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Evaluation of The Effect of Lack of Street Lights on Road User Safety: Case Study of Jalan Utama Kutamanggu Village

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ABSTRACT

Majalengka is a city that lacks lighting, especially in Kutamanggu village. One of the most important factors in order to create safety and comfort in the transport environment is to improve the quality of road safetyn this day and age, time is no longer an obstacle for humans to do activities. There are many people who choose to utilise the night time as their time for activities. Street lighting is essential for the traffic system and for various social events. In the case of the main road in Kutamanggu village, there is no street lighting. Which makes motorists uncomfortable when passing through the road. This research examines the effects of insufficient street lighting on the road. Jalan Utama Kutamanggu Village on safety for road users, focusing on accident rates, traffic crime and public views on road safety. The research was conducted at Jalan Utama Kutamanggu Village, more precisely on the road Kutamanggu Village. This research employs a qualitative methodology incorporating perception analysis. The main data came from questionnaires given to 52 users Jalan Utama Kutamanggu Village. Respondents evaluated the importance and satisfaction of the existing street lighting on a 5-point scale, ranging from "not important" to "very important" and "not satisfied" to "very satisfied". Importance Performance Analysis (IPA) was the method used to process the data this time. The results of the study revealed some significant key findings. The finding of this study is the need for greater efforts from the government and related parties to improve street lighting, with a focus on meeting the expectations and needs of everyday road users.

1. Introduction

One of the most important factors in order to create safety and comfort in the transport environment is by improving the quality of safety on the road. One of them is to improve the quality of street lighting. Good street lighting can help drivers improve visibility. In addition, adequate street lighting can make road users feel safe and can reduce crime rates in some places that have little lighting. We found clear evidence that outdoor crimes at midnight significantly decreased in areas where additional lighting was installed [1]. Therefore, street lighting management is the most important aspect that must be considered.

In this day and age, time is no longer an obstacle for humans to move. Not a few people choose to use night time as a time for them to do their activities, the lack of road lighting at night will increase the risk of traffic accidents, criminal crimes, which makes motorists unsafe. this makes that road lighting is very important to support road users who carry out their activities at night. Good lighting is one of the most important environmental factors influencing outdoor activities and the development of livable urban communities. The quality of nighttime lighting in public areas has a significant impact on the social well-being of the people who use the [2].

Improving facilities and infrastructure for the community is one way for regional development to demonstrate the health of the local economy [3]. Street lighting has a very important role in improving the community's economy. Lack of lighting not only increases the risk of traffic accidents but can also be an obstacle to the economic, social and educational activities of the community. Road users are entitled to street lighting, which local governments are responsible for providing based on their needs. This should be done with proper installation and in compliance with standards to ensure adequate lighting [4]. Some areas far from urban centres have the right to quality lighting. For example, the Kutamanggu Village - Babakanmanjeti Village road Does not reach a satisfactory level of quality.
Regarding the incident in Jalan Utama Kutamanggu Village this is because there is no lighting on the road, allowing motorists to feel uncomfortable when driving through the road. It is difficult for people to carry out activities with various other parties if access is adequate [5]. With the lighting on this road, it is expected to make road users comfortable. Governments can generally lower the severity of road accidents by addressing road users' behavior or enhancing road infrastructure. Numerous studies have presented empirical evidence on the impact of both factors on fatalities. Drivers who fail to wear seatbelts are more likely to experience more severe crashes [6].

This research aims to look further into the problem of the lack of street lighting in the Jalan Utama Kutamanggu Village. The lack of street lights is considered to affect safety for road users. In addition, inadequate road infrastructure, lack of traffic supervision, and unsafe driving behavior are factors that cause accidents on this road. [7]. So this research will focus on three main issues, namely the high number of accidents that often occur, the risk of crime on the road, and how people perceive safety when passing through the road. Inadequate lighting makes road users, both pedestrians and motorists, feel less comfortable and alert. This study aims to understand whether the public thinks the current street lighting is sufficient or still needs improvement. The results of this study are expected to provide recommendations to the government or related parties to improve the quality of street lighting, so that public safety and comfort can be guaranteed. With more optimal lighting, it is expected that the number of accidents and crimes on the road can be reduced.

2. Literature Review

2.1 Traffic

The movement of vehicles and pedestrians on the road is called traffic. It includes all aspects of road use, such as interactions between cyclists, pedestrians, drivers and other road users [8]. Traffic functions include creating an effective and safe mobility system by regulating and managing the flow of vehicles and pedestrians [9] Traffic itself has several important components that are influential in making traffic balanced. The rapid increase in motor vehicles has significantly amplified the gap between the increasing traffic demands in transportation and the service capability of the infrastructure [10]. Organising traffic sections is necessary to maintain traffic balance. To produce balanced traffic, many factors are important, including infrastructure, vehicles, road users, and traffic management.

Any incident that causes harm, death, or other damages is considered an accident. The victim's unanticipated or inadvertent acts caused the accident [11]. One of the main causes of death and illness worldwide is traffic accidents. According to predictions, traffic accidents would be responsible for the third-highest percentage of global illness burden by 2020 [12]. One of the causes of these traffic accidents is the imbalance of traffic components, such as the absence of adequate street lighting, while street lighting is an influential component in traffic balance. The absence of adequate lighting reduces motorists' visibility, especially at night, which can increase the risk of accidents. Therefore, it is important to ensure an effective street lighting system to maintain road safety.

What needs to be improved so that traffic runs smoothly is by improving regulations, services, transportation management and traffic infrastructure [13]. Traffic management can be done in various

ways to optimise the traffic system. Reducing interruption and improving traffic efficiency are the two main objectives of traffic management. Traffic management also ensures road safety and public health. In addition, measures such as traffic light management, vehicle lane management, and increased driver awareness can support the achievement of these goals. Many traffic management techniques are also intended for other objectives. For example, speed limits are frequently set for safety or traffic control purposes, and new road building is frequently done to accommodate growing travel demand [14].

2.2 Road Lighting

In order to illuminate the path or neighborhood surrounding the necessary roads, such as crossroads, bridges, and underground roads, Both the left and right sides of the road, as well as the center (the middle section of the road), can have street lights installed as part of a complimentary road construction. [15]. In many ways, street lighting is very important for road users. To meet functional standards on roads, good lighting is certainly required [16]. In addition, good street lighting can also affect the safety of road users, both motorists and pedestrians. One of the alleged benefits of road illumination on auxiliary roads is a reduction in crime [17].

Adequate street lighting significantly improves visibility for both drivers and pedestrians, thereby reducing the number of accidents occurring in poorly lit areas, particularly during nighttime [18]. Adequate lighting not only makes road users feel safe and comfortable, but also helps them make better driving choices. Drivers can keep their speed at a safe limit because the road conditions are clearly visible. In addition, adequate lighting helps road users to be more cautious, especially when passing through vulnerable areas such as intersections. Therefore, good street lighting is essential to making traffic safer and more efficient. As street lighting systems are essential for maintaining the safety and comfort of road users, they must be properly installed. Numerous studies have shown that adequate lighting can improve vehicle flow, reduce driver confusion, and lessen the risk of congestion on busy road segments [19]. An atmosphere that is less favorable to criminal activities can also be produced by well-lit streets, adding another degree of security for walkers and drivers [20]. Thus, allowing road users to feel comfortable when passing through this road, especially at night or during bad weather. The installation of street lighting should pay attention to important locations such as intersections, bends, and accident-prone areas. The distance between lights also needs to be regulated so that road users still have a clear view. With proper planning, street lighting can significantly improve traffic safety and smoothness.

2.3 Road User Safety

Traffic-related accidents cause a large proportion of unintentional injuries, making road safety a major global health issue [21]. One definition of safety is a state of being secure or protected from harm or other obstacles, both mental and physical. So that there will be no danger that can occur. According to research conducted by Dwiani, Road infrastructure is crucial for both human movement and economic prosperity [22]. One of the elements that most affect road user safety is infrastructure, with good quality road infrastructure, it can reduce accidents and increase the morning safety of road users. Studies show that road infrastructure plays a crucial role in traffic safety. Roads with proper signage, clear lane markings, and pedestrian facilities significantly reduce the likelihood of accidents, especially in urban areas [23].

The safety factor for road users is not entirely influenced by adequate road infrastructure, the behaviour of road users themselves affects traffic safety. Human behavior, particularly speeding, distracted driving, While driving while under the impact of drugs or alcoholic beverages is still Among the main reasons forf traffic accidents worldwide [24]. So to avoid accidents due to driver negligence, to make traffic safe and comfortable, drivers who meet the legal criteria are needed. Every road user

wishes to prevent traffic accidents, yet occasionally they happen unexpectedly as a result of inadequate road infrastructure or user irresponsibility [25]. Safety for road users is the highest priority in transport planning and management, apart from improving the quality of infrastructure, it can also be done by enforcing traffic regulations. The enforcement of traffic regulations, such as speed limits and seat belt laws, is essential to lowering the number of road fatalities and accidents [26]. In addition, education and to create a safer driving environment, it is important to inform people about the importance of obeying traffic rules. With the combination of strict law enforcement and high awareness among motorists, It is anticipated that the downward trend in traffic accidents will persist.

3. Method

In general, research refers to the work done by individuals who have been schooled to acquire knowledge by methodical [27]. This research uses a qualitative research method that uses perception analysis. Qualitative research methods produce findings through non-numerical means, eschewing quantitative measurement and statistical analysis [28]. This is qualitative research method is often used to answer research without having to rely on calculations or quantitative. The results of the data obtained in this study will be in the form of road users' perceptions of the importance of street lighting to safety and comfort for road users. In this study, the lack of lighting on the Jalan Utama Kutamanggu Village assessed through road user perceptions. The main data came from a questionnaire given to 30 users Jalan Utama Kutamanggu Village. Respondents' perceived importance and satisfaction with the existing street lighting were evaluated on a 5-point Likert scale ranging from 'not significant' to 'extremely important' and from 'not satisfied' to 'very satisfied. One method for processing data is called Importance Performance Analysis (IPA). In an effort to satisfy customers, the firm will employ Importance Performance Analysis (IPA) to determine the critical performance elements and create a priority scale. [29]

Method 4 Kuadran is typically used in the Importance Performance Analysis (IPA) method.

a. Quadrant I, This quadrant represents areas of critical importance where the user's performance is currently inadequate. To meet expectations, resources must be directed towards improving performance in these crucial areas.
b. Quadrant II, This quadrant encompasses factors of high importance where the user is already performing at a high level, meeting expectations. Maintaining this level of achievement is crucial.
c. Quadrant III, This quadrant includes factors of low importance where the user's performance is also not a major priority, and expectations are relatively low. Consequently, this area provides minimal perceived benefit to the user.
d. Quadrant IV, This quadrant comprises factors of low importance where the user is significantly overperforming. To optimize resource allocation, the university should redirect resources from this quadrant towards areas in other quadrants that require performance improvement. [30]

The research was conducted at jalan Utama Kutamanggu Village, more precisely on the Kutamanggu Village - Babakanmanjeti Village road. The research location is shown in the picture.

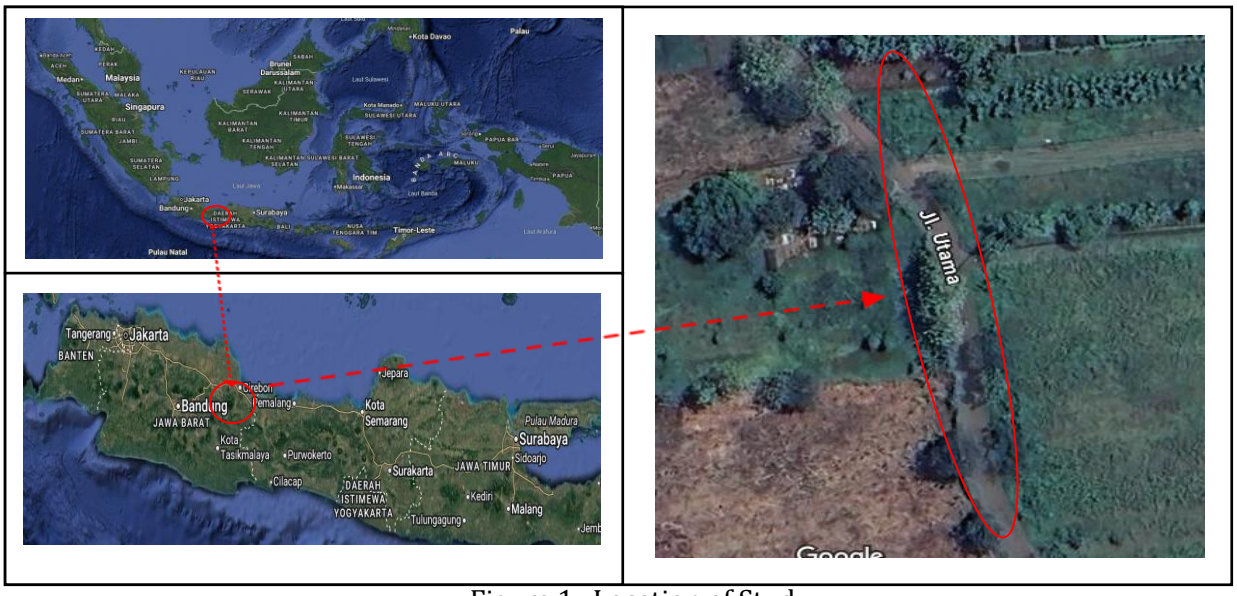

Figure 1 . Location of Study

4. Result and Discussion

4.1 Respondent's Personal Information

The 52 respondents were categorised by age, gender, and the vehicle they travelled in Jalan Utama Kutamanggu Village. According to the questionnaire's results, women make up the majority of those who drive to Jalan Utama Kutamanggu. The bulk of people that used this road were under 20 years old, and the least frequent travelers were in the 31–35 age range. The target respondents of this questionnaire are students, college students, factory e Based on the results of the questionnaire, the majority of drivers who drive on Jalan Utama Kutamanggu are women. Most of the drivers who pass through the road are 20 years old and under. employees and others. Motorbikes are also the most widely used vehicle.

Table 1. Respondent Information

Variabel	Category	Frequency	Persent
Have Passed Jalan Utama Kutamanggu Village	ever	52	100%
	never	-	
Gender	Male	22	42%
	Female	30	58%
Age	≤20	34	65%
	21 - 25	12	23%
	26 - 30	3	6%
	31 - 35	3	6%
	36 - 40	0	0%
	41 - 45	0	0%
	≥46	0	0%
Vehicles Used	Motorcyle	46	88%
	Car	6	12%

Source : Research result

4.2 The Importance and Performance Level

Data is required from two respondents, who are frequent road users. One assessment theory in the management of questionnaire data is confidence, which is a grouping based on quality. Using this theory, the study was able to group the questionnaire results based on the type of questionnaire questions and based on the results of road users' assessment using the questionnaire. Table 1 shows the data processing instrument designed to assess the level of importance and satisfaction of road users on the Jalan Utama Kutamanggu.

Table 2. *Importance and Performance Analisys*

NO	Indicator	I	P	G
A1	Lighting for road user safety	4.96	2.52	-2.44
A2	Lighting for driving safely	4.92	2.65	-2.27
A3	Lighting for driving comfort click to apply	4.96	2.58	-2.38
A4	lighting in avoiding road damage	4.85	2.62	-2.23
A5	lighting for pedestrians	4.87	2.56	-2.31
NO	**Indicator**	**I**	**P**	**G**
A6	lighting in reducing the risk of accidents	4.9	2.54	-2.36
A7	bend illumination	4.98	2.46	-2.52
A8	visibility lighting	4.94	2.58	-2.36
A9	lighting for road user mentality	4.81	2.56	-2.25
A10	lighting for crime prevention	4.9	2.52	-2.38

Source: Research Results

The results of the questionnaire were then analyzed using the IPA. (Importance Performance Analysis) method, which aims to assess the relationship between performance and the level of importance of each indicator that has been determined. The IPA diagram produces four quadrants, each of which provides a different picture of the combination of the two aspects. Quadrant I represents indicators that have a high level of performance and are considered very important, so they require attention to be maintained. Quadrant II shows indicators with good performance but a low level of importance, so the priority of improvement may not be too urgent. Quadrant III contains indicators with equally low performance and importance, which means that focusing on these indicators may not have a significant impact. Meanwhile, Quadrant IV displays indicators that have low performance but arerated as very important, so they require special attention to be improved to meet user or stakeholder expectations.

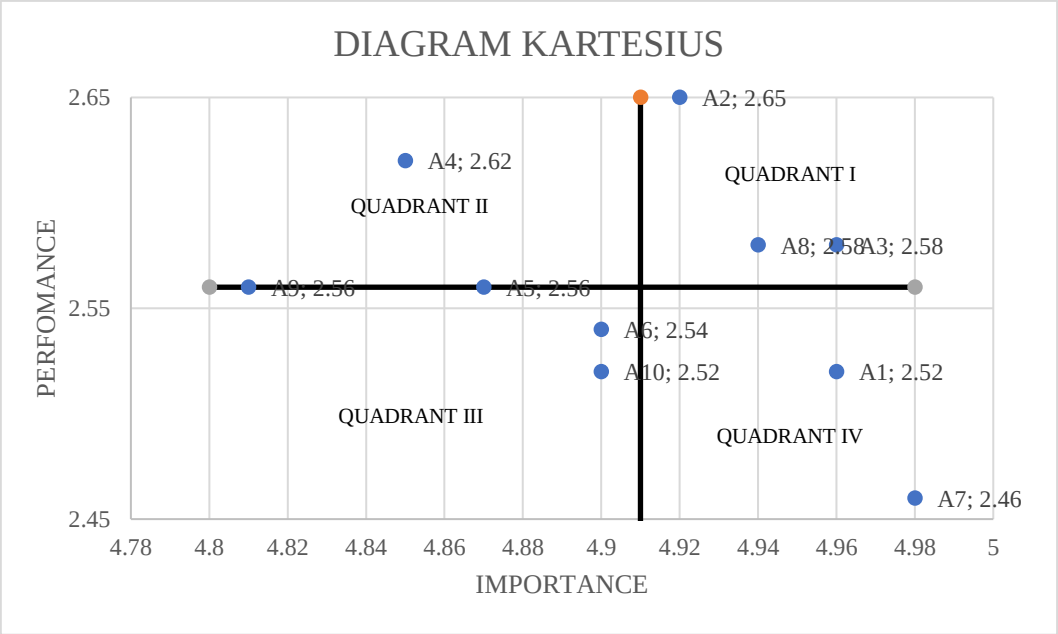

Figure 2. *Interest and Performance Analysis*

The research results reveal some significant key findings. In Quadrant IV, there are several aspects that have high importance scores but low actual performance scores. Firstly, road lighting towards bends (A7) was considered important by respondents, with an average importance score of 4.98 on a scale of 1 to 5. However, the actual performance of the road only reached a score of 2.46, indicating a large gap between expectations and the reality received by road users. Furthermore, road performance towards driving safety (A1) is also an important focus with an importance score of 4.96, but performance satisfaction towards road user safety currently stands at only 2.52. Apart from the above aspects that have a high level of importance, all aspects of the assessment indicators in quadrants I, II and III should also be considered to review the road performance conditions on this road.

5. Conclusion

This study shows that community perceptions of the condition of Jalan Utama Kutamanggu Village showed several crucial aspects. Firstly, the level of illumination on bends was rated as very important. This indicates the need for enhancements in road infrastructure to improve user satisfaction. Secondly, the performance of street illumination on the safety of drivers is also considered important and needs improvement in road infrastructure to make users feel safe while driving. According to the study's findings, the government and related parties should make more efforts to improve the quality of street lighting. To make the roads safer and more convenient to use, these measures should concentrate on meeting the expectations and needs of daily users of the road. The goal of this endeavor is to make Jalan Utama Kutamanggu Village more efficient, safe, and comfortable for motorists and pedestrians. It is expected that traffic safety, comfort and efficiency in the region will improve significantly with the addition of street lighting.

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