LEADER
Civil Engineering and Architecture Journal

Civil Engineering and Architecture Journal Vol.3 No.3 (2025) 3026-622X
DOI 10.37253/leader.v3i3.10841

Analysis of Public Street Lighting for Road Users Case Study: Cigasong Market, Majalengka

Rifatunnisa[1], Jody Martin Ginting[2],
[1]Faculty of Engineering, Universitas Majalengka, Indonesia
[2]Civil Engineering Program, Universitas Internasional Batam, Indonesia
Emai korespondensi: rifatunnisa65@gmail.com

ARTICLE INFO

Keywords:
Road Lighting
Road User Safety
Traditional Market

ABSTRACT

Majalengka is one of the cities that lacks lighting, significantly affecting community activities. In addition, public street lighting helps increase traffic comfort and safety, reduces crime rates, and improves people's quality of life. Lighting also impacts the economic sector, which is needed in some places, for example, in traditional markets. In these conventional markets, trading is not only done during the day or regular hours of human activity. Some traders and market consumers trade at night for convenience or because prices are lower than during the day. Because of this, market traders and consumers complain about the lack of lighting in the market area, which limits visibility, and sometimes criminality occurs. Accordingly, the purpose of this study is to examine the deficiency of street lighting in the Sindangkasih market area, Cigasong, an economic sector area. This study uses the perception variables of road users and market consumers to assess the lack of lighting at Sindangkasih Market, Jalan Raya Cigasong, Kab. Majalengka. Primary data came from questionnaires completed by 60 road users and market consumers surveyed. The parameters used were respondents perceived On a scale of 1 to 5, from not significant to very important and from not satisfied to very satisfied, rate the significance and level of satisfaction with the street lighting on this road. Critical performance analysis was used to process the data (IPA) technique. The results of this research are expected to provide solutions and changes for future spatial arrangements that lead to better regional development in terms of infrastructure and various other aspects, especially in public street lighting.

1. Introduction

Road management is often a crucial issue in the context of expanding urbanization around the world. Land transportation facilities and infrastructure cover all aspects of roads, including complementary infrastructure for long-distance drivers. (Nurhasanah & Pamadi, 2024). The quality of roads not only affects the comfort and safety of its users but also impacts energy efficiency, economic growth, and the standard of living of the general public; Road traffic accident injuries are a major worldwide concern public health concern (Marchant, Hale, & Sadler, 2020). According to recent research, well-maintained roads can reduce the time spent on unproductive activities, increase daily economic activity, and create safer and more inclusive neighborhoods. As such, public street lighting can aid sustainable development and improvements in people's quality of life. Although street lighting already has a standard, it will not simply be complied with. Even so, lighting standards must be adhered to as much as possible so as not to cause accidents for road users. Therefore, Road illumination still needs to be closely watched in order to reduce traffic accidents. (Sumantri, Rifai, & Ferial, 2022).The high number of traffic accidents in Indonesia, especially at night, was highlighted in a discussion on public street lighting. Road user safety is an essential factor in the effective operation of transportation infrastructure; proper road upkeep tackles elements that impact the user experience in addition to enhancing the road's physical state(Kharisma, Rifai, Taufik, & Prasetijo, 2024).

The lack of adequate lighting on many roads increases the risk of accidents for motorists and pedestriansNumerous academics have shown the importance of nighttime lighting design in the age of rapidly changing, densely populated cities (Pan & Du, 2021). So, improving the quality of public street lighting is one of the important efforts in improving traffic safety. Well-lit areas are associated with lower crime rates. Research shows that enhanced public street lighting can substantially decrease nighttime crime, with some studies reporting reductions of up to 36% in outdoor crime indexes (Wardhana, 2024). Therefore, assessing the existing road safety system and implementing more efficient technologies is necessary. A smooth traffic system is a symbol representing every one of its parts. Another example of a crucial element of the highway system for efficient traffic flow is good lighting. (Reta & Savitri, 2024).

Street lighting is an important component of urban development at the regional level. In general, efficient lighting technologies, integration with renewable energy, and consideration of environmental humidity are important issues in the research and maintenance of street lighting. The main characteristics of a road will affect its capacity and productivity over the long term. (Purnama, Rifai, & Nasrun, 2022). Well-lit roads can improve regional accessibility, reduce traffic flow, and encourage economic integration. However, the lack of public street lighting infrastructure is an obstacle in some areas that impacts regional development, especially for road users. In general, governments can lessen the severity of traffic accidents by changing the behavior of drivers or enhancing the state of the roads (Sari & Yudhistira, 2021).

One of several cities currently aggressively building road infrastructure is Majalengka City. (Anugraha, Rifai, Taufik, & Isradi, 2024). The lack of public street lighting in Majalengka significantly affects community activities. Poor street lighting increases the risk of road users (Candra & Savitri, 2024), especially for women and children who want to do outdoor activities. Many of them are afraid to travel because of the rampant crime at night. We discover evidence of a significant decrease in midnight outdoor index crimes in towns that were given extra lights (Chalfin, Hansen, Lerner, & Parker, 2022). In addition, the lack of lighting also hampers local economic growth, especially in the MSME sector, which operates at night. This research provides a solid basis for understanding the importance of traffic lights in the driving context of road user safety and in creating a safe and peaceful environment along the highway. (Septiyani, 2024).

Highways can be categorized according to their function: local roads, collector roads, and arterial roads. However, according to their type, they can be classified as village roads, district roads, city roads, provincial roads, or national roads. (Pernama, Rifa'i, & Fajarika, 2024). One example of a road located in a district with minimal lighting is the Cigasong market area, which is an economic sector area. Many traders and the general public complained about the lighting, which became the basis for researching the place. Tree branches block the distance between the lights, and until some lights are not lit. This is why the lack of lighting on the road in the casing market area causes road users to feel limited visibility. This research will analyze the relationship between the quality of lighting and the level of economic activity of the community at night. The results of this research are expected to provide solutions in spatial planning, especially in public street lighting, to create better regional development in various aspects in the future.

2. Literature Review

2.1 Road Lighting

Enhancing public safety, particularly at night, is greatly aided by street lighting. The primary purpose of street lighting is to improve visibility and lower the chance of mishaps and criminal activity. A literature review shows that various studies have evaluated the effectiveness of street lighting measures in different contexts. For instance, a systematic review covering 21 studies across four

countries discovered that a notable decrease in crime was linked to better street illumination rates, particularly property crimes, by approximately 14% in areas where lighting was enhanced compared to control areas (Welsh, Farrington, & Douglas, 2022). This highlights the importance of proper lighting as a safety measure and its potential to create safer urban environments. Research on crime and lighting consistently raises awareness about the importance of lighting, and in general, "improvement" refers to either the condition of a previously unimproved roadway or the improvement of a roadway that has already been improved. (Fotios, Robbins, & Farrall, 2021).

The study also highlights the psychological impact of street lighting on people's sense of safety. Improving lighting reduces the fear associated with crime and encourages more people to use public spaces at night. Research shows that improved street lighting contributes to increased social cohesion and informal surveillance, which is vital for crime prevention (Struyf, Enhus, Bauwens, & Melgaco, 2019). In addition, well-lit streets are linked to higher levels of pedestrian activity, which can further deter criminal behavior due to increased visibility and the likelihood of witnesses being present (Ibrahim, Alharbi, Almoshaogeh, & Elmadina, 2020). The relationship between lighting and community engagement highlights the benefits of an effective street lighting strategy. However, the debate over public street lighting is not without its challenges. Recent concerns about environmental impacts such as light pollution have fueled debate about the need for and extent of public lighting.

The presence of well-placed street lights at road intersections and pedestrian crossings not only makes navigation easier. It also makes road features and users more visible, reducing the likelihood of accidents. Research also shows that improved lighting increases personal safety and contributes to lower crime rates in urban areas, as brighter environments reduce criminal activity. Improved lighting can enhance personal security, reducing crime rates in urban areas, as illuminated environments are less conducive to criminal activity (Marchantfinds, 2019). However, too high a brightness can confuse drivers, so it is important to balance the brightness to avoid glare and ensure signals are visible. Overall, the Lighting Handbook stresses the importance of "balanced brightness distribution" to avoid strong dark-light contrasts, which can lead to confusion and safety hazards for road users (DiLouie, 2020). Adequate street lighting is an important part of a road safety strategy and contributes to safe movement for all road users.

2.2 Road User Safety

Road user safety is a major worldwide concern. According to WHO statistics, traffic accidents are the world's largest cause of mortality, claiming an estimated 1.35 million lives each year. This alarming statistic has prompted national and international initiatives to improve road safety (Ishak & Rahim, 2020). Moreover, its successor, the Global Decade of Action Plan for Road Safety 2021-2030, highlights a systematic approach to managing traffic safety. The interdependence of safe roadways is acknowledged by this approach, safe vehicles, and safe road users, advocating for comprehensive strategies that address human vulnerabilities and errors in road traffic systems (El Khalaı, Chorfı, & Berrado, 2023). Understanding user attitudes and behaviors is an important aspect of improving road user safety. Research shows that many drivers believe that road safety is influenced more by the actions of others than their driving behavior. For example, research shows that while drivers know that speeding is dangerous, they often do not apply this knowledge to their actions, creating a mismatch between knowledge and behavior.

This phenomenon highlights the need for targeted educational campaigns that provide information and encourage drivers to think about their driving habits. In addition, road safety audits (RSAs) have become an important tool for assessing and improving the road safety situation. These audits systematically evaluate existing or planned roads to ensure they meet optimal safety standards. Research shows that RSA can prevent up to 27% of accidents by identifying potential hazards before

they result in injuries or fatalities (Calderón Ramírez, Núñez López, García Gómez, & Montoya Alcaraz, 2023). The proactive nature of the RSA highlights the importance of incorporating safety assessments into all stages of road development and maintenance, thereby enhancing the safety culture among all stakeholders involved in road use. In summary, addressing road user safety requires a multifaceted approach combining effective management strategies, understanding user preferences, and rigorous safety testing.

Road safety audits (RSA) play an important role in improving road user safety by systematically assessing existing road design and infrastructure to identify potential hazards. According to the Federal Highway Administration, RSA is both practical and cost-beneficial as a proactive safety improvement tool (Lin, Ni, Guo, & Mei, 2020), which can significantly reduce the high number of accidents. For example, a study in Surrey County, UK, demonstrated a reduction of 1.25 fatal and injury crashes per year at audited sites compared to a mere 0.26 at non-audited locations, highlighting the impact of thorough safety assessments on reducing road incidents (Vaiana, Perri, Iuele, & Gallelli, 2021). The Irish Road Safety Agency emphasizes that "the RSA team identifies potential safety problems within the scheme and makes recommendations to the designer to minimize future collision occurrence and severity " (Khan & Das, 2024). This proactive approach addresses pressing safety issues and fosters a culture of continuous improvement in road safety practices to reduce road deaths and injuries significantly.

2.3 Traditional Market

Traditional markets have long been a fundamental aspect of many communities' cultural and economic life, particularly in Indonesia. These markets serve not only as places of trade but also as social spaces where community interaction occurs. A study on the revival of Pasar Badung in Bali highlights the unique characteristics that make traditional markets that provide daily needs and rituals different from modern shopping centers. The revitalization efforts aimed to improve physical conditions and management practices, demonstrating how traditional markets can adapt to contemporary challenges while maintaining their cultural Significance (Saragih & Meak, 2021). Traditional market practices with contemporary business models are needed to improve the survival of traditional markets.

Despite their importance, traditional markets face stiff competition from modern retail formats and e-commerce platforms. Research shows that these markets are increasingly struggling to attract visitors due to the convenience and variety of modern alternatives. This shift has led to a decline in foot traffic and sales, particularly affecting lower-middle-class vendors who rely on these markets for their livelihoods (Mahato, 2020). Emerging hygiene issues and inefficient management practices exacerbate these challenges and require innovative strategies to guarantee their survival. Market operating hours are also one of the things that should be considered because some traders conduct transactions at night. This impacts the community's limited visibility due to the lack of lighting around the market at night.

Highways are one of the leading transportation accesses for people traveling on foot and transporting goods from one area to another. (Pramadita & Rifai, 2024). Trading in traditional markets at night represents a unique and dynamic aspect of the local economy, especially in these markets' locations. These markets serve as important trading centers, allowing traders and consumers to trade outside regular business hours. Night services often cater to specific consumer needs, such as the convenience of late-night grocery shopping or traders preparing to sell in the morning. This phenomenon is particularly evident in Indonesian traditional markets, where the vibrant atmosphere at night fosters a sense of community and cultural exchange among participants (Purwanto, Sidanti, & Kadi, 2021). In addition, the shift to digital platforms has begun to impact night trading. The role of the government is vital in this case to realize the comfort of the people shopping in traditional markets at night, especially the fulfillment of urban spatial infrastructure, especially street lighting. The

government's role is crucial in promoting sustainable urban development and balancing current needs with future generations (Luthfiah, Guswandi, & Anggrahita, 2023).

3. Methodology

This research uses a perception analysis or qualitative research method. It analyzes road users' perceptions regarding street lighting's impact on road user safety. Finding the causes of observable patterns—mostly hidden or unexpected—requires a qualitative design (Busetto, Wick, & Gumbinger, 2020). That way, the data processing results in this study will describe the results of perceptions received by researchers. Data was collected at Sindangkasih Market, Jalan Raya Cigasong, Kab. Majalengka, West Java, Indonesia.

This study uses the perception variables from road users to evaluate the lack of lighting at Sindamgkasih Market on Jalan Raya Cigasong, Majalengka Regency. Sixty road user respondents and market consumers completed questionnaires that provided the primary data. On a scale of 1 to 5, from not important to extremely important and from not satisfied to very satisfied, the respondents' perceptions of the street lighting on this road are the factors employed. The Importance Performance Analysis (IPA) approach is used to process data. Priority measures that firms can utilize to attain customer satisfaction are established by Importance Performance Analysis (IPA), which identifies essential performance elements (Faqih, Kuhon, Aji, & Ardiansyah, 2020).

According to (Fatoni, Adi, Widodo, 2020), Metode Importance Performance Analysis (IPA) consists of 4 quadrants:

a) Quadrant I: Resources must be distributed as anticipated to enhance performance because this quadrant is crucial but does not correspond with user performance.
b) Quadrant II: In order to satisfy user expectations, this quadrant needs to be maintained at a high level of performance.
c) Quadrant III: The advantages experienced by consumers are insufficient due to this quadrant's low relevance, low priority performance, and comparatively low expectations.
d) Quadrant IV: The university should direct its resources to other quadrants that need better performance because this one has a low level of priority and an excessively high performance level.

Quadrant II (Concentrate Here)	Quadrant I (Keep Up The Good Work)
Quadrant III (Low Priority)	Quadrant IV (Possibly Overkill)

Figure 1. Importance Performance Analysis

This research was conducted on Jalan Raya Cigasong, Kab. Majalengka, more precisely in the Sindagkasih Cigasong market area. The research location is in the picture.

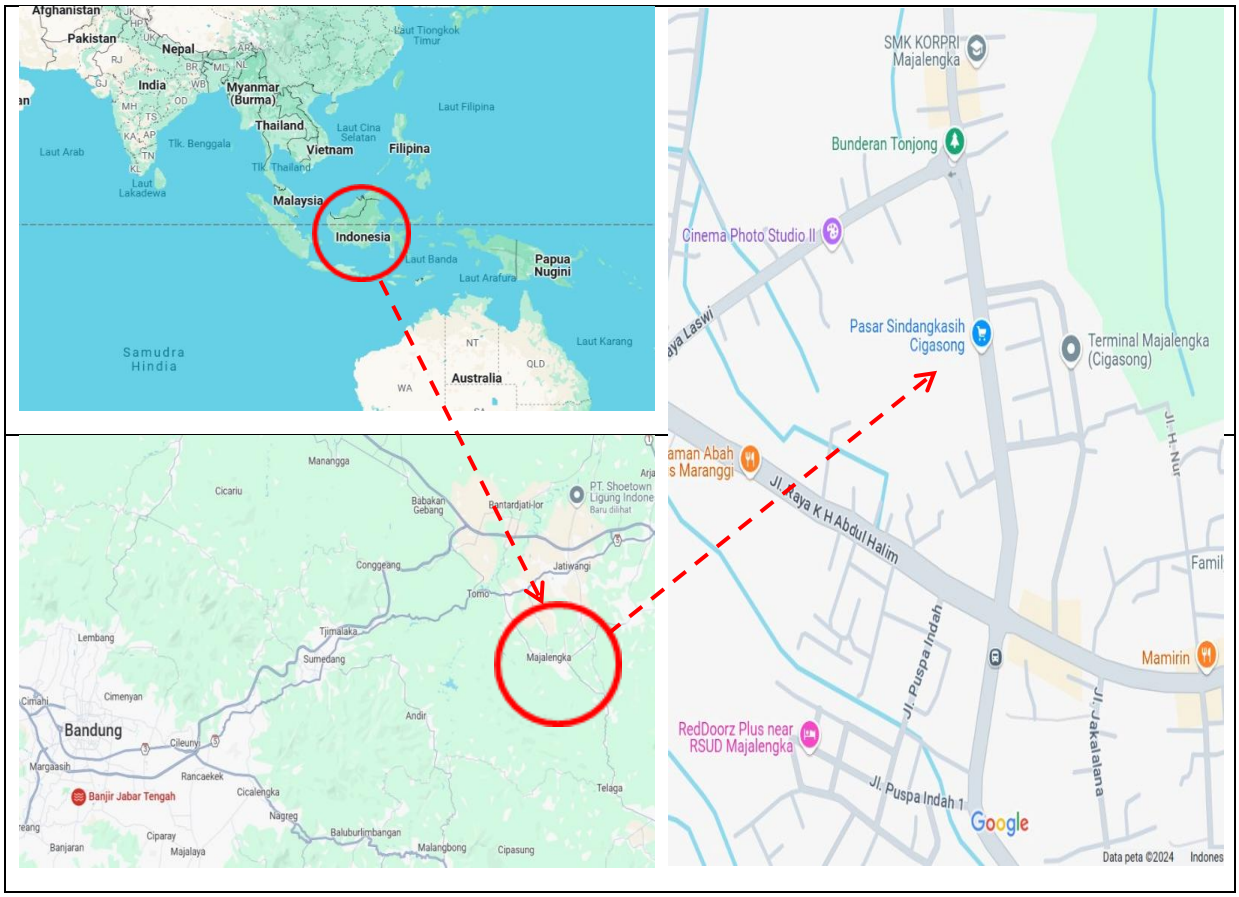

Figure 2. Plan of the Research Location

4. Result and Discussion

4.1 Respondent's Personal Information

Data collected from 60 respondents were analyzed by examining factors such as age, gender, and the type of vehicle used when traveling on public roads in the Sindangkasih Cigasong market. Based on the questionnaire results, it is known that most respondents in the area are female. The age group that travels this road most frequently is the 20 - 30. The age group that does not frequent this road is those over 60 years old. In addition, respondents most often used motorized vehicles as their vehicle type. As such, the results of this analysis provide detailed information on the demographic characteristics and preferred modes of transportation of those traveling on this road.

Variable	Category	Frequency	Percent
Through the public road in Sindangkasih Majalengka market	Ever	60	100%
	Never	-	
Gender	Male	25	42%
	Female	35	58%
Age	≤20	18	30%
	21 - 30	18	30%
	31 - 40	7	12%
	41 - 50	14	23%
	51 - 60	3	5%
	≥ 60	0	0
	Motorcycle	47	78%

Vehicles used	Car	10	17%
	Public transport	2	3%
	Another	1	2%

Table 1. Respondent's Personal Information

4.2 Level of Importance Analysis

Questionnaire results from 60 respondents who traveled this road were divided into two categories: importance and satisfaction. Based on fifteen research indicators, importance was given a value between 1 (not important) and 5 (very important). Then, satisfaction was given a value between 1 (dissatisfied) and 5 (very satisfied). From these two values, the difference (Gap) value is obtained, which is generated from the average importance and satisfaction values.

Table 2. The importance and performance level of road lighting

No	Indicator	I	P	G
A1	Road lighting for road safety	4.9	2.9	-2
A2	Street lighting for road safety	4.9	2.93	-1.97
A3	Road lighting for comfortable driving	4.92	2.92	-2
A4	Street lighting for road damage risk	4.92	2.8	-2.12
A5	street lighting for vehicles in the same direction	4.88	3	-1.88
A6	street lighting for vehicles traveling in the opposite direction	4.87	2.9	-1.97
A7	street lighting for road crossers	4.95	2.77	-2.18
A8	street lighting for road intersections	4.95	2.95	-2
No	**Indicator**	**I**	**P**	**G**
A9	street lighting for road bends	4.92	2.8	-2.12
A10	street lighting on driver age	4.9	2.97	-1.93
A11	street lighting on driver's vision	4.93	2.77	-2.16
A12	street lighting on driver's vision	4.95	2.83	-2.12
A13	road lighting on the visibility of traffic signs	4.85	2.88	-1.97
A14	street lighting on pedestrians	4.88	2.8	-2.08
A15	street lighting on the road User Awareness	4.9	2.82	-2.08

The questionnaire results were then analyzed using an IPA (Importance Performance Analysis) diagram. The IPA diagram produces four quadrants showing the combined performance and importance of the available indicators. The indicator that performs the best is in Quadrant I. Quadrant II is characterized by low importance and high performance. Quadrant III is characterized by low performance and equally low importance.Quadrant IV is characterized by poor performance and high importance, while

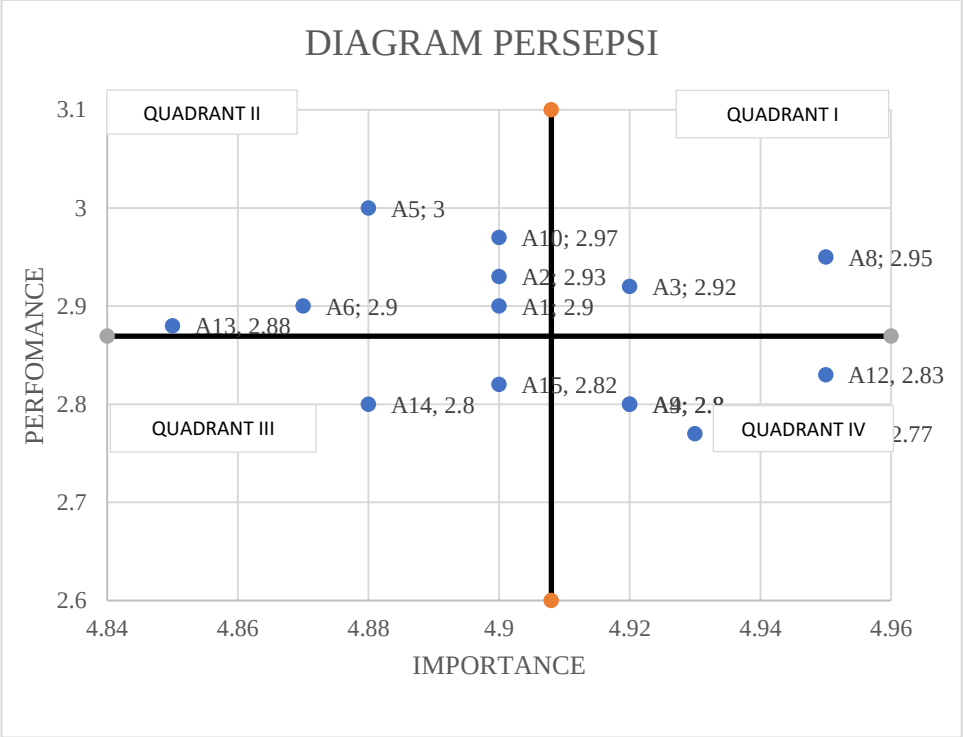

Figure 3. Importance Performance Analysis Diagram

The results of the study state some significant key findings. Quadrant IV aspects have high importance scores but low actual performance scores. First, respondents thought that street lighting for road crossers (A7) was very important, with an average importance score of 4.95 out of 1 to 5. However, road performance only reached a score of 2.77, indicating a significant gap between expectations and the reality experienced by road users. Furthermore, road lighting performance on (A11) is included in the important focus for discussion with an importance score of 4.93.

In contrast, respondents' satisfaction with street lighting performance for motorists' vision reached a score of 2.77. This states that there is a need for further additions and improvements to maintain the comfort level for consumers and road users in daily life. In addition, the performance of street lighting for the risk of road damage (A4) is also a serious concern, with an importance score of 4.92, but the performance of street lighting for the risk of road damage currently only reaches a score of 2.8. Furthermore, the performance of street lighting on the driver's view (A12) on the road is considered by respondents to be very important with an importance score of 4.95. However, the lighting performance on the Sindangkasih Cigasong market public road currently only reaches 2.83, indicating that the lighting needs to be adjusted and increased again to minimize accidents for consumers and road users who pass through the area. In addition to some of the factors mentioned in the previous discussion that have a high level of importance, all quadrant I, II, and III indicators must also be reconsidered to restore and improve the performance conditions of public street lighting on roads in the Sindangkasih Cigasong market.

After collecting data and information about the views of consumers or road users on public street lighting about improving several aspects of infrastructure, especially in the case of street lighting, 60 respondents have been asked whether there are improvements that need to be made to the performance of public street lighting. Respondents were asked to rate applying a five-point rating system, with 1 denoting (not necessary) and 5 denoting (very necessary)
. Variables have a significant meaning in determining the level of need for safety, comfort, and security of consumers and road users when traveling on roads in the Sindangkasih Cigasong market and serve as a benchmark for improving infrastructure, especially in the case of street lighting.

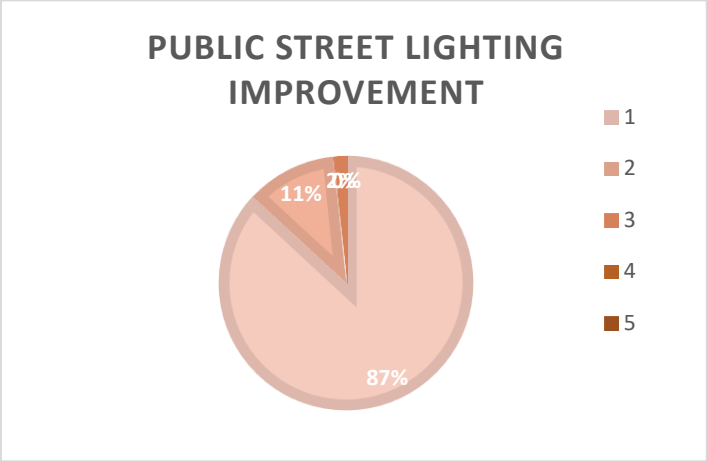

Figure 4. Road Improvement Diagram

In the diagram, it can be stated that 87% of respondents gave uniform answers with a scale of 5 (Essential) on all three variables, while there were no answers from respondents who chose or gave values with a number between 1 and 2. This clearly demonstrates that customers and drivers need and support improved lighting, safety, security, and comfort for road users, be they motorists or pedestrians who go through the Sindangkasih Market Road, Cigasong.

5. Conclusion

Street illumination is very significant, according to the research findings, which also found that its total level of relevance averaged 4.91. Nevertheless, the average level of road user satisfaction has only risen to 2.87 overall, so the level of importance of street lighting does not measure user satisfaction. The gap or difference found has an average of -2.04; this negative or minus sign indicates that user satisfaction has not been fulfilled perfectly or according to the wishes of consumers or road users. In addition, motorcycles are the most widely used vehicles in crossing or traveling through roads, and they can be considered vulnerable to reduce the risk of traffic accidents. Enhancing road safety and security is essential. In addition, the most important indicator in the perception of road usability is its illumination of the driver's vision. In contrast, the indicator considered less important by respondents is the illumination of vehicles in the opposite guidance. Regarding the degree of contentment, the contentment with the highest value or scale falls on the indicator of street lighting for the driver's age, and the satisfaction with the lowest value or scale falls on the indicator of street lighting for road crossers. As for the road improvement variable, all respondents rated and gave the highest scale of 5 (Essential), and it can be stated that these respondents considered the need for an increase in public street lighting in the Sindangkasih market, Cigasong. From this research, it is hoped that there will be efforts by the government and related parties to improve infrastructure, especially public street lighting, focusing on meeting the expectations and needs of the community or daily road users.

References

Anugraha, P. T., Rifai, A. I., Taufik, M., & Isradi, M. (2024). The redesign of provincial road geometric used AutoCAD® 2D: A case Jalan Majalengka-Rajagaluh, Indonesia—*Indonesian Journal of Multidisciplinary Science*, 3(12).

Busetto, L., Wick, W., & Gumbinger, C. (2020). How to use and assess qualitative research methods. *Neurological Research and Practice*, 2(1), 14.

Calderón Ramírez, J. A., Núñez López, I., García Gómez, L. G., & Montoya Alcaraz, M. A. (2023). Main guidelines in road safety audits: a literature review. *Frontiers in Built Environment*, 9, 1282251.

Candra, B. Y., & Savitri, A. (2024). ANALYSIS OF ROAD LIGHTING IMPACT ON ROAD USER SAFETY: CASE STUDY OF JALAN JATIBARANG-JATITUJUH. *LEADER: Civil Engineering and Architecture Journal*, 2(1), 595-603.

Chalfin, A. H. (2022). Reducing crime through environmental design: Evidence from a randomized experiment of street lighting in New York City. *Journal of Quantitative Criminology*, 1-31.

DiLouie, C. (2020). Lighting controls handbook. *Lighting controls handbook*, 123.

El Khalaı, I., Chorfı, Z., & Berrado, A. (2023). Road Safety Performance Monitoring Practices: A Literature Review. *The Eurasia Proceedings of Science Technology Engineering and Mathematics*, 22, 99-110.

Faqih, H., Kuhon, F., Aji, S., & Ardiansyah, A. (2020). An Analysis and Measurement of Website Quality Using WebQual 4.0 and Importance Performance Analysis (IPA) Method (A Case Study of Kemiriamba Village Brebes). *In Journal of Physics: Confere*nce, 012096.

Fatoni, A., Adi, K., & Widodo, A. P. (2020). PIECES framework and importance-performance analysis method to evaluate the implementation of information systems. *In E3S Web of Conferences (Vol. 202, p. 15007). EDP Sciences.*, 11.

Fotios, S. A., Robbins, C. J., & Farrall, S. (2021). The effect of lighting on crime counts. Energies, *Energies*, 14(14), 4099.

Ibrahim, A. H., Alharbi, F. A., Almoshaogeh, M. I., & Elmadina, A. E. (2020). Literature review and a conceptual research framework of adaptive street lighting criteria. *Engineering, Technology & Applied Science Research*, 10(4), 6004–6008.

Ishak, S. Z., & Rahim, S. A. (2020). Where is Malaysia at the End of the Decade of Action 2011-2020? *International Journal of Road Safety*, 1(1), 1-3.

Khan, M. N., & Das, S. (2024). Advancing traffic safety through the safe system approach: A systematic review: *Accident Analysis & Prevention*, 199, 107518.

Kharisma, G., Rifai, A. I., Taufik, M., & Prasetijo, J. (2024). The Analysis Of Deterioration Of Village Road: A Case Of Palasah-Majalengka. *Jurnal Ekonomi Teknologi dan Bisnis (JETBIS)*, 3(10), 1750-1757.

Lin, P., Ni, P., Guo, C., & Mei, G. (2020). Mapping soil nail loads using Federal Highway Administration (FHWA) simplified models and artificial neural network technique. *Canadian Geotechnical Journal*, 57(10), 1453-1471.

Luthfiah, F., Guswandi, G., & Anggrahita, H. (2023). The Role of City Spatial Plan (RTRW) on Regional Development in Depok City (West Java Province). *Indonesian Journal of Geography*, 55(2).

Mahato, B. (2020). Social Class and Public Space: An Empirical Study of Class Relations in New Market Square, Kolkata, India. *(Doctoral dissertation, University of Cincinnati)*, 123–124.

Marchant, P., Hale, J. D., & Sadler, J. P. (2020). Does changing to brighter road lighting improve road safety? Multilevel longitudinal analysis of traffic collision frequency during the relighting of a UK city. *J Epidemiol Community Health*, 74(5), 4.

Marchantfinds, P. (2019). Do brighter, whiter street lights improve road safety? *Significance*, 8.

Nurhasanah, R., & Pamadi, M. (2024). ANALYSIS OF ONE-WAY TRAFFIC REGULATION IN THE MAJALENGKA SQUARE AREA. *LEADER: Civil Engineering and Architecture Journal*, 2(1), 657-663.

Pan, W., & Du, J. (2021). Impacts of urban morphological characteristics on nocturnal outdoor lighting environment in cities: An empirical investigation in Shenzhen: *Building and Environmen*t, 192, 107587.

Pernama, I., Rifa'i, A. I., & Fajarika, A. (2024). ROAD GEOMETRIC PLANNING USING AUTOCAD® 2D CASE STUDY: PRAPATAN PANJALIN STREET, SUMBERJAYA DISTRICT, MAJALENGKA REGENCY. *LEADER: Civil Engineering and Architecture Journal*, 2(2), 684-692.

Pramadita, M. G., & Rifai, A. I. (2024). GEOMETRIC EVALUATION OF ROADS ON MAJALENGKA-CIKIJING ROAD: A CASE STUDY OF PASUKAN SINDANGKASIH-JALAN CUCUK DALEM. . *LEADER: Civil Engineering and Architecture Journal,* 2(1), 541-548.

Purnama, E., Rifai, A. I., & Nasrun, N. (2022). Analysis of Road Performance Used Indonesian Highway Capacity Manual 1997: A Case Jalan KH Abdul Halim Majalengka-Indonesia. *Citizen: Jurnal Ilmiah Multidisiplin Indonesia*, 2, 888-895.

Purwanto, H., Sidanti, H., & Kadi, D. C. (2021). Traditional market transformation into digital market (Indonesian traditional market research library). *International Journal of Science, Technology & Management*, 2(6), 1980-1988.

Reta, R. T., & Savitri, A. (2024). EVALUATION OF THE LEVEL OF STREET LIGHTING ON THE SAFETY ROAD USERS: CASE STUDY OF THE KERTAJATI–KADIPATEN ROAD. *LEADER: Civil Engineering and Architecture Journal,* 2(1), 632-639.

Saragih, L. S., & Meak, S. V. (2021). Post-revitalization of the traditional market from a marketing perspective. Review of Management. *Accounting, and Business Studies*, 2(1), 58-67.

Sari, Y. &. (2021). Bad light, bad road, or bad luck? The associations of road lighting and road surface quality on road crash severities in Indonesia. *Case studies on transport policy*, 9(3), 1407–1417.

Septiyani, Y. N. (2024). ANALYSIS OF TRAFFIC LIGHTING ON ROAD USERS: CASE STUDY OF SILIWANGI ROAD KADIPATEN-MAJALENGKA. *LEADER: Civil Engineering and Architecture Journal*, 2(1), 648-656.

Struyf, P., Enhus, E., Bauwens, T., & Melgaco, L. (2019). Literature study: The effects of reduced public lighting on crime, fear of crime, and road safety.

Sumantri, V. N., Rifai, A. I., & Ferial, F. (2022). Impact of inter-urban street lighting on users perception of road safety behavior: A Case of Jalan Majalengka-Rajagaluh. *Citizen: Jurnal Ilmiah Multidisiplin Indonesia,*, 2, 703-711.

Vaiana, R., Perri, G., Iuele, T., & Gallelli, V. (2021). A comprehensive approach combining regulatory procedures and accident data analysis for road safety management based on the European Directive 2019/1936/EC. *Safety*, 7(1), 6.

Wardhana, Y. M. (2024). The Provision of Public Street Lighting Based on Risk Mitigation for Energy Efficiency and Environmental Protection. *Prisma Sains: Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram*, 12(1), 148-159.

Welsh, B. C., Farrington, D. P., & Douglas, S. (2022). The impact and policy relevance of street lighting for crime prevention: A systematic review based on a half-century of evaluation research. *Criminology & Public Policy*, 21(3), 739–765.