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# The Road User Perception of Municipal Road Deterioration: A Case Majalengka West Java

**[1] Nurmala Dwiani, [2*]Andri Irfan Rifai, [3] Mohamad Taufik, [4] Susanty Handayani**
[1] Universitas Majalengka, Indonesia
[2]Universiti Tun Hussein Onn, Malaysia
[3] Directorate General of Highway, Indonesia
[4] Trisakti Institute of Transportation and Logistics, Indonesia
Email: dwianinurmala@gmail.com, andri.irfan@uib.ac.id, mohamad.taufik@pu.go.id, susantyhandayani@gmail.com
*Correspondence: andri.irfan@uib.ac.id

**ABSTRACT:** Municipal Roads are local infrastructure and serve as global routes for trade, tourism, and cultural exchange. Damage to roads is a topic of much urgent discussion in Indonesia. The aim of research on road damage in municipal roads, Majalengka, is to investigate the causes and impacts of road damage in the area. The research location to be carried out is Jalan Baribis in the Majalengka district. This research uses qualitative methods with perception analysis to study the various factors that cause damage to roads in the city of Majalengka and their Impact on society. When passing through Jalan Baribis, Majalengka, the respondents' data was divided into gender, vehicle used, and age. Based on the questionnaire results, the variable that received the highest importance value was the effect of road damage on two-wheeled vehicles and pedestrians, with an average value of 4.8. The variable that received the lowest importance value was road damage to public facility services, with an average value of 4.2. Meanwhile, the variable that received the highest satisfaction score was the effect of road damage on two-wheeled vehicles and pedestrians, with an average value of 2.6. On the other hand, the variable that got the lowest satisfaction score was the effect of road damage on heavy vehicles, with an average value of 2.14. From the research results, the level of importance of damage to road sections to road users has an average value of 4.48, which shows that repairing damaged road sections is very important.

**Keywords: Deterioration; municipal road; perception, road repair,**

## INTRODUCTION

Roads are essential for many elements of life, including safety, social benefits, and economic progress (Pham, Pham, & Dang, 2020). Roads are local infrastructure and serve as global trade, tourism, and cultural exchange routes. Roadways are significant public resources that serve society in concrete, long-term ways by facilitating access to the mobility of people and goods and fostering market economic development (Cao, Tran, Nguyen, Chang, & Kuan-Tsung, 2020). Global supply chains and cross-border mobility are often affected by a country's road infrastructure problems. Many countries are paying attention to road damage, congestion, and better maintenance. Maintaining a nation's roads is essential to its socioeconomic progress and the seamless running of its daily affairs (Doshi, Yilmaz, & Yasin, 2020). By understanding the importance of roads globally, countries seek to work together to

improve road infrastructure to support economic growth and sustainable mobility at the international level.

Road damage is a significant regional problem in the Southeast Asia region. Much research has been done on the vulnerability, risk analysis, damage assessment, and damage quantification of structures (Anbazhagan, Srinivas, Chandran, & Deepu, 2020). Countries in the region face similar challenges, including damage from floods, landslides, and other extreme weather. This damage often disrupts inter-country connectivity and regional trade. However, road issues include population increase, failing infrastructure, and sharply increasing road-building expenses (Pham, Nguyen, Donan, & Christopher, 2022). Rapid urbanization and population growth contribute to the problem, as is the requirement for increased funding for road upkeep. These factors affect mobility, transportation, regional development, and economic growth. To address this problem, countries must work together to repair and maintain critical road infrastructure**.**

With more than 260 million inhabitants, Indonesia is the fourth most populous country in the world (Dermawan & Tjahjono, 2020). Traffic congestion results from the country's major cities' fast expansion and rising car usage (Rachmadina, Rifai, & Handayani, 2022). Damage to roads is a topic of much urgent discussion in Indonesia. Damaged road infrastructure causes severe traffic congestion, especially in urban areas. Factors such as heavy rainfall and rapid growth in vehicle volumes contribute to the problem. Damage that often occurs will certainly affect safety and comfort (Isradi, Prasetijo, Rifai, and Ade, & Amin, 2022). Through collaborative efforts between the government, private sector, and society, damage to roads in Indonesia can be minimized to support safe and efficient mobility and sustainable economic growth.

Roads are a vital component of the community service system's infrastructure since they link different areas (Syaiful & Rusfana, 2022). Damage to road infrastructure on the Jalan Baribis, Majalengka, is a local problem that urgently needs to be addressed because it causes inconvenience for routine road users. Road damage can cause losses that road users directly feel because road damage can cause problems that authorized government agencies cannot directly handle (Sinambela & Rifai, 2024). Numerous factors can lead to road damage, such as overloaded vehicles, shifting climate and environmental conditions, inadequate drainage systems causing waterlogging, heavy traffic volumes, improper planning, non-compliant implementation of existing plans, and insufficient oversight of road conditions (Isradi, Hedianto, Rifai, & Mufhidin, 2021). Local people often complain about the government's need for more attention to road maintenance in this area. Therefore, the local government's fast and effective repair efforts are significant in ensuring safe and comfortable road conditions for all Jalan Baribis and Majalengka road users.

Research on road damage in Jalan Baribis, Majalengka, aims to investigate the causes and impacts of road damage in the area. This research aims to identify specific factors that cause road damage, such as traffic conditions, climate change, or construction quality. This research also evaluates the effect of road damage on residents' mobility communities and the local economy. Finally, it is envisaged that this research would significantly advance initiatives to raise the standard of the road system on the municipal road of Majalengka.

## Literature Review

### *Roads*

One of the most essential functions of roads in life is facilitating the flow of goods and services (Isradi, Arifin, & Sudrajat, 2019). Roads are the main component of a country's transportation infrastructure, connecting various regions and facilitating human mobility. In addition, the road also provides a good solution for the smooth flow of traffic, which impacts

the smooth delivery of one region to another (Barus & Rifai, 2020). From main highways that cross big cities to minor roads in rural areas, roads are essential in supporting economic and social development. These roads connected important places such as business and industrial centers, opened access to remote areas, and facilitated local trade. Roads are anticipated to offer community services related to efficient, safe, and convenient transportation (Wincent, Rifai, & Isradi, 2022). A country's economic growth can be improved with good roads and people's mobility limited.

Although the importance of roads is widely recognized, their management has various challenges. One of the main challenges is adequate maintenance of existing road infrastructure. Lack of funds for routine maintenance often delays road repairs, resulting in further damage. Another factor that complicates road management is increasing traffic loads, which can lead to traffic congestion and the need for increased road capacity. The phrases "crowding" and "overcrowding" are interchangeable when referring to the degree of discomfort and possible risks resulting from a lack of available space (Wen, Kenworthy, & Marinova, 2020). Apart from that, damage due to extreme weather, such as floods and landslides, is a severe challenge that must be overcome in road management.

They serve multiple purposes in a city, including utility services and traffic movement; roads and urban roadways are invaluable assets (Afridi, Erlingsson, & Sjogren, 2023). Various maintenance and development strategies have been proposed and implemented to overcome the challenges faced in road management. This includes a regular maintenance program for pothole repair, road marking replacement, and drainage maintenance. In addition, construction technology innovations, such as modified asphalt and durable concrete, contribute to better road maintenance efforts. In addition, improving the geometric design of roads and using intelligent transportation systems are the focus of efforts to increase the efficiency and safety of roads in the future. Through joint efforts among the community, the private sector, and the government, roads can continue to develop into reliable, safe, and efficient infrastructure to support economic growth and community mobility.

***Road Infrastructure***

Effective highway infrastructure networks are crucial for advancing the socioeconomic growth of nations and regions in the construction industry (Salsabila, Rifai, & Isradi, 2022). Road infrastructure is essential for economic development and human mobility. With a good road network, people can easily access various places for personal and business purposes. Road networks dominate most countries' transportation infrastructure (Gibbons, Lyytikäinen, Overman, & Shancis-Guarner, 2019). Road infrastructure also enables the smooth flow of goods, facilitating trade and distribution of products between regions. A strong road network or efficient road infrastructure gives businesses a competitive edge when transporting goods (Ng, Law, Jakarni, & Kulanthayan, 2019). Therefore, investment in building and upkeep of transportation infrastructure is essential for a country's development.

Public infrastructure projects that are crucial for social benefits include those involving highways or road building (Razi, Ali, & Ramli, 2021). Although road infrastructure is critical, many things could be improved in terms of managing it. The need for more sufficient funds to repair and maintain the existing road network is a significant problem. Budget constraints often cause road repairs to be delayed, which can cause further damage. In addition, improving technology and innovation in road design and construction also requires a lot of money. Regarding infrastructure transportation networks, many developed country governments monitor how reliable their local roadways are (Khalifa, Zulkiplie, Ogab, & Mohammed, 2020).

A developing nation's severely deteriorating road system, severe financial constraints, and a marked increase in traffic have made it necessary to enhance the effectiveness of highway maintenance strategies (Dardak, Zuna, & Rifai, 2020). Various development approaches have been proposed and implemented to overcome road infrastructure management problems. The routine maintenance program includes road repairs, drainage maintenance, and improving road signs and markings. In addition, using advanced technology, such as real-time road condition monitoring systems, also helps detect damage and take necessary preventive measures. With a comprehensive approach and suitable investment, road infrastructure can become more reliable, safe, and efficient in supporting mobility and sustainable economic growth. Therefore, national road development plans and initiatives are crucial to raising living standards in developing nations (Mejía, Sánchez, Castañeda, & Pellicer, 2020).

***Road Deterioration***

Community activities have expanded because the world's largest cities are increasing quickly, particularly in emerging nations (Rifai & Arifin, 2020). Road damage is one of the main problems facing transportation infrastructure in many countries. Many countries' roads have numerous flaws due to road surface degradation caused by aging infrastructure, fast vehicle growth, and frequent use (Xu, et al., 2023). These are problems involving damaged or unusable road conditions, often caused by extreme weather, overloading, or lack of maintenance. Road damage not only endangers road users' safety but also impacts a region's mobility and economic growth. Without adequate maintenance, road damage can become more severe and require significant repair costs in the future.

Various factors can damage roads. One is extreme weather conditions such as heavy rain, floods, or landslides, which can damage the road surface. Excessive traffic loads can also cause damage, especially on roads frequently passed by trucks or other heavy vehicles. The pavement is subjected to tremendous strains from the large carload, which damages it (Saharuddin & Ing, 2019). Lack of maintenance is also a common cause of road damage, where potholes and cracks can develop into more severe problems if not addressed on time.

There are instances when different degrees of road damage result in puddles, landslides, and other problems (Isradi, Setiaputri, Rifai, & Prasetijo, 2021). A breakdown in the road infrastructure is one of the most significant things that prevents response activities during catastrophes (Farzaneh, Rezapour, Baghaian, & Amini, 2023). Various handling and repair efforts have been carried out to repair damage to the highway. Repairing potholes, replacing road markings, and maintaining drainage are routine maintenance. More sophisticated construction technology, such as modified asphalt and durable concrete, has also been used to increase the road's resistance to damage. In addition, to reduce road damage and extend the service life of existing road infrastructure, careful road geometry design and regular use of road condition monitoring systems are required.

## RESEARCH METHODOLOGY

To study the various factors that cause damage to the municipal roads of Majalengka and their Impact on society, this research uses qualitative methods with perception analysis. Qualitative research provides insights into and an understanding of the problem setting (Ahmad, 2019). The qualitative method can be interpreted as a research method focusing on in-depth observation. This method was chosen because it allows researchers to gain a deeper understanding by collecting descriptive and narrative data by interviewing community members who frequently use the road. In addition, direct observations at the location of road

damage will be carried out to collect supporting data about the physical condition of the road. The data was collected from Jalan Baribis, Majalengka. This location was chosen as the research object because this road was damaged. The local research site is Jalan Baribis in the Majalengka. For more precise information, see Figure 1.


**Figure 1**. Research Location

Meanwhile, the variable used in this research is road users' perceptions of road damage. The primary data comes from road user perceptions obtained through questionnaires and observations regarding the Jalan Baribis, Majalengka. The parameters used in the questionnaire are performance perceptions and the level of importance of repairing road damage using a scale of 1 to 10 from very important to very satisfied and very unimportant to very dissatisfied. Data was processed using the IPA (Importance Performance Analysis) method. Quadrant (I): "High importance and high performance (keep up the good work)." Quadrant (II): "Low importance and high performance (possible overkill)." Quadrant (III): "Low importance and low performance (low priority)." Quadrant (IV): "High importance and low performance (concentrate here)."

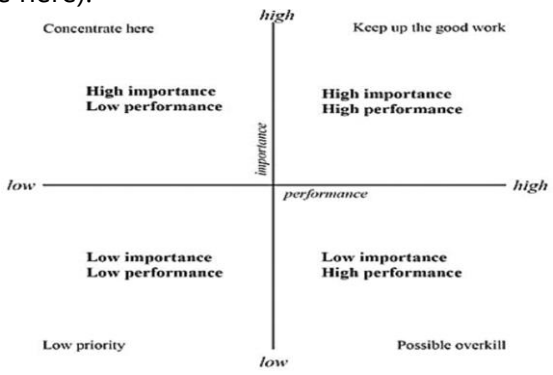


**Figure 2**. Importance Performance Analysis

## RESULT AND DISCUSSION

### Respondent *Personal Information*

Respondent data included when passing through Jalan Baribis, Majalengka, was divided into gender, vehicle used, and age. Based on the survey results, most respondents who passed Jalan Baribis and Majalengka were men, and the majority were aged 31 - 40. The vehicles often used to pass this road were motorbikes. Meanwhile, the least used vehicle is a car, and the age group that rarely travels on Jalan Baribis, Majalengka, is 61 - 60.

**Table 1**. Respondent Personal Information

| Variable | Category | Frequency | Present |
|---|---|---|---|
| Gender | Male | 36 | 72% |
| | Female | 14 | 28% |
| Vehicles Use | Motorcycle | 26 | 52% |
| | Car | 24 | 48% |
| Age | ≤20 | 10 | 20% |
| | 21 - 30 | 13 | 26% |
| | 31 - 40 | 17 | 34% |
| | 41 - 50 | 6 | 12% |
| | 51 - 60 | 4 | 8% |

*Source: Question Result Data*

***The Importance and Performance Level***

Based on the questionnaire results, the variable that received the highest importance value was the effect of road damage on two-wheeled vehicles and pedestrians, with an average value of 4.8. On the other hand, the variable that received the lowest importance value was road damage to public facility services, with an average value of 4.2. Meanwhile, the variable that received the highest satisfaction score was the effect of road damage on two-wheeled vehicles and pedestrians, with an average value of 2.6. On the other hand, the variable that got the lowest satisfaction score was the effect of road damage on heavy vehicles, with an average value of 2.14.

**Table 2**. The Importance and Performance Level of Road Damage

| No | Indicator | I | P | G |
|---|---|---|---|---|
| A1 | Impact of Road Damage on Heavy Vehicles | 4,5 | 2,14 | -2,36 |
| A2 | Impact on two-wheeled vehicles and pedestrian roads | 4,8 | 2,6 | -2,2 |
| A3 | Accurate Timeout | 4,6 | 2,45 | -2,15 |
| A4 | Traffic damage to public facility services | 4,2 | 2,34 | -1,86 |
| A5 | Road Damage to Smooth Traffic | 4,3 | 2,4 | -1,9 |

Technically, road damage indicates a condition where the structural and functional road can no longer provide optimal service to traffic passing through the road. This condition causes traffic density and the type of vehicle that will pass through a road to affect the design of construction planning and road paving significantly. Road damage can occur due to several factors, including excessive vehicle loads (overloading), changing climate and environmental conditions, poor drainage systems that cause waterlogging, high traffic loads, inappropriate planning, implementation not under existing plans, and lack of supervision of road conditions.

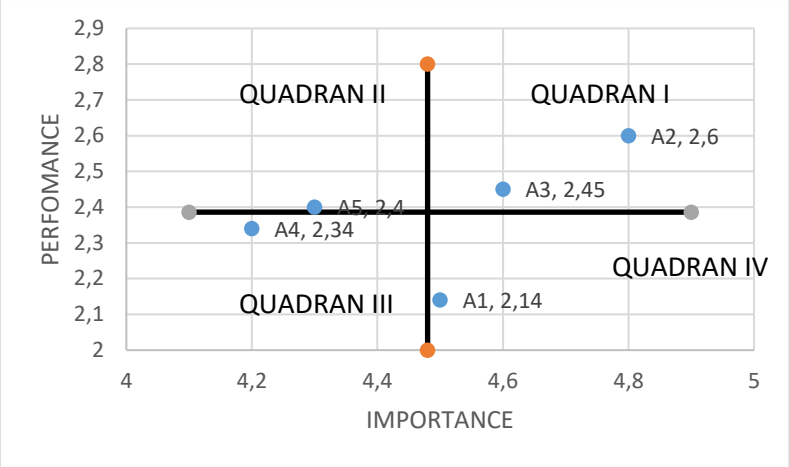


**Figure 3**. Importance and Performance Analysis Diagram

As seen in Table 2, the gap value between the level of damage to road sections and road users is at a minus value, which indicates that the damage to road sections does not meet the level of needs for road users. Then, in the diagram above, quadrant I is a variable with high importance and satisfaction. Quadrant II is a variable with a low significance level and a high level of satisfaction. Quadrant III is a variable with a low level of importance, and the level of satisfaction is also relatively low. Quadrant IV is a variable with a high level of importance but with a low level of satisfaction.

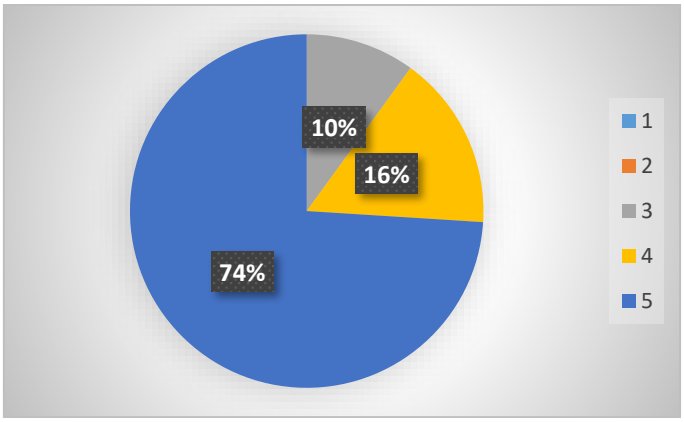


**Figure 4**. Road Improvement Diagram

After obtaining information on road users' perceptions of various aspects of the level of damage to the road section, 50 respondents were asked whether the damage to the road section should be repaired immediately or not. There are five response scales from strongly disagree to agree strongly. Figure 4 shows that 74% of road users scored 5. Most respondents had the same answer, and no one gave answers one and two, meaning all respondents think there is a reasonable need for road improvements. Of the three variables, damage to roads is the one that has the highest value or requires immediate repair. Meanwhile, the results of the other two variables are similar in terms of the necessary amount of improvement but are still high. This shows that damage to the road section needs to be repaired immediately.

## CONCLUSION

From the research results, the level of importance of damage to road sections to road users has an average value of 4.48, which shows that repairing damaged road sections is very important. However, the road performance level only reached 2.39, so user satisfaction must be proportional to the importance of repairing damaged roads. So, the resulting gap averages -2.1; the minus sign shows that road user satisfaction still needs to be met. Thus, respondents

expect immediate repairs to damaged roads. Apart from that, because motorbikes are a vulnerable part of the vehicle and the vehicles that mostly use the Jalan Baribis, Majalengka, it is necessary to improve road user safety to reduce the risk of traffic accidents. Apart from that, the parameters considered the most important in road users' perception are road damage and punctuality of travel time. On the other hand, the less critical parameter is road damage to public facility services, which is still discussed in terms of the level of satisfaction. The highest road user satisfaction parameter is the effect of road damage on two-wheeled vehicles and pedestrians and the lowest impact of road damage on heavy vehicles. In this case, all variables that include road repairs for road users must be repaired immediately.

**REFERENCES**

Afridi, M. A., Erlingsson, S., & Sjogren, L. (2023). Municipal street maintenance challenges and management practices in Sweden. *Frontiers in Built Environment, 9*, 1205235.

Ahmad, S. a. (2019). Qualitative v/s. quantitative research-a summarized review. *population, 1*(2), 2828--2832.

Ahmed, H. O. (2021). How to use importance-performance analysis (IPA)-based SWOT analysis as a new quantitative methodology for developing actual strategic plans in universities. *SN Social Sciences, 1*(1), 32.

Anbazhagan, Srinivas, P. &., Chandran, S. &., & Deepu. (2020). Classification of road damage due to earthquakes. *Natural hazards, 60*, 425-460.

Barus, R., & Rifai, A. I. (2020). Analysis of the Effects of Overloading on the Age of The Toll Road Case Study Taanggerang-Merak Km 72 s.d KM 77. *Neutron*, 72-80.

Cao, Tran, M.-T. &., Nguyen, Q.-V. &., Chang, N.-M. &., & Kuan-Tsung. (2020). Survey on performance of deep learning models for detecting road damages using multiple dashcam image resources. *Advanced Engineering Informatics, 46*, 101182.

Dardak, H., Zuna, H. T., & Rifai, A. I. (2020). A conceptual pavement optimization considering costs and maintenance & rehabilitation interventions (learn from long segment maintenance contract). *Journal of Advanced Research in Dynamical and Control Systems*, 3072-3078.

Dermawan, W., & Tjahjono, T. (2020). A conceptual framework for development of safety performance functions for rural roads in Indonesia. *IOP Conference Series: Earth and Environmental Science, 498*(1), 012022.

Doshi, Yilmaz, K. &., & Yasin. (2020). Road damage detection using deep ensemble learning. *2020 IEEE International Conference on Big Data (Big Data)*, 5540-5544.

Farzaneh, M. A., Rezapour, S., Baghaian, A., & Amini, M. H. (2023). An integrative framework for coordination of damage assessment, road restoration, and relief distribution in disasters. *Omega, 115*, 102748.

Gibbons, S., Lyytikäinen, T., Overman, H. G., & Shancis-Guarner, R. (2019). New road infrastructure: the effects on firms. *Journal of Urban Economics, 110*, 35--50.

Isradi, M., Arifin, Z., & Sudrajat, A. (2019). Analysis of Damage of Rigid Pavement by Using Pavement Condition Index (PCI). *Journal of Applied Science, Engineering, Technology, and Education*, 193-202.

Isradi, M., Hedianto, A. D., Rifai, A. I., & Mufhidin, A. (2021). Comparison of PCI (Pavement Condition Index) and SDI (Surface Disstres Index) in Identification of Urban Road Damage. *ADRI International Journal of Engineering and Natural Science*, 90-98.

Isradi, M., Prasetijo, J., Rifai, A. I., and Ade, T. S., & Amin, M. (2022). Comparison of Pavement Performance Models for Urban. 1109-1118.

Isradi, M., Setiaputri, H. A., Rifai, A. I., & Prasetijo, J. (2021). Analysis of Urban Road Damage with Pavement Condition Index (PCI) and Surface Distress Index (SDI) Methods . *ADRI International Journal of Sciences, Engineering and Technology*, 10-19.

Khalifa, Zulkiplie, N. A., Ogab, A., & Mohammed. (2020). The Impact of different road damage factors on the pavement of local roads (JKR U2/U3) in Malaysia. *International Journal of Pavement Research and Technology*, 240-246.

Mejía, G., Sánchez, O., Castañeda, K., & Pellicer, E. (2020). Delay causes in road infrastructure projects in developing countries. *Revista de la Construcción, 19*(2), 220--234.

Ng, C. P., Law, T. H., Jakarni, F. M., & Kulanthayan, S. (2019). Road infrastructure development and economic growth. *IOP conference series: materials science and engineering, 512*(1), 012045.

Pham, Nguyen, V. &., Donan, D. &., & Christopher. (2022). Road damage detection and classification with yolov7. *2022 IEEE International Conference on Big Data (Big Data)*, 6416-6423.

Pham, V., Pham, C., & Dang, T. (2020). Road Damage Detection and Classification with Detectron2 and Faster R-CNN. *2020 IEEE International Conference on Big Data (Big Data)*, 5592-5601.

Rachmadina, Y., Rifai, A. I., & Handayani, S. (2022). TRAFFIC MANAGEMENT EFFECTIVITY OF BULAK KAPAL . *Indonesian Journal of Multidisciplinary Science*, 369-382.

Razi, P. Z., Ali, M. I., & Ramli, N. I. (2021). Exploring risk associated to public road infrastructure construction projects. *IOP Conference Series: Earth and Environmental Science, 628*(1), 012030.

Rifai, A. I., & Arifin, F. (2020). Analysis of The Level of Passenger Satisfaction with Services and Transport Facilities-Based Integration in Jakarta. *Journal of World Conference (JWC)*, 66-73.

Saharuddin, I. N., & Ing, D. S. (2019). Factors influencing road damage in developing countries. *Int. J. Eng. Res. Manag, 6*(2), 2349-2058.

Salsabila, F. V., Rifai, A. I., & Isradi, M. (2022). The Geometric Design of Horizontal Curved on Jalan Drono–Nganom, Wonogiri Using Autocad® Civil 3D. *Indonesian Journal of Multidisciplinary Science*, 304-317.

Sinambela, Y. A., & Rifai, A. I. (2024). Bibliometric Analysis of Road Damage Due to High Rainfall Intensity in Mountainous Areas Using VOSviewer. *OPSearch: American Journal of Open Research*, 940-952.

Syaiful, S., & Rusfana, H. (2022). Rigid pavement planning in traffic: Case study in Ciherang road and Pemuda road, Bogor Regency, Indonesia. *Journal of Applied Engineering Science, 20*(2), 485-497.

Wen, L., Kenworthy, J., & Marinova, D. (2020). Higher density environments and the critical role of city streets as public open spaces. *Sustainability, 12*(21), 8896.

Wincent, W., Rifai, A. I., & Isradi, M. (2022). The Road Performance Analysis in Jalan Ahmad Yani Batam Using IHCM 1997. *ndonesian Journal of Multidisciplinary Science*, 103-116.

Xu, C., Zhang, Q., Mei, L., Shen, S., Ye, Z., Li, D., . . . Zhou, X. (2023). Dense Multiscale Feature Learning Transformer Embedding Cross-Shaped Attention for Road Damage Detection. *Electronics, 12*(4), 898.