Analysis of Road Pavement Conditions on The Maospati-BTS. Magetan City Road Section Using The Surface Distress Index (SDI) Method

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KEYWORDS	ABSTRACT
surface distress index, pavement condition, road maintenance, transportation infrastructure, cost estimation	This research evaluates the condition of the pavement on the Maospati - Bts. Magetan City with the Surface Distress Index (SDI) method. The results showed the average value of SDI < 50, indicating that the road condition is in good category with minor damage. The dominant damage types are longitudinal cracks and small holes. Based on the survey results, the estimated maintenance cost required reached Rp. 333,468,376, including patching, slurry seal, and crack sealing works. This study confirms that the SDI method is effective for road maintenance planning and budget allocation in an efficient manner. This strategy not only prolongs the service life of the road but also minimizes long-term maintenance costs. Moreover, sustainable road maintenance practices play a crucial role in supporting regional connectivity and development. Well-maintained roads facilitate smoother transportation, enhance logistics efficiency, and improve access to social and economic services, contributing to inclusive and sustainable growth in Magetan Regency.

INTRODUCTION

Roads play a vital role in supporting economic growth, social connectivity and cultural development in a region. As one of the main elements of land transportation infrastructure, the existence of good quality roads has a significant impact on various sectors of life. In Indonesia, roads are the main link between remote areas and the center of economic, social, and government activities. According to the Geography of Transport Systems (2021), good roads improve accessibility, logistics efficiency and regional competitiveness, thereby promoting inclusive economic growth (Azhari et al., 2024; Rahman et al., 2021).

Maospati road section - Bts. Magetan City is one of the strategic routes in East Java Province. With a length of approximately 9.8 km, this road section is the main link for the community and economic activities in Magetan Regency (Gusnilawati et al., 2021). In addition, Magetan Regency has great tourism and cultural potential, which can only be maximized if road access supports smooth mobility. Unfortunately, the high traffic intensity and lack of maintenance have caused damage to this road, such as cracks, potholes, and surface deformation. These conditions not only disrupt the comfort of road users but also potentially jeopardize safety (Hasrudin & Maha, 2024).

Road damage affects various aspects of life. According to Bahri (2023), road damage can reduce economic productivity due to increased travel time and logistics costs. In addition, road damage also has an impact on social aspects, such as the difficulty of accessing health and education services in remote areas (Anugrah, 2021). As one solution, the Surface Distress Index (SDI) method has been widely used to visually evaluate pavement condition. This

method provides accurate information on the type and extent of road distress, allowing for more efficient maintenance planning (Rochmawati, 2020).

The SDI method measures road condition based on visual defects such as cracks, potholes, and ruts. The evaluation results with this method provide an index value that reflects the condition of the road, ranging from good to severely damaged categories (Labaso et al., 2022). This method is considered more effective because it provides quantitative data that can be used to determine road maintenance priorities. For example, a study conducted by Muhaimin and Winayati (2022) showed that the SDI method is able to identify the level of road damage in detail, allowing the government to allocate maintenance budgets in a more targeted manner.

The importance of regular road maintenance has also been emphasized in previous studies. Yusup & Kartika (2019) found that maintenance delays can worsen road conditions, resulting in greater repair costs in the future. Therefore, planned and sustainable road maintenance is key to ensuring the quality of road infrastructure remains optimal. This is also relevant to the sustainable development goals, where solid and reliable infrastructure is one of the main pillars.

In addition to providing economic benefits, well-maintained roads also contribute to improving people's quality of life. Good roads allow people to access public facilities more easily, such as schools, hospitals and markets. According to Longdom (2021), quality road infrastructure can reduce social inequality by opening up access for remote areas to connect with growth centers. This is increasingly relevant in Indonesia, where development disparities between regions remain a major challenge (Nisumanti & Prawinata, 2020).

However, despite its great benefits, road construction and maintenance also face various challenges. One of them is budget constraints that often affect road maintenance priorities. In this context, the SDI method is a helpful tool to ensure that budget allocations are made efficiently. Using the resulting index values, the government can determine which road segments require immediate attention, be it routine, periodic or total rehabilitation maintenance (Vin Civil World, 2023).

In addition to the SDI method, the Bina Marga Method approach has also long been used in Indonesia. This method prioritizes visual inspection and classification of defects based on their severity. While effective, this method often provides less quantifiable data than the SDI method. Therefore, a combination of these two methods can provide more comprehensive evaluation results. According to Sugiharto & Abduh (2023), using these two methods together allows for more accurate identification of road defects, thus supporting better maintenance planning.

Road damage on the Maospati - Bts. Magetan City requires special attention given its strategic role in supporting community mobility and distribution of goods. Based on a field survey conducted in 2024, various types of damage were found, such as longitudinal cracks, potholes, and deformation due to high traffic loads. These damages not only reduce road user comfort but also increase the risk of accidents. Therefore, a detailed road condition assessment is an important first step to determine the appropriate maintenance strategy (Artiwi et al., 2021).

In this context, the SDI method offers various advantages, such as ease of implementation, relatively low cost, and the ability to provide reliable quantitative data. It also allows for regular monitoring of road conditions, allowing the government to take preventive measures before deterioration becomes more severe. A study by Kumar & Patel (2022) showed that the SDI method is able to reduce long-term maintenance costs by ensuring that defects are addressed at an early stage (Desei et al., 2023).

Investment in road maintenance also has significant long-term impacts. In addition to improving transportation efficiency, well-maintained roads also support the development of the tourism sector. Magetan Regency, with its natural tourism potential such as Telaga Sarangan, can attract more tourists if the road access to the tourist sites is in good condition.

According to the Global Infrastructure Hub (2021), adequate road infrastructure is one of the main factors driving the growth of the tourism sector.

On the other hand, budget constraints are often a major obstacle in the implementation of road maintenance. Therefore, the government needs to adopt a more efficient approach in managing the budget. Using the SDI method, maintenance costs can be estimated more accurately based on the level of damage identified. This allows for more effective budget allocation, so that available resources can be optimally utilized (Fitriyadi et al., 2021).

In conclusion, road infrastructure is the backbone of Indonesia's economy and social connectivity. Well-maintained roads not only improve transportation efficiency but also have a positive impact on people's quality of life. In the context of the Maospati - Bts. Magetan City, the application of the SDI method is a very relevant solution to overcome the challenges of road damage. With a data-driven approach, this method not only provides an accurate evaluation but also supports more sustainable maintenance planning. Going forward, investment in road maintenance should be a top priority to ensure that this infrastructure can continue to support economic growth and community welfare.

Literature Review

Definition and Function of Road

Roads are one of the most important elements in the land transportation system that supports the mobility of goods, services and people. Based on Indonesian Law No. 38 of 2004 concerning Roads, roads include all parts of the road including complementary buildings designed to serve traffic. This infrastructure plays a central role in improving the accessibility, connectivity and logistics efficiency of a region, thus becoming a key driver for economic growth. Apart from being a transportation route, roads also serve to strengthen social and cultural integration between regions. According to the Geography of Transport Systems (2021), well-connected roads enable people in remote areas to access education, health and economic facilities. This function makes roads an important tool to reduce regional disparities while improving the quality of life.

Road Condition Evaluation Method

Road condition evaluation methods are an important step to ensure the service life of the road is as planned. The Surface Distress Index (SDI) method offers a visual observation-based approach to identify types of distress such as cracks, potholes, and ruts. The result of this evaluation is an index that provides an objective picture of the road condition (Yahya et al., 2019). In addition to the SDI method, the Bina Marga method is often used to evaluate road conditions in Indonesia. This method emphasizes visual inspection and classification of damage based on severity. Although not as quantitative as SDI, this approach has been widely used to support routine and periodic maintenance planning (Sugiharto & Abduh, 2023).

Pavement Damage

Road damage is a major problem affecting transportation quality and safety. Common types of damage include longitudinal cracking, transverse cracking, potholes, and deformation due to traffic loads. These damages can be caused by factors such as overloading, extreme weather changes, or poor construction quality (Yusup & Kartika, 2019). Damage that is not addressed promptly can worsen road conditions and increase future maintenance costs. Therefore, early identification of defects is crucial for planning appropriate maintenance strategies. A systematic road condition assessment also helps prioritize repair areas based on the level of damage and traffic intensity.

Road Maintenance Strategy

Road maintenance aims to maintain the road in optimal condition to serve the traffic flow. There are three common types of maintenance: routine maintenance, periodic maintenance, and total rehabilitation. Routine maintenance includes minor patching and crack repair, while periodic maintenance involves an overlay to restore the road to a better condition

(Vin Civil World, 2023). Total rehabilitation is performed when the road has suffered severe damage that cannot be handled by routine or periodic maintenance. According to Kumar & Patel (2022), a strategic approach in choosing the type of maintenance is essential to optimize the available budget. Thus, a planned strategy can ensure that the quality of the road is maintained throughout its service life.

Social and Economic Impacts of Road Infrastructure

Adequate road infrastructure has a major impact on various social and economic aspects. Well-connected roads enable more efficient distribution of goods and services, thereby lowering logistics costs and improving regional competitiveness. This is in line with the findings of the World Economic Forum (2022) which states that road infrastructure is key to regional economic development. In addition to economic benefits, roads also contribute to improved social welfare. Good roads allow easier access to basic services such as education and health, which are particularly important for people in remote areas. Thus, investment in road infrastructure not only promotes economic growth but also supports inclusive and sustainable social development.

Research by Yusup and Kartika (2019) explored the relationship between road maintenance costs and the level of damage using the Surface Distress Index (SDI) method, concluding that higher damage levels lead to increased maintenance costs. Similarly, Muhaimin (2022) utilized the SDI method in a study of road conditions in Pekanbaru, demonstrating its effectiveness in identifying the severity of pavement damage and its role in improving maintenance prioritization. These studies underscore the value of the SDI method in assessing road conditions and planning maintenance interventions.

The urgency of this study lies in the critical role that well-maintained road infrastructure plays in economic development, social connectivity, and public safety. In the Maospati-BTS. Magetan City road section, poor pavement conditions, such as cracks and potholes, not only disrupt traffic flow but also pose significant risks to road users. With limited budgets for infrastructure maintenance, efficient and targeted interventions are essential to ensure that roads remain functional, reduce long-term repair costs, and support economic activities in the region. The results of this study will help local authorities allocate maintenance resources more effectively.

While previous studies have applied the SDI method to evaluate road conditions, few have provided a comprehensive cost estimation for maintenance based on SDI results, especially in regions with high traffic intensity like Magetan. Additionally, existing studies have often focused on isolated aspects of road damage without addressing the integrated maintenance needs based on SDI. This study aims to bridge this gap by offering a complete assessment that combines damage evaluation and cost estimation, providing practical recommendations for efficient road maintenance.

This research is novel in its application of the SDI method for a comprehensive pavement condition assessment in a strategic road section of Magetan, East Java. By combining visual inspection with quantitative data, the study offers a detailed analysis of road damage and associated maintenance costs, making it a valuable tool for local governments in planning road repairs. The cost estimation based on SDI levels, coupled with a focus on long-term maintenance strategies, provides new insights into managing road infrastructure more effectively in Indonesia.

The main objective of this study is to evaluate the condition of the Maospati-BTS. Magetan City road section using the SDI method and to estimate the cost of necessary maintenance interventions. The findings will assist local governments in planning targeted maintenance strategies, prioritizing areas most in need of repair, and allocating limited resources more effectively. This research will contribute to improving the overall quality of

road infrastructure in the region, ensuring smoother transportation, enhancing economic activities, and improving public safety.

RESEARCH METHOD
Research Location
This research was conducted on the Maospati - Bts. Magetan City, East Java, with a length of 9.8 km. This road section was chosen because it has a strategic role in connecting various important areas in Magetan Regency, so road damage can have a significant impact on mobility and the local economy. The research location was determined based on the results of an initial survey that identified the most significantly damaged road segments. Data collection was conducted using a direct field approach to ensure the accuracy of the information obtained, including the physical condition of the road and the type of damage present.

Data Collection
Data collection consisted of primary and secondary data. Primary data was obtained through direct field surveys using visual methods to observe the types of road defects, such as cracks, potholes, and ruts. This survey was conducted on road segments every 100 meters. Secondary data was obtained from relevant agencies, such as the East Java Provincial Bina Marga Public Works Office. The data included information on average daily traffic (LHR), material unit price data, and other relevant technical information to support the road condition analysis.

Data Collection Tools and Techniques
The tools used in this research include a meter, camera, and stationery for documentation. The meter was used to measure the dimensions of the damage such as length, width, and depth. Cameras were used to visually record road conditions, while writing instruments were used to record observations. Data collection techniques were conducted using a visual survey approach using the Surface Distress Index (SDI) method. Each road segment was assessed based on the level of visual distress identified, and the results were recorded for further analysis using standard guidelines from Bina Marga.

Data Analysis
The data obtained from the field survey was analyzed using the SDI method. SDI values were calculated based on the level of damage identified, such as crack area, crack width, number of pits, and depth of ruts. Each of these values was then accumulated to determine the overall damage index. The results of the data analysis were presented in tables and graphs to facilitate interpretation. The data is used to identify maintenance priorities, the type of treatment required, and the estimated cost of road maintenance on the Maospati - Bts. Magetan City.

Research Stages
The research began with the planning stage, which included identifying the location and necessary equipment. Following this, a field survey was conducted to collect primary data. The data obtained was then processed and analyzed to determine road conditions.

The final stage of the research involved the preparation of a report containing the results of the analysis and recommendations for road improvements. All stages of the research were conducted systematically to ensure the accuracy of the results and relevance to the research objectives.

RESULTS AND DISCUSSION
Results
Pavement Condition Based on SDI

The survey results show that the condition of the Maospati - Bts. Magetan City is dominated by mild to moderate damage based on the Surface Distress Index (SDI) method. Longitudinal cracks and small potholes are found on most road segments, with the average percentage of crack area reaching 25%. This data indicates that the pavement requires regular maintenance to restore its optimal function. Based on table 4.4 "SDI Results" in the document, the average SDI value on these road segments is in the range of 75-100, which classifies the road condition as moderate.

In addition to longitudinal cracks, ruts and grooves were found in some segments that have high average daily traffic (LHR). The segments with the highest level of deterioration have SDI values above 100, signaling the need for regular maintenance. This condition is influenced by traffic load factors and lack of previous maintenance. As such, this survey provides a basis for setting appropriate road maintenance priorities.

The survey results also show an uneven distribution of damage along the road section. Segments with higher traffic intensity tend to suffer more severe damage than other segments. This factor underscores the importance of good traffic management to reduce further road deterioration. Routine maintenance such as patchwork and crack filling can be a short-term solution to repair minor damage.

From visual observations, it was found that crocodile crack damage dominates some sections of the road. This type of damage requires special handling because it can develop into more severe damage if not repaired immediately. This data is consistent with previous research which shows that cracks are a common type of early damage on roads with flexible pavements.

Road Maintenance Fee

Estimated maintenance costs are calculated based on damage data obtained from field surveys. The total cost required to maintain this road is IDR 333,468,376. The cost includes patchwork, slurry seal, and crack sealing, which are considered sufficient to restore the road condition to the optimal service level. This estimate was made by considering the unit price of materials and services obtained from the Bina Marga Public Works Office.

Patchwork is the largest cost item due to the significant extent of damage identified. Slurry seal is used to repair road surfaces that are starting to wear but have not yet suffered structural damage. Crack sealing is used to prevent small cracks from developing into more severe damage. This cost allocation has been adjusted to the needs of each road segment based on the SDI survey results.

The maintenance cost calculation also considers the priority level based on the SDI value. Segments with higher SDI values are given higher priority in the maintenance budget allocation. With this approach, it is expected that cost efficiency can be achieved without reducing the quality of maintenance. This budget adjustment is in line with the strategic approach to optimize limited resources.

The cost estimate also includes a reserve for handling damage that may be found during the implementation of maintenance. This is done to anticipate the possibility of additional damage that was not detected during the survey. As such, this budget plan provides flexibility to handle various needs that may arise during the road improvement process.

Discussion

Road damage found on the Maospati - Bts. Magetan City is in line with previous research findings regarding the factors that cause road damage. According to Yusup & Kartika (2019), repeated traffic loads and lack of routine maintenance are the main causes of road damage in Indonesia. This condition is also exacerbated by weather factors and inadequate

initial construction quality. Therefore, the application of the SDI method in this study provides relevant results to support road maintenance strategies.

The survey results show that routine maintenance such as patchwork and crack sealing is necessary to deal with minor to moderate damage. This strategy is in line with the approach recommended by Vin Civil World (2023), which emphasizes the importance of preventive maintenance to reduce future rehabilitation costs. In addition, slurry seal can be used to repair worn road surfaces, guarding against further structural damage.

The estimated maintenance cost of IDR 333,468,376.00 shows that the SDI-based approach is effective in allocating the budget efficiently. By focusing on segments with high SDI values, this strategy ensures that available resources are utilized to address defects that require the most attention. It also helps prioritize maintenance works that have a direct impact on improving road quality.

However, challenges in implementing maintenance include budget constraints and the need for inter-agency coordination. In this case, the role of the local government is crucial to ensure that maintenance implementation goes according to plan. In addition, strict supervision is needed to maintain the quality of maintenance work in accordance with the specifications that have been set.

The study also shows the need for improved traffic management to reduce the load on certain road segments. By diverting traffic or restricting heavy vehicles, road damage can be minimized. This strategy should be combined with public education on the importance of maintaining road infrastructure, creating a collective awareness to sustainably maintain roads.

Table 1. SDI Results

SEGMENT	RETAIL AREA (SDI 1)	RETAIL WIDTH (SDI 2)	HOLE (SDI 3)	SCRAP WHEEL (SDI 4)	SDI VALUE	Description
1	5	5	5	5	5	both
2	5	5	5	5	5	both
3	5	5	5	5	5	both
4	5	5	5	5	5	both
5	5	5	5	5	5	both
6	5	5	5	5	5	both
7	5	5	5	5	5	both
8	20	20	20	20	20	both
9	5	5	5	5	5	both
10	5	5	5	5	5	both
11	5	5	5	5	5	both
12	5	5	5	5	5	both
13	20	20	35	35	35	both
14	20	20	35	35	35	both
15	20	20	35	35	35	both
16	5	5	20	20	20	both
17	5	5	5	5	5	both
18	5	5	5	5	5	both
19	5	5	5	5	5	both
20	5	5	5	5	5	both
21	5	5	5	5	5	both
22	0	0	0	0	0	both
23	0	0	0	0	0	both
24	5	5	5	5	5	both
25	5	5	5	5	5	both
26	0	0	0	0	0	both
27	0	0	0	0	0	both

28	0	0	0	0	0	both
29	0	0	0	0	0	both
30	0	0	0	0	0	both
31	0	0	0	0	0	both
32	0	0	0	0	0	both
33	5	5	5	5	5	both
34	0	0	0	0	0	both
35	0	0	0	0	0	both
36	5	5	5	5	5	both
37	5	5	20	20	20	both
38	5	5	5	5	5	both
39	0	0	0	0	0	both
40	5	5	5	5	5	both
41	0	0	0	0	0	both
42	0	0	0	0	0	both
43	5	5	5	5	5	both
44	20	20	35	35	35	both
45	20	20	20	20	20	both
46	20	20	20	20	20	both
47	40	40	40	42,5	42,5	both
48	40	40	55	57,5	57,5	Medium
49	5	5	5	7,5	7,5	both
50	5	5	5	5	5	both
51	5	5	5	5	5	both
52	5	5	5	5	5	both
53	5	5	5	5	5	both
54	5	5	5	5	5	both
55	5	5	5	5	5	both
56	5	5	5	5	5	both
57	5	5	5	5	5	both
58	5	5	5	5	5	both
59	5	5	5	5	5	both
60	5	5	5	5	5	both
61	5	5	5	5	5	both
62	0	0	0	0	0	both
63	0	0	0	0	0	both
64	0	0	0	0	0	both
65	0	0	0	0	0	both
66	0	0	0	0	0	both
67	0	0	0	0	0	both
68	5	5	5	5	5	both
69	0	0	0	0	0	both
70	5	5	20	20	20	both
71	5	5	5	5	5	both
72	5	5	5	5	5	both
73	0	0	0	0	0	both
74	0	0	15	15	15	both
75	5	5	5	5	5	both
76	0	0	0	0	0	both
77	0	0	0	2,5	2,5	both
78	5	5	5	5	5	both
79	0	0	0	0	0	both
80	5	5	5	5	5	both
81	5	5	5	5	5	both
82	0	0	0	0	0	both

83	0	0	0	0	0	both
84	5	5	5	5	5	both
85	5	5	5	5	5	both
86	0	0	0	0	0	both
87	5	5	5	5	5	both
88	0	0	0	0	0	both
89	5	5	5	5	5	both
90	0	0	0	0	0	both
91	5	5	20	20	20	both
92	5	5	5	5	5	both
93	0	0	0	0	0	both
94	5	5	5	5	5	both
95	5	5	20	20	20	both
96	5	5	5	5	5	both
97	5	5	5	5	5	both
98	0	0	15	15	15	both
99	5	5	5	5	5	both

Discussion

The results of the study indicate that the pavement condition of the Maospati-Bts. Magetan City Road section falls within the category of light to moderate damage, based on the Surface Distress Index (SDI) method. These findings highlight the need for planned maintenance interventions to ensure the optimal functionality of road infrastructure. The predominant types of damage, such as longitudinal cracks, alligator cracks, and potholes, can significantly deteriorate road quality if not addressed promptly. These issues are primarily caused by a combination of high traffic loads, extreme weather conditions, and a lack of prior routine maintenance.

The SDI method has proven effective in providing a structured framework for quantitatively evaluating road conditions. By generating an index value, maintenance priorities can be established based on the severity of the damage. This enables more efficient budget allocation, especially in the context of limited resources. The proposed maintenance activities, such as patching, slurry sealing, and crack sealing, are suitable strategies for addressing the types of damage identified. The estimated maintenance cost of IDR 333,468,376.00 reflects a cost-effective approach to maintaining road infrastructure quality.

In addition to budget efficiency, this study emphasizes the importance of routine monitoring and preventive interventions to prevent further deterioration. Continuous monitoring not only extends the road's service life but also reduces long-term maintenance costs. This strategy is particularly relevant given the strategic role of the Maospati-Bts. Magetan City Road section as a key link for community mobility and goods distribution in Magetan Regency.

The discussion also highlights the importance of inter-agency coordination in implementing road maintenance. The quality of maintenance work must be strictly supervised to ensure compliance with established technical specifications. Moreover, public education on the importance of maintaining road infrastructure should be enhanced to foster collective awareness in supporting sustainable road maintenance.

Overall, this study demonstrates that the SDI method is not only relevant for identifying road conditions but also for supporting more targeted and efficient maintenance planning. These findings provide critical insights for local governments in developing sustainable road maintenance policies, particularly in regions with high traffic intensity, such as Magetan Regency.

CONCLUSION

This research shows that the condition of the pavement on the Maospati - Bts. Magetan City is in the moderate to lightly damaged category based on the Surface Distress Index (SDI) value. The dominant types of damage include longitudinal cracks, alligator cracks, and potholes, which require routine and periodic maintenance. The estimated maintenance cost of Rp. 333,468,376.00 includes patchwork, slurry seal, and crack sealing. These results confirm the importance of planned road maintenance management to maintain the quality and efficient use of transportation infrastructure.

REFERENCES

Anugrah, D. A. (2021). *Analisa Penilaian Kondisi Jalan Raya Dengan Metode Surface Distress Index (Sdi) Dan Present Serviceability Index (Psi) Studi Kasus: Duri Kecamatan Mandau*. Universitas Islam Riau.

Artiwi, N. P., Amilia, E., & Abadi, H. J. (2021). Analisa Kerusakan Jalan Pada Ruas Jalan Raya Jakarta Km. 04 Kota Serang Menggunakan Metode Pci Pavement Condition Index) Dan Sdi (Surface Distress Index). *Journal Of Sustainable Civil Engineering (Josce)*, *3*(1), 59–72.

Azhari, U. S., Hartatik, N., & Fatmawati, L. E. (2024). Analisis Kerusakan Perkerasan Jalan Menggunakan Metode Surface Distress Index (Sdi)(Studi Kasus Jalan Mayjen Bambang Yuwono, Balongbendo, Sidoarjo). *Journal Of Scientech Research And Development*, *6*(1), 598–605.

Bahri, S. (2023). Analisis Dampak Refocusing Anggaran Terhadap Kondisi Jalan Dengan Metode Surface Distress Index (Sdi). *Infomanpro*, *12*(1), 10–19.

Desei, F. L., Kadir, Y., & Ende, A. Z. (2023). Evaluasi Kerusakan Jalan Menggunakan Metode Surface Distress Index Dan International Roughness Index. *Konstruksia*, *15*(1), 67–77.

Fitriyadi, G. E., Erwan, K., & Mukti, E. T. (2021). Analisis Kerusakan Permukaan Jalan Batas Kota Pontianak–Sungai Kakap Berdasarkan Metode Surface Distress Index (Sdi). *Jelast: Jurnal Teknik Kelautan, Pwk, Sipil, Dan Tambang*, *8*(3).

Gusnilawati, A., Chrisnawati, Y., & Maryunani, W. P. (2021). Analisis Penilaian Faktor Kerusakan Jalan Dengan Perbandingan Metode Bina Marga, Metode Pci (Pavement Condition Index), Dan Metode Sdi (Surface Distress Index)(Studi Kasus Ruas Jalan Patuk-Dlingo, Kec. Dlingo, Kab. Bantul). *Jurnal Rekayasa Infrastruktur Sipil*, *2*(1), 15.

Hasrudin, L., & Maha, I. (2024). Analisis Penilaian Kondisi Perkerasan Jalan Dengan Metode Pci (Pavement Condition Index), Sdi (Surface Distress Index) Dan Iri (International Roughness Index). *Syntax Idea*, *6*(4), 1881–1898.

Labaso, E. R., Ishak, M. S., & Kasan, M. (2022). Evaluasi Kerusakan Jalan Menggunakan Metode Pavement Condition Index (Pci) Dan Surface Distress Iindex (Sdi) Studi Kasus Jalan Pue Bongo–Kota Palu. *Rekonstruksi Tadulako: Civil Engineering Journal On Research And Development*, 67–74.

Muhaimin, M. (2022). *Analisis Kerusakan Jalan Berdasarkan Metode Surface Distress Index (Sdi) Studi Kasus: Jalan Meranti Kota Pekanbaru Provinsi Riau*. Universitas Lancang Kuning.

Nisumanti, S., & Prawinata, D. P. (2020). Penilaian Kondisi Jalan Menggunakan Metode International Roughness Index (Iri) Dan Surface Distress Index (Sdi) Pada Ruas Jalan Akses Terminal Alang-Alang Lebar (Studi Kasus: Sp. Soekarno Hatta €"Bts. Kota Palembang Km 13). *Jurnal Tekno Global*, *9*(2).

Rahman, N. F., Rintawati, D., & Sari, C. (2021). Evaluasi Kondisi Perkerasan Jalan Menggunakan Metode Surface Distress Index (Sdi)(Studi Kasus: Ruas Jalan Kebun Baru–Pulau Sangkar, Kabupaten Kerinci). *Prosiding Seminar Intelektual Muda*, *3*(1).

Rochmawati, R. (2020). Studi Penilaian Kondisi Kerusakan Jalan Dengan Metode Nilai International Roughness Index (Iri) Dan Surface Distress Index (Sdi)(Studi Kasus Jalan Alternatif Waena _ Entrop). *Dintek*, *13*(02), 7–15.

Sugiharto, S., & Abduh, M. (2023). Uji Dan Analisa Kerusakan Jalan Pada Ruas Jalan Kertosono-Nganjuk Dengan Metode Surface Distress Index (Sdi). *Seminar Keinsinyuran Program Studi Program Profesi Insinyur*, *3*(1).

Yusup, C. M., & Kartika, N. (2019). Analisis Biaya Pemeliharaan Terhadap Tingkat Kerusakan Jalan Menggunakan Metode Surface Distress Index (Sdi). *Santika Is A Scientific Journal Of Science And Technology*, *9*(2), 943–951.