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STUDY OF ROAD MAINTENANCE MANAGEMENT SYSTEM AT PERAK TENGAH DISTRICT'S STATE ROAD - CASE STUDY AT JALAN KAMPUNG GAJAH - TANJUNG TUALANG AND JALAN BALUN BIDAI

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ABSTRACT

Road accidents caused by poor road conditions are a major worry that risks road users' safety and leads to economic losses. Effective road maintenance management systems help to reduce such accidents by ensuring timely discovery and rectification of road issues. Therefore, this study was conducted to study the current practice in JKR and to identify the challenges in road maintenance management system at Perak Tengah district's state road. Furthermore, the case study for this research is at Jalan Kampung Gajah - Tanjung Tualang and Jalan Balun Bidai. The questionnaires were distributed to the staff at Public Work Department, Perak Tengah District Engineer Office (JKR). After the collecting data, the data has been analysed using statically package for social science (SPSS) and Microsoft Excel. The analysis shown by the frequency, percentage, and mean value. This paper concludes that increasing traffic volume is the most challenging in road maintenance management, followed by the impact of climate change on roads and technology improvements. The most effective solutions discovered for overcoming these difficulties include avoiding peak hours for maintenance work and creating a Traffic Management Plan (TMP). Apart from that, regular inspection is very helpful to maintain the road condition and to minimize the road accidents.

Keywords: Road accidents, current practice in JKR, challenges

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INTRODUCTION

The term "structures" does not only refer to buildings. Other structures include bridges, roads, drainage systems, and any other type of engineering construction. Maintenance on these structures may vary, but it must all be done in a strategic and systematic way.

The research focuses on the road maintenance management system in Perak Tengah District, emphasizing the importance of regular maintenance to preserve the benefits of road improvements. Roads are crucial public resources that provide access, comfort, safety, and cost savings for road users. However, without proper maintenance, these benefits can diminish, hindering long-term development.

The purpose of maintenance is to protect and maintain road assets rather than upgrade them. It involves actions to preserve the road's original condition and address faults to minimize future maintenance efforts. Maintenance is classified as regular, periodic, or urgent for effective management and operations.

LITERATURE REVIEW

According to the Malaysian Ministry of Transport, there were 567,516 registered traffic accidents in 2019. Potholes, loose gravel, and other hazards on the road contribute to these incidents by causing drivers to lose control and hit with vehicles or objects. According to Saad (2016), a pavement maintenance management system is a collection of tools that assists decision makers in determining the best options for preserving existing road conditions while assuring adequate serviceability for a specified length of time. According to the article "Highway Maintenance Management: A Review of Some Practise in Malaysia" published in the *Journal of Technology and Operation Management*, maintenance is defined as necessary procedures performed to maintain or restore a system, part, or piece of equipment to its initial condition.

Current Practice in Jabatan kerja Raya (JKR)

There are three (3) maintenance practice that were implemented in Jabatan Kerja Raya (JKR), which are routine maintenance, periodic maintenance, and emergency maintenance.

1. Routine maintenance.

Routine maintenance is required for avoid greater damage caused by traffic and weather. This maintenance is to ensure that the condition safe for road users by maintaining the condition of road furniture. In addition, the responsibility for the maintenance work on Perak Tengah state roads lies with the concession, Empayar Indera Sdn. Bhd. that were hired by State Government. Therefore, Empayar Indera Sdn. Bhd. will perform routine patrols and routine inspections. Every routine patrol needs to be completed with a report of the patrol results and any damage will be identified through the patrol results. The examples of routine maintenance work include road & drainage cleaning, grass cutting, landscape maintenance and other. (Khairunnisa, 2023).

2. Periodic maintenance

Maintenance work is carried out on a scheduled or periodic basis. It is involving the work of monitoring, measuring & evaluating road components. Including periodic repair work such as repainting road furniture, road resurfacing, cutting and patching cracked road surfaces, etc. In addition, periodic tasks such as pavement or non- pavement maintenance are subjected to the approval of government allocations. After receiving the allocation, the implementation of the works will take two weeks to six months depending on the type of work approved. (Khairunnisa, 2023)

3. Emergency Maintenance

Emergency maintenance is required to solve road problems that occur outside of the scope of the regular maintenance plan and necessitate quick care. In response to these situations, the Public Works Department (JKR) adopts a Traffic Management Plan (TMP) to improve traffic control for vehicles and pedestrians, provide a safer workplace for construction workers, and offer an effective implementation plan. (Khairunnisa, 2023)

Challenges in Road Maintenance Management System

Road maintenance management systems encounter a number of issues that must be solved in order to effectively maintain and repair roadways. Securing finance for road construction is one problem, particularly in developing countries where acquiring resources for projects with no immediate financial benefits can be challenging. Furthermore, climate change poses a substantial danger to road networks owing to extreme weather events like as floods and wildfires, which may threaten transportation infrastructure's sustainability and safety. (Mouratidis A., 2020)

Another concern is noncompliance with traffic laws and regulations, which causes challenges such as overloading and damage to previously rebuilt pavements. (Lin H., 2020). The disregard for regulations restricts traffic personnel' ability to supervise road upkeep. Timing issues occur as well, as road repair work is sometimes performed at night to minimize disruption peak traffic hours. (Khairunnisa, 2023).

The increased number of traffic contributes to road wear and tear, demanding more frequent and costly repairs. Furthermore, problems with coordination among the many organizations engaged in road maintenance, such as government agencies, contractors, and suppliers, can lead to delays and increased expenses. (Khairunnisa, 2023).

Moreover, because of the hazards that employees and road users confront, safety is critical in road maintenance. Taking extra efforts to ensure correct safety measures might cause delays and greater expenses. Another issue is the environmental impact of road repair activities, which contributes to soil erosion, air and noise pollution. Mitigating these effects involves regulatory measures as well as cautious management of materials and chemicals used in maintenance procedures. (Mouratidis A., 2020)

Last but not least, technology advances provide new materials and techniques for road maintenance, but their implementation can be costly and need specialized training and equipment.

In conclusion, addressing these issues requires strategic planning, proper money, stakeholder collaboration, adherence to legislation, and consideration of the long-term impact of maintenance efforts on the environment and road infrastructure.

METHODOLOGY

Research methodology is a systematic strategy to doing scientific research with the aim of tackling research issues and achieving study objectives. It serves as a framework for data gathering, analysis, and interpretation. This study includes a quantitative methodologies. The review of literature focuses into various aspects of road maintenance management systems, such as definitions, strategies, processes, and problems. A questionnaire survey is used to analyse road maintenance management system challenges. Data from the survey will be analyzed using frequency counts, percentages, and statistical tools such as Google Excel software or Statistical Packages for Social Science (SPSS) software.

FINDING AND ANALYSIS

This chapter focuses on the analysis of quantitative data obtained through a questionnaire survey administered via Google Form. The responses were collected from 11 JKR staff members in the Perak Tengah District. The data collected through Google Form was evaluated using Google Excel or SPSS, and tables were created to facilitate understanding and interpretation. The questionnaire aimed to address the research's objective which is identifying the challenges in the road maintenance management system.

Respondent Demographic

Table 1: Respondent Demographic

Responden's Gender	Frequency	Percentage
Male	4	36.4%
Female	7	63.6%

The gender distribution of respondents in this study was analyzed in order to determine any potential differences in perception between male and female. 63.6% (7 staff) of the 11 respondents identified as female, while 36.4% (4

respondents) identified as male. This data assists researchers in understanding the amount of involvement and gender representation in the study.

Analysis of Challenges in Road Maintenance Management

There are ten (10) question were asked in this section. All questions are about challenges in road maintenance management. In addition, in this section also use likert scale. The scale start from (1) strongly disagree - (5) strongly agree. Below are the questions survey about challenges in road maintenance management system that were answered by JKR staff :

Table 2: Challenges in Road Maintenance Management

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Index
Low budget in financing road construction project	0	0	6	5	0	3.45	Neutral
Climate change impact on roads	0	0	2	6	3	4.09	Agree
Driver do not pay attention to traffic law and regulation	0	0	5	4	2	3.73	Agree
Timing trouble	0	0	2	7	2	4.00	Agree
Increased traffic volume	0	1	1	4	5	4.18	Agree
Aging infrastructure	0	0	3	6	2	3.91	Agree
Coordination issue	0	0	3	6	2	3.91	Agree
Safety concern	0	0	8	3	0	3.27	Neutral
Environmental impact	0	1	8	2	0	3.09	Neutral
Technologies advancements	0	0	1	8	2	4.09	Agree

According to the responds of 11 JKR staff staff members, increased traffic volume is the most major challenge in road maintenance management, with a mean value of 4.18. With an increasing number of vehicles on the road, wear and tear increases, needing more regular and expensive maintenance.

The next biggest problems, with mean values of 4.09, are technological advancements and the influence of climate change on roadways. Respondents

agreed that the expense of applying new technology is an impediment, and that climate change events like storms and heavy rain might cause road damage and degradation.

With a mean value of 4.00, time problem has been identified as an issue because of congestion induced by maintenance work during peak traffic hours. Maintenance work is frequently performed at night, when traffic flow is lower, to minimize interruptions.

Respondents also identified ageing infrastructure (mean value: 3.91), coordination concerns (mean value: 3.91), and noncompliance with traffic regulations (mean value: 3.73) as challenges.

However, three factors of challenges in road maintenance management system which are low budget in financing road construction project with 3.45 mean value, safety concern with 3.27 mean value and environmental impact with 3.09 mean value are unsure opinion. They neither agree nor disagree with the question survey. So, it hard to researcher to analyzed the data properly.

These findings provide valuable insights into the challenges faced in road maintenance management, highlighting areas that require attention and potential strategies for improvement.

Analysis of Solution to Overcome the Challenges in Road Maintenance Management System.

There are 10 questions in this section. All the question are about solution to the challenges that were asked before. This section is analysed by its frequency of the element as mentioned before.

Table 3: Solution to Overcome the Challenges in Road Maintenance Management System

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Index
Applying a temporary patch method	0	0	1	10	0	3.91	Agree
Traffic Management Plan (TMP)	0	0	1	7	3	4.18	Agree
Install restricted access signboard	0	0	1	8	2	4.09	Agree
Avoid peak hours for maintenance work	0	0	0	7	4	4.36	Agree
Invest in public transportation	0	7	4	0	0	2.36	Disagree
Prioritize preventative maintenance	0	0	0	10	1	4.09	Agree
Establishing clear line of communication	0	0	8	2	1	3.36	Neutral
Implement strict safety regulation	0	1	7	1	2	3.36	Neutral
Establish regulation and recommendations	0	0	6	5	0	3.45	Neutral
Prioritize research and development in order to create cost-effective and ecologically friendly solutions	0	0	2	7	2	4.00	Agree

Several effective ways to solve issues in road maintenance management were discovered based on the responds of 11 JKR staff members. The preferred choice, with a mean score of 4.36, is to avoid performing maintenance during peak hours. This reduces traffic congestion while also prioritizing user comfort and ensuring smooth traffic flow. Implementing a Traffic Management Plan (TMP) is likewise thought to be helpful, with a mean value of 4.18, since it improves traffic flow, lowers congestion, and improves safety for road users and employees.

Next, prioritizing preventative maintenance obtained a mean score of 4.09 and is seen as an option for increasing the lifespan of existing infrastructure. It

improves road safety and lowers repair costs. With a mean score of 4.09, installing limited access signboards is considered effectively as a method to reduce overloaded vehicles on the roads, hence protecting road longevity.

Besides, with a mean score of 3.91, the use of temporary patch methods is considered as an appropriate choice for addressing minor road damage quickly and cost-effectively. It reduces the amount of material and labour required.

Respondents indicated uncertainty about the effectiveness of strong lines of communication, implementing strict safety laws, and establishing regulations and suggestions as remedies. Lastly, respondents with 2.36 mean value are disagreed that invest in public transportation is one of the solutions to overcome the challenges in road maintenance management because Jalan Kampung Gajah - Tanjung Tualang and Jalan Balun Bidai is a rural area. Therefore, it is not necessary to invest in public transportation.

CONCLUSION

This paper concludes that increasing traffic volume is the most challenging in road maintenance management, followed by the impact of climate change on roads and technology improvements. The most effective solutions discovered for overcoming these difficulties include avoiding peak hours for maintenance work and creating a Traffic Management Plan (TMP). Avoiding peak hours reduces congestion and prioritize user convenience, while TMP enhances traffic flow and safety. Respondents, however, disagreed on investing in public transit as a solution, due to the rural environment of the research location. These findings give useful insights for tackling road maintenance management challenges.

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