respondents who completed the survey. On a scale of 1 to 5, from not important to paramount and from not satisfied to very satisfied, the respondents' assessed importance and satisfaction with traffic signs and road lights are the factors employed. Importance Performance Analysis (IPA) is the method used to process data.

This research was carried out on Jalan Jaka Kusuma, Desa Panongan—Jatitujuh, Majalengka. The research location is shown in the picture.

4. Result and Discussion

4.1 Respondent's Information

Data from 40 respondents' questionnaires were categorized by age, gender, and kind of vehicle utilized to cross Jalan Jaka Kusuma. The results show that men and women who cross Jalan Jaka Kusuma are 50% each; the majority of people who cross Jalan Jaka Kusuma are ≤ 20 years old, while most vehicles used are motorcycles.

Table 1 Respondent's information

Variable	Category	Frequency	Per cent
Gender	Male	18	45%
	Female	22	55%
Age	≤20	21	53%
	21 - 30	11	28%
	31 - 40	2	5%
	41 - 50	3	8%
	51 - 60	2	5%
	> 60	1	3%

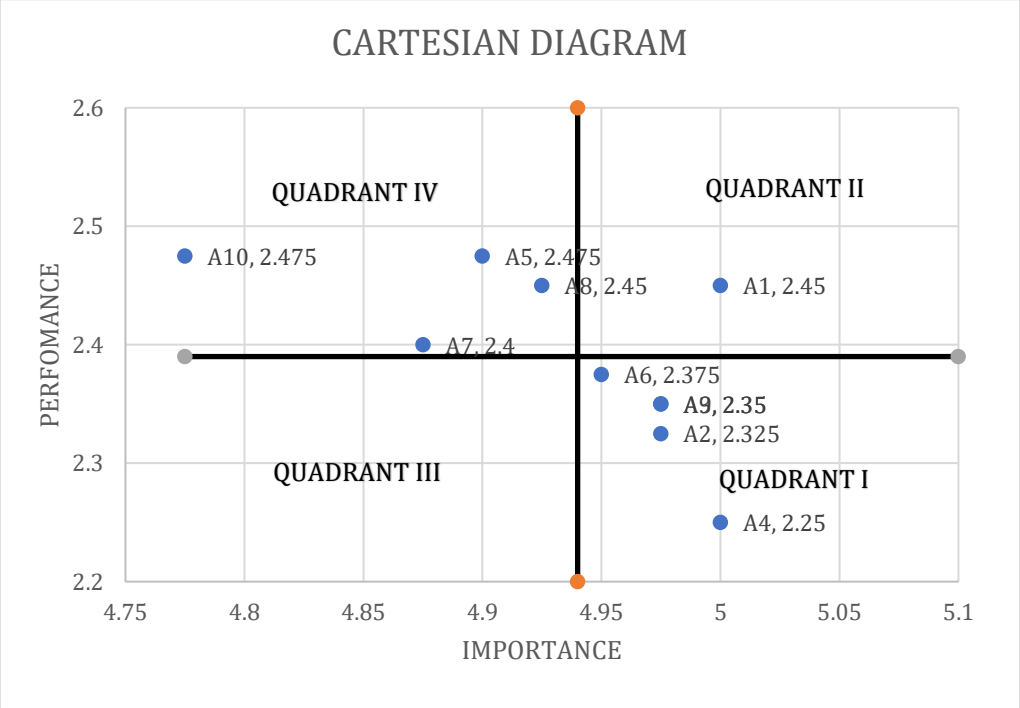
Vehicles Used	Car	13	33%
	Motorcycle	27	68%

4.2 The Importance and Performance Level of Road Lighting

From the questionnaire data, the variable of lighting and signs for road conditions received the highest importance score (5) but the lowest satisfaction score (2.25). Meanwhile, lighting and signs for activities other than driving received the lowest importance score (4.775) but the highest satisfaction score (2.475).

Table 2 The importance and performance level of road lighting

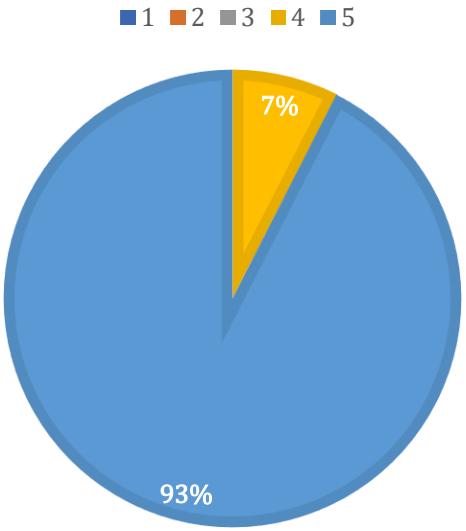
NO	Indicator	I	P	G
A1	Road lighting and traffic signs for safe driving	4,85	2,15	-2,7
A2	Road lighting and traffic signs for crime prevention	4,75	2,5	-2,25
A3	Road lighting and traffic signs for safe and comfortable driving	4,77	2,42	-2,35
A4	Road lighting and traffic signs for road conditions	4,65	2,55	-2,1
A5	Road lighting and traffic signs for intersections	4,67	2,47	-2,2
A6	Road lighting and traffic signs for road bends	4,66	2,52	-2,14
A7	Road lighting and traffic signs for road inclines	4,55	2,5	-2,05
A8	Road lighting and traffic signs for driving on bridges	4,75	2,38	-2,37
A9	Road lighting and traffic signs to reduce the risk of road accidents	4,67	2,35	-2,32
A10	Road lighting and traffic signs for activities other than driving	4,65	2,75	-1,9



The table above shows that the importance of lighting has not met the needs of road users, as indicated by the minus gap value. Furthermore, in the Cartesian diagram image, Quadrant IV is a variable with a relatively low level of importance but has the highest level of satisfaction. Quadrant II should be maintained since it is a variable with a high degree of value and satisfaction. Several variables in quadrant I have the highest importance but the lowest level of satisfaction, which means that the most significant variables require improvement.

The 40 people surveyed were asked their opinions on various aspects of the level of street lighting and traffic signs in Jalan Jaka Kusuma, one of which was whether or not street lighting and traffic signs should be improved. There were 5 levels of responses, ranging from disagree to agree strongly. These factors are very important for evaluating the standard installation of lighting and traffic signs on Jalan Jaka Kusuma and for showing how comfortable road users are when crossing the road.

ROAD LIGHTING IMPROVEMENT



In the Road Lighting Improvement diagram, there were 93% strongly agree, and 7% agree on responses, while no respondents gave responses 1, 2, or 3. This demonstrates that in order to ensure safety, drivers on Jaka Kusuma Road truly expect improvements to the traffic illumination and signage.

5. Conclusion

The results showed that street lights and traffic signs were rated as important on average at a level of 4.94, but their performance was only 2.39 on average; the gap between importance and satisfaction was -2.55. The level of performance that needs to be improved to balance performance with road users' importance is indicated by negative values. In addition, motorcycles, which are more prone to traffic violations, are the vehicles that frequently traverse Jalan Jaka Kusuma. Furthermore, from these results, road users' perceptions of the most critical parameters are lighting and traffic signs for driving safety and for knowing road conditions. The highest satisfaction was achieved with lighting and traffic signs for intersections and activities other than driving.

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