

POLITEKNIK SULTAN SALAHUDDIN

ABDUL AZIZ SHAH

**STUDY OF DAMAGED ROAD ALONG JALAN
SEMPADAN TELOK PANGLIMA GARANG**

**ABDURRAHMAN ATIQULLAH BIN MOHD
MAHYILDDIN**

(08DKA20F1065)

JABATAN KEJURUTERAAN AWAM

DIS 2022

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**Laporan ini dikemukakan kepada Jabatan Kejuruteraan Awam
sebagai memenuhi sebahagian syarat penganugerahan
Diploma Kejuruteraan Awam**

JABATAN KEJURUTERAAN AWAM

DIS 2022

AKUAN KEASLIAN DAN HAK MILIK

STUDY OF DAMAGED ROAD ALONG JALAN SEMPADAN TELOK PANGLIMA GARANG

1. Saya, ABDURRAHMAN ATIQULLAH BIN MOHD MAHYILDDIN (NO KP: 020823-12-1363) adalah pelajar Diploma Kejuruteraan Awam, Politeknik Sultan Salahuddin Abdul Aziz Shah, yang beralamat di Persiaran Usahawan, Politeknik Sultan Salahuddin Abdul Aziz Shah, 40150 Shah Alam, Selangor.
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3. Saya bersetuju melepaskan pemilikan harta intelek 'Projek tersebut' kepada 'Politeknik tersebut' bagi memenuhi keperluan untuk penanugerahan Diploma Kejuruteraan Awam kepada saya.

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With this, I am very grateful to Allah SWT because I could complete this final project with His grace and permission. I hope this report can be used as an example and guide for the parties concerned.

ABSTRACT

Road damage has been a common problem in society that comes with harmful effects. This study focused on a 2.2-kilometre along Jalan Sempadan Telok Panglima Garang that stretches from Taman Sri Orked to Lorong Haji Tahir. This study aims to identify the damage characteristics and the cause and find ways to improve road conditions. Arahan Teknik Jalan JKR has, and some journal was referred. A site survey was performed to collect types and damage counts along the road. A traffic volume study is conducted to identify average daily traffic and suitable pavement design and repair methods. A questionnaire survey was also shown to collect the road users' experiences and opinions. According to the research findings, road pavement should be regularly maintained, and damages must be repaired as soon as possible.

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CHAPTER 1: INTRODUCTION

1.1 Introduction

A country's level of development can be gauged by looking at the extent of its long-distance infrastructure network. The roads in this infrastructure network join to form a more extensive network of communities to the road that links north and south, west and east.

The road system is the primary driver of economic and societal progress. The result is an increase in cars on the country's roads. While an increase in the number of automobiles on the road may be seen as positive in raising average living standards, it has the opposite effect on the safety of road users. Because of this change, there were more car crashes on the roads. In metropolitan locations, it contributes to a worsening of traffic congestion.

Alterations to the land use classification close to constructed facilities are also mentioned in once undeveloped regions. Road users are often the ones negatively impacted by changes in the terrain and haphazard construction. When this occurs, it lowers the driver's sense of security, reducing driving safety and raising the stakes for drivers already contending on congested roads.

Inadequate preparation of road design that does not prioritise safety also contributes to the issue, as does disregard for the comfort of vulnerable road users, including walkers, cyclists, and motorcyclists. When repairs aren't done correctly, it might exacerbate issues with traffic safety. All these factors contribute to the danger of violence on the roads. Often, an agency's design process will directly reference or be inspired by international best practices. Road users' general mindset and driving style in this country is not conducive to the local environment. It was also discovered that the design standards were only sometimes up to par with the area's aesthetics and traffic demands. Most of the time, while developing standards, engineers focus on satisfying the requirements of motorised vehicles and spend less time investigating the needs of pedestrians and motorcyclists, frequently exposed to risk on the road. An insufficient focus on road safety during planning and construction will have severe consequences for everyone involved. It isn't suitable for protecting drivers everywhere and undermines the reputation of the agency in charge of maintaining roads. There are supplementary expenditures for infrastructure repairs that road authorities must foot. While this has a monetary impact, the state must bear it; the higher cost is the daily mortality toll from traffic accidents.

Both the anticipated volume of traffic and the necessary level of improvement dictate the scale of a road project, but budgetary constraints also play a role. All road users should feel secure on this road project. Hence precautions should be taken to safeguard their safety. However, they frequently end up as a "victim," especially when project budgets are tight.

1.2 Background of Study

The research was conducted by myself, Abdurrahman Atiqullah Bin Mohd Mahyilddin, and my colleague Muhamamd Shazniel Shafieq Bin Saharuddin. Our chosen topic is the result of collaborative brainstorming, with additional guidance from our expert reviewers; this research will benefit the general public and other interested parties, while its scope is limited. Our research pertains to the widespread pavement damage over Jalan Sempadan. It will harm road users and attract danger. This research is being conducted to solve the road safety problem for the good of the community.

1.3 Problem Statement

The road narrowed due to erosion on the road's shoulder, forcing traffic in both directions to move closer together and deal with road damage that damaged several automobiles and put motorcycle riders at risk. Along 2.2 kilometres of the road, this happened.

1.4 Objective of Study

Establishing and fulfilling the study's objectives to succeed before beginning the research process is essential. The three main findings from the damaged road research are as follows:

- i. To identify the types of damage that occur along 2.2 kilometres of Jalan Sempadan
- ii. To find the traffic volume based on vehicle types that use the road
- iii. To find out the way to improve the road condition

1.5 Question of Study

How can the issue of frequent road damage be identified and solved? Motorcycle riders are especially at risk because of this issue. This study was carried out to support those affected road users.

1.6 Scope of Study

This research aims to study the road damage and traffic volume by road users along 2.2 kilometres of Jalan Sempadan 41200 Telok Panglima Garang starting from the main entrance of Taman Sri Orked to the junction of Lorong Haji Tahir. To collect the primary and secondary data such as traffic study, questionnaire, and interview at the study location.

1.7 Importance of Study

To provide a safer, more dependable environment for users of the trunk route and all other road users in general, this study aims to raise awareness among all parties involved. When a traffic accident happens, people tend to blame the drivers or other road users, even though the driver's negligence may have been caused by different causes that diverted the driver's attention. The Public Works Department (JKR) of the Ministry of Works Malaysia and the Local Authority may find it beneficial to reduce the road design and construction issue due to this research's ability to analyse the accident rates on the trunk road in detail.

1.8 Definisi Operasi/Istilah

Road damage, characteristics, site survey, traffic volume, pavement design, maintenance

1.9 Conclusion

Delivering a pleasant and secure infrastructure is hampered when road safety is ignored and becomes a local sociopolitical problem. In the end, the circumstance will necessitate the road authority to issue additional requirements to decrease road accidents, as demonstrated in various completed projects. However, many people have been hurt or killed in accidents within the relevant period.

BAB 2: LITERATURE REVIEW

2.1 Introduction

In Malaysia, car crashes are a leading cause of death. Accidents on the road can be caused by a number of factors, including driver error and vehicle malfunction, but also by the actual state of the road itself. Maintaining traction and stopping in time to avoid an accident may be challenging if the road is in poor condition. Road potholes, cracks, silt, uneven roads, manhole covers embedded or above street level, are all variables that cause accidents to arise, especially to motorcyclists. Road damage can also cause shock absorbers and tyres to be readily damaged. In addition, the JKR shall frequently inspect the work sites of the contractors under their supervision to verify that they are following all of the parameters outlined in the SOP. Malaysia is a developing nation with ambitious plans to join the ranks of the developed world. Therefore, contractors and the government need to take the problem of road repair seriously and act quickly. Pavements are cost-effective, low-maintenance engineering structures designed to withstand heavy vehicle traffic and various weather conditions. Failure mode may also vary depending on the pavement structure type and environmental factors. While fatigue failure, rutting, undulation, and other comparable problems are more common in flexible pavement, faulting edges and cracking can affect stiff pavement. Heavy loads, bad weather, poor drainage, subpar materials, and inadequate design thickness are only some of the many possible causes of collapse. Multiple reasons have contributed to pavement deterioration, the most significant of which is the high volume of vehicle traffic. Size and shape of vehicle loads and collisions have had a significant impact on the resulting tensile stresses within the flexible pavement. Repaired roads have reduced the number of accidents and resulting social unrest. In order to mitigate the negative impacts of damaged roadways, it is important to first classify them. With traffic load resistance being the principal function of pavement, it was a major factor in pavement thickness design. Despite ongoing repairs, the road's condition would deteriorate again if too many vehicles used it. Throughout the developing world, most institutions have addressed the issue of road deterioration. That's why we conducted this research—to catalogue the wear and tear on Araham Teknik (Jalan) 5/85, quantify the volume of vehicle traffic there, and pinpoint opportunities for improvement.

2.2 Previous Study

Pavements are engineering structure which economically designed to withstand traffic loading and climate action with minimal deterioration [1]. Pavements may encounter different mode of failures depending on its structural types which caused by specific factors [2]. For example, flexible pavement may experience fatigue failure, rutting, undulating, etc. while rigid pavement may experience faulting edge, cracking, etc. All these mode of failure are caused by several factors such as heavy traffic loading, climate effect, drainage effect, material properties and inadequate design thickness [1]. Among all these factors, heavy traffic loading has contributed significantly to pavement damage. The magnitude and configuration of vehicle loads in conjunction with environmental factor have imposed significant effect on the induced tensile stresses within flexible pavement [3]. Although heavy vehicle load is subjected to high stresses causing pavements damage, not all trucks have the same damaging effects. The damaging factor depend on speed, wheel loads, number and location of axles, load distributions, type of suspension, number of wheels, types of tire, inflation pressure and many other factors [4]. There are numerous studies have been conducted by previous researchers on the road damage due to vehicle overloading. The traffic load by surveyed data have far exceeded the designed bearing capacity of the designed road structure [5-12]. This has caused prevalent premature pavement damage. Those studies also addressed that the overload vehicles has imposed significant influence to the reduction of pavement service life. Although issues on road damage due to vehicle overloading have been addressed by most agencies in developing countries, there are no available study found to address this issue on Perak state road. Ipoh has been known as the busiest town in Perak State. It is located at the heart of Perak under District of Kinta. Hence it has quite a numbers of inter-city road networks which connects Sungai Siput in the North of Perak, Simpang Pulai in the South, Batu Gajah in the West, Tambun in the North-West, Cameron Highland in the East and Jelapang in North-East. Other than that, crossing through Ipoh is the North-South Expressway with two (2) main exits i.e. in the South (Ipoh Selatan Interchange) and North (Ipoh Utara Interchange). In conjunction with this, obviously the road has been used by numbers of vehicles with various types and the pavement may have been imposed by high stresses from overloaded vehicle which causing road damage [13]. Based on records of previous maintenance works, it was found that several rehabilitation works has been carried out for the past three (3) years. In addition, Notice of Defect by maintenance concessionaire's company has also been issued to local authorities regarding the pavement damage and the necessity to conduct repairing work. This has been further proved by the records of pothole defect found on the road pavement. This phenomenon has indicated that the road may experience fatigue failure due to rapid overloading imposed on pavement surface. This also shows that the pavement could not last longer as per design life and the pavement service life has become shorter. Hence, the objectives of this study were to determine the current traffic composition of the road, to assess the percentage of overloading vehicle according to different types of vehicle based on local Weight Restriction Order and the damaging factor from equivalency factor (EF), to calculate the adequacy of existing pavement thickness to withstand current overloading traffic and to estimate the reduction of pavement service life due to overloading.

2.3 Conclusion

Based on the results, it can be concluded that the existing traffic composition of the road revealed that numbers of vehicle travelled on primary direction was higher as compared to secondary direction for all vehicle classes, and 2-axle class has contributed more than 60% of the overall daily traffic compared to 3-axle class and above. However, more than 50% vehicles from 4-axle, 5-axle and 6-axle vehicles exceeded the PGVW compared to 2-axle vehicle was only exceed the PGVW about 9%. This also indicated that the vehicle overloading is mostly consist of vehicles from 4-axle and above. By comparing with recommended design value for E.F. which is 3.0, the primary direction gained E.F. value of 4 times higher than the E.F. design value with 12.4 while secondary direction gained E.F. value of 3 times higher than the E.F. design value with 9.2. It can be concluded that the current road traffic load was higher than road traffic load for designed existing road. Furthermore, based on the results, primary direction need to be overlaid with at least 70mm additional thickness while secondary direction need to be overlaid by at least another 50m thick in order to resist current traffic load. Thus, road damage can be prevented. Lastly, both primary and secondary conditions experienced 6 and 7 years of reduction of service life respectively due to overloaded heavy vehicles. This also denoted that both primary and secondary directions met maximum service life within about 2.59 and 4.39 years under overload condition. For more reliable results, data collection for traffic count shall be conducted based on recommended 24-hours survey period, and by taking optimum results from data which collected through the whole week.

BAB 3: METHODOLOGY

3.1 Introduction

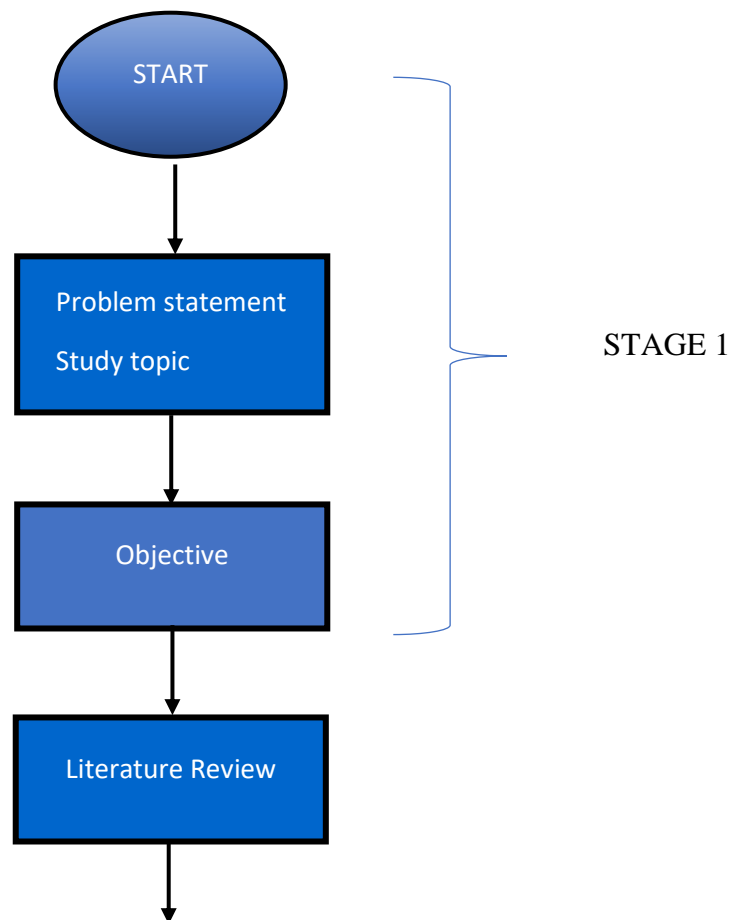
Research methodology refers to the procedures and methods used to collect data and draw conclusions about a topic. Methodology sections of research articles let readers critically evaluate the quality of the research as a whole.

This research necessitates the use of information and data from a variety of sources. Each student in this section is responsible for understanding the material and making appropriate choices about organising their work to obtain all necessary information. Before beginning research, careful consideration must be given to the best methodology. The procedures outlined in this section are crucial to ensuring that your research runs smoothly and according to plan. This guide will provide clear guidance on how this research is conducted. Each step and tool provided here will serve as a guide to ensure that this research is completed on schedule. All steps of the process will be outlined in this section. So, he or she will provide an overall picture of the steps that need to be taken.

Road safety aims to pinpoint potential dangers caused by a lack of proper road signs, unsafe road fixtures, or unfortunate traffic collisions. Office review, field review, and final report are the three stages of road safety review. The office inspection mainly entails an in-depth description of the site and an in-depth investigation of crash data. The road survey is part of the field review, collecting and analysing accident data using suggested guides and checklists. The final report compiles the findings from the desk and on-the-ground assessments. The report needs to be succinct while identifying the issues and providing solutions. Roads can benefit from focusing on road safety in all their forms and developmental stages. Local roads in urban and suburban regions are the primary focus of the technique outlined here. Team members from the Malaysian Public Works Department, the Police Station, and other relevant agencies should work together to ensure road safety. The team members should

know about road management and be well-versed in road safety engineering, crash investigation and prevention.

3.2.1 Method / Procedure



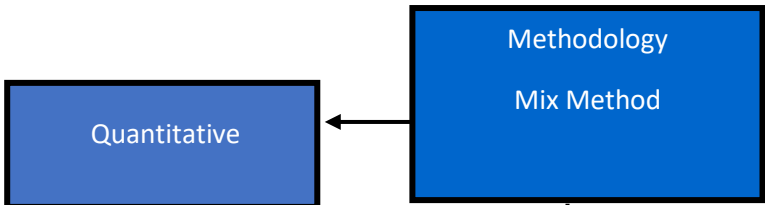
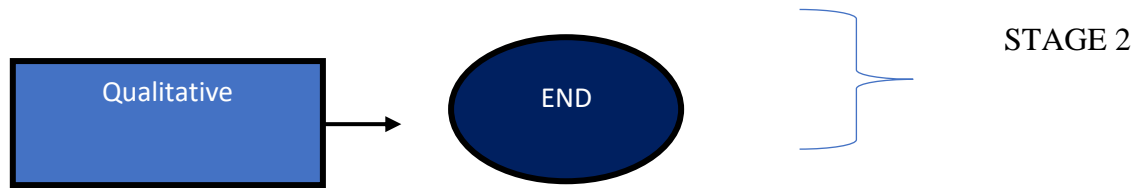


Figure 1. Procedures for conducting research and drafting explanatory documents

3.2.2 Penjelasan Carta Alir

- The disclosure of the research problem's focal point**
 This problem is being disclosed in light of current events in this country about the chosen field. It is essential to make the problem known before conducting any research on it, so that the results can be useful to the outside world and can inspire hope among the general populace.
- Objectivity and research design**
 This research has three objectives that must be met to be considered successful. Objective also as a guide on where this research has been successful and where it can help the general public outside of academia to solve this problem. In addition, I focused my research along a 2.2-kilometre stretch of Jalan Sempadan because it is a residential area.
- Literature review**
 Literature reviews are necessary before conducting any research in order to gather data from previous studies that can be used to improve the quality of future studies. By referencing prior research, we can better understand the current issue and the prior research-backed approach to resolving it.
- Methodology Mix Method**

A research methodology is a set of procedures for gathering and analysing data to produce a comprehensive study. Understanding can be aided by employing methodology, and this is done to pave the way for more extensive or fine-tuned research into the state of the research process. The Quantitative Methods and the Qualitative Method are the two components of the Mix Method. Each individual plays a crucial role from the outset of this research until its conclusion.

- **Quantitative**

This technique or tool is used to gather data by maximising the value of the data and information gathered. Quantitative research must rely on observable phenomena or be amenable to statistical inference. Forms created in Google are used to collect relevant data. The information and data were gathered by interviewing regular users of the highway in question.

- **Quantitative**

By working together, we can collect data or information that is both more precise and more trustworthy, which will strengthen the validity of the research.

- **End**

Several things must be done in this final stage of the research process to ensure its success. Among these are producing a report detailing the research, drawing conclusions, and, most importantly, ensuring that the research's stated goals are met.

3.2.3 Data Collection Method

OBJECTIVE	METHOD	DATA ANALYSIS
i. To identify the number and types of damage that occur along 2.2 kilometres of Jalan Sempadan	<ul style="list-style-type: none"> Gather information, and utilise select article-based data and discussion questions. 	Collect and classify data
ii. To find the traffic volume based on vehicle types that uses the road	<ul style="list-style-type: none"> Using Qualitative data Google Form distributed to road users 	Bar chart & Pie chart
iii. To find out the way to improve the road condition	<ul style="list-style-type: none"> Referring to some literature 	Collect data

3.2.3 Analysis Data Method

I use the ATJ JKR to determine Average Daily Traffic in my data analysis. These statistics will be displayed as graphs, bar charts, and pie charts.

Figure 2 shows ATJ JKR 5/85 Pindaan 2013

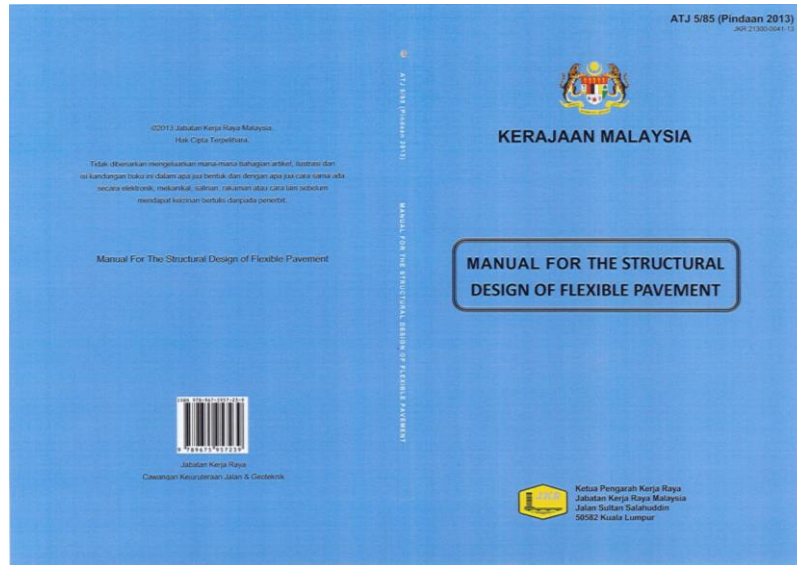


Figure 2. 6-day traffic volume study (0700-1000) (1200-1400) (1600-1900)

3.3 Conclusion

This approach uses a mixed methodology to maximise information and data collection. I used quantitative methods to learn about the types of road damage on these roads through a site survey and a traffic volume study and qualitative methods to find ways to improve the road condition.

BAB 4: EXPECTED RESULTS

4.1 Introduction

This process is the result of a mixed method—an essential resource for gathering information for this study. In addition, the Google form plays a vital role in collecting information directly from road users about current road safety issues.

4.2 Results of the Study

Information gathered from a site study is representative of constant road hazards. The information presented here is quite helpful for answering the first objective of this study. This research's findings will be organised according to the types of errors and accounts made along the way.

4.2.1 First Results of the Study

One of the most critical research findings is determining what kinds of road hazards along the road

According to the site inspection, there are 15 potholes, 73 shoulder potholes, 17 erosion spots, and 5 alligator cracks.

These roads have narrow shoulder widths, forcing clean vehicles to pass through muddy areas of the roadway. Road users, especially motorcyclists, will be put in danger as a result.

Figure 3 shows damage that occurred along the road.

Potholes	Shoulder Potholes	Erosion	Alligator Cracks
15	73	17	5

Figure 3. Damage occurred along the road

Figure 4 shows the percentage of every damage.

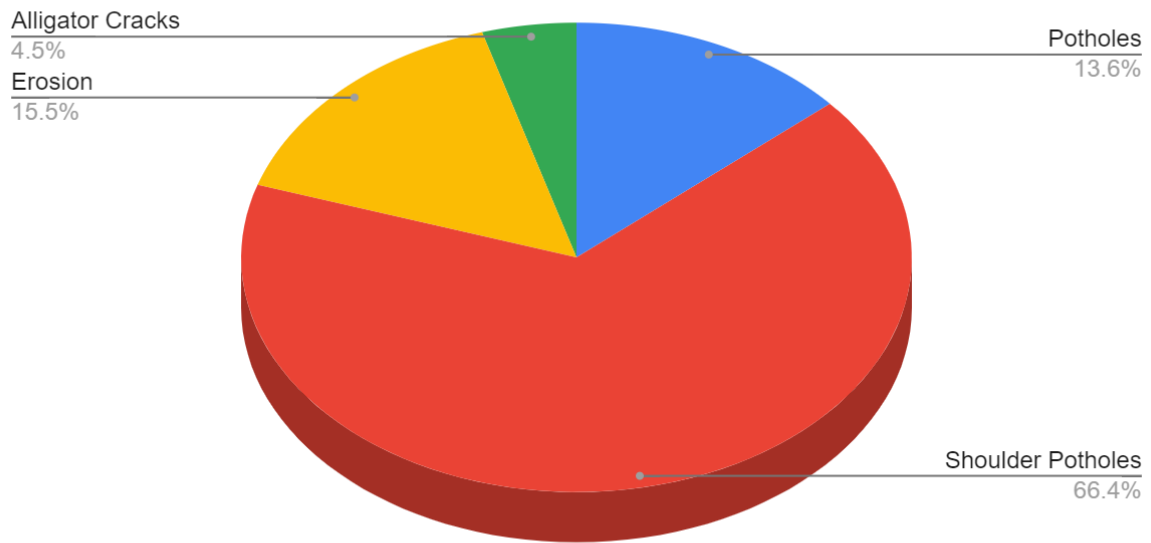


Figure 4. Percentage of damages that occurred.

Figure 5 below shows road damage that road users found.

Jenis kerosakan jalan yang sering dijumpai
40 responses

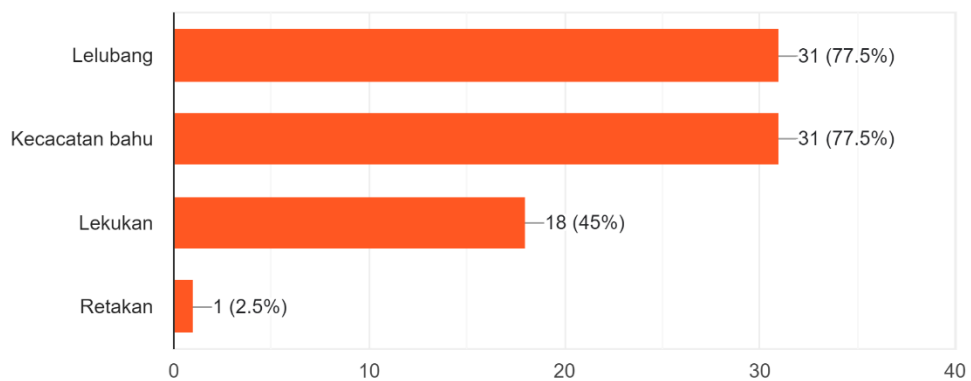


Figure 5. Road damages found by road users.

4.2.2 Second Results of the Study

Dapatan kajian bagi objektif dua iaitu mendapatkan Average Daily Traffic. Traffic volume study telah dibuat for 6-day survey (0700-1000) (1200-1400) (1600-1900)

Figure 6 and 7 shows a 6-day traffic volume study.

Date	Car	Heavy Vehicle	Motorcycle	Total Vehicle/day
23/10 - Sunday	4080	112	976	5168
24/10 - Monday	2906	52	582	3540
25/10 - Tuesday	3246	50	712	4008
26/10 - Wednesday	3327	62	743	4132
28/10 - Friday	4533	64	1112	5709
29/10 - Saturday	4701	104	1288	6093
TOTAL	22793	444	5413	28650
Percentage %	79.56	1.55	18.89	100

Figure 6. 6-day traffic volume study (0700-1000) (1200-1400) (1600-1900)

Total Vehicle/day vs. Date

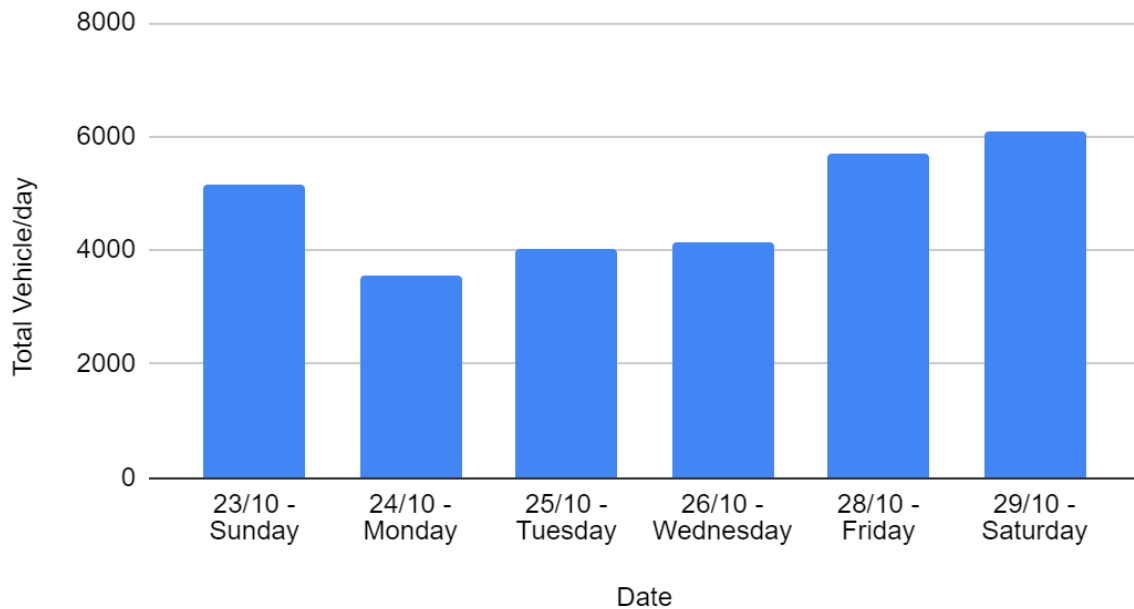


Figure 7. Total vehicle per day for 6-day survey

Figure 8 below shows the type of vehicles

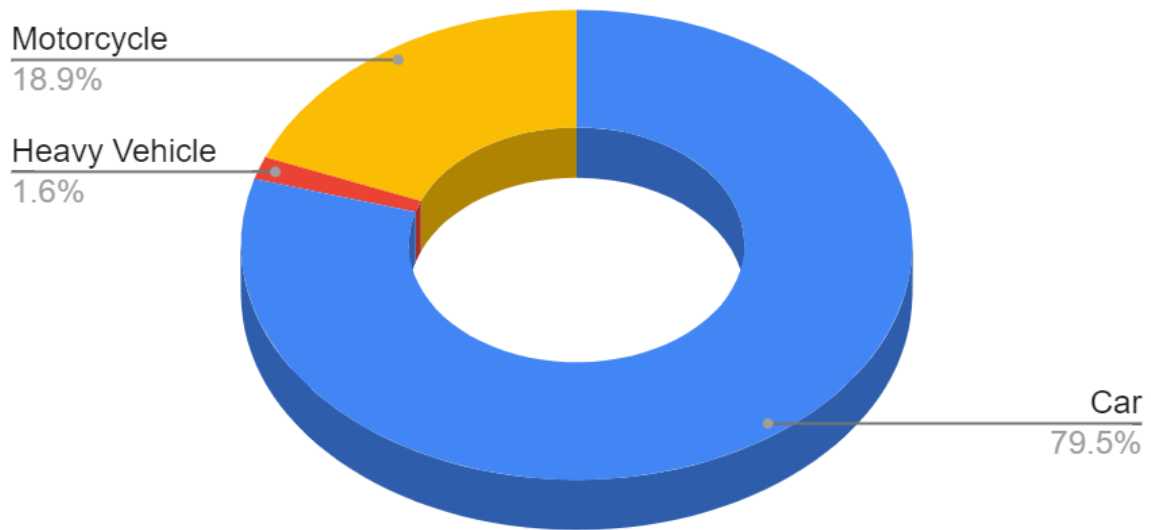


Figure 8. Classification of Road Vehicles.

The heavy vehicle population proportion is the lowest of any investigated segment at 1.6%. More over 80% of all traffic is comprised of cars, making them the most prevalent mode of transportation.

4.2.2 Third Result of the Study

Information was gleaned from a third source of research, namely a journal search, to answer a third-objective question: how to better the road's state.

The JKR Road Safety Facilities Manual offers two options: paved or unpaved roadways.

Figure 9 shows the paved road shoulder structure.

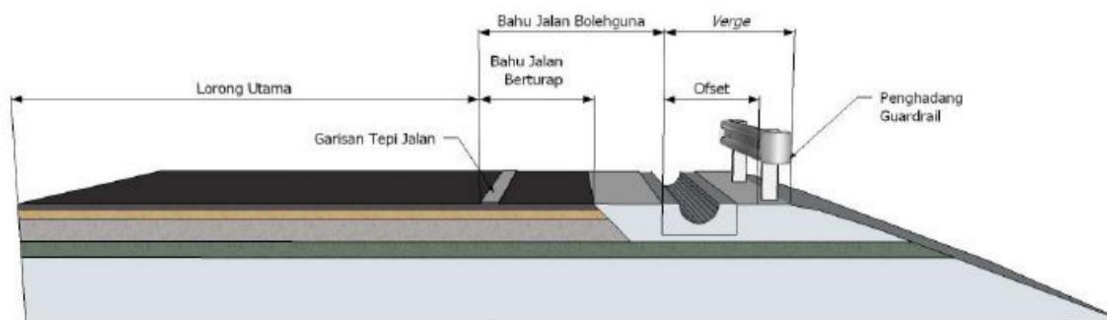


Figure 9. Paved road shoulder structure

It's possible that some or all of the road shoulder in question has been paved. The paved road shoulder along the significant road absorbs the weight of the vehicles. Thus its layout must match the exact specifications of the pavement structure. Each turn in the road must be planned according to the same turn structure as the main thoroughfares. Some examples of functions that highlight this trait and offer other benefits are as follows:

1. Assigning space for a halt in activity in the event of an emergency or other specific reasons, such as building maintenance, is a must.
2. Provide space for road users to avoid potential road rage incidents, especially those involving motorised and pedestrian traffic.
3. Give priority to highway users if the road is too wide due to flooding.
4. Increase the viewing distance, especially in turn, to boost safety measures.
5. Improve road capacity and traffic flow at intersections.
6. Provide a location for road sign installation and road marking.
7. Offer support to road construction infrastructure

Figure 10 explains the need for the width of the paved road shoulder surface on the rural road.

Piawaian Rekabentuk	Lebar Bahu Jalan
R6	Min. 2.5
R5	Min. 2.0
R4	1.5
R3	1.5

Figure 10. Width of paved road shoulder (rural area)

Figure 10 shows the unpaved road shoulder structure.

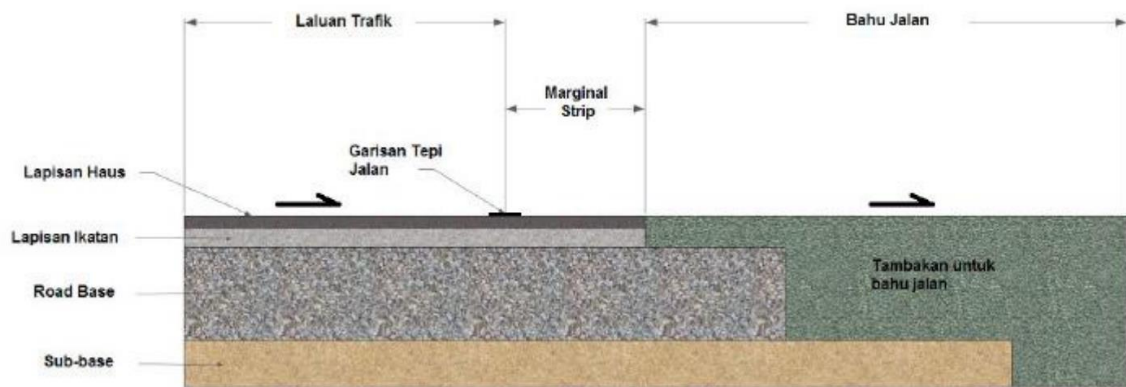


Figure 10. Unpaved road shoulder structure.

In contrast, a non-turfed road shoulder is the portion of a road's surface that is not levelled but instead is laid out by the road's existing structure, except the top layer, which is made of subbase material and is layered on top of lateritic soil. Mixing grass or layered aggregates with the road is not acceptable to make a road shoulder surface unsuitable for the roadway. The proliferation of these two types of roadside vegetation depends on roadside vegetation management practices.

Figure 11 Wide roadways aligned with street grids in urban and rural areas (rural).

Piawai Jalan Luar Bandar	Lebar Bahu Jalan (m)		
	Mukabumi		
	Rata	Beralun	Berbukit
R6	3.0	3.0	2.5
R5	3.0	3.0	2.5
R4	3.0	3.0	2.0
R3	2.5	2.5	2.0
R2	2.0	2.0	1.5
R1	1.5	1.5	1.5

Figure 11. Width of the non-paved road shoulder.

Commonly available widths range from 1.5 to 3 metres, depending on road grade.

Figure 12 shows the cross slope of the road shoulder.

Jenis Permukaan	Kecerunan Rentas %
Pavemen	Mengikut <i>cross fall</i> laluan jalan
Laterit	4 - 6
Rumput	> 6

Figure 12. Cross slope of road shoulder

Roadside ditches must have a slope that allows water to drain away from the roadbed. To effectively remove standing water, the cross slope of the road shoulder must be no less than 4%, regardless of whether or not a road barrier is made available outside the road shoulder.

4.3 Discussion

Our research provided the information necessary to accomplish the first three goals. Each of the three approaches taken to this end is unique in its own right.

Carjackings and other forms of traffic-related violence against the most helpless elements of society are the most common types of crime on American roadways. Not paying attention when praying contributes to this sort of disaster. Also, the storm highlights problems with under-maintained roads. The road shoulder is an essential part of highway design that helps keep drivers and passengers safe. In addition to its primary role as a pillar of the road network, it also performs several other tasks that contribute to the well-being of motorists. Roadside shoulders are typically the locations for traffic control devices such as stop signs, traffic lights, and signals. It's also a section of the "clean zone," which is supposed to be devoid of obstacles that could put people at risk in the event of a car breakdown. The road shoulder can be used as a makeshift emergency lane if a motorist suddenly loses control or a vehicle is damaged beyond repair. Due to this, a roadside ditch is an integral part of any highway to improve the security for motorists on key thoroughfares.

It is advised to offer a road shoulder for the convenience of drivers and pedestrians entering and leaving the driving lane. Frequently, drivers will use the shoulder of a paved road as a parking lot for a nearby establishment. If this continues, the facility's intended purpose—improving traffic safety—will be severely compromised. The white line that denotes the road shoulder can be replaced with a yellow one to discourage drivers from pulling over there.

Defining the nature of road damage is essential for accomplishing the first goal. Potholes, shoulder potholes, erosion, and alligator cracking were among the many forms of damage observed after a site examination.

Figure 4.3.1 and Figure 4.3.2 shows respondent experience with the road

Kenderaan anda pernah mengalami kerosakan disebabkan jalan tersebut
40 responses

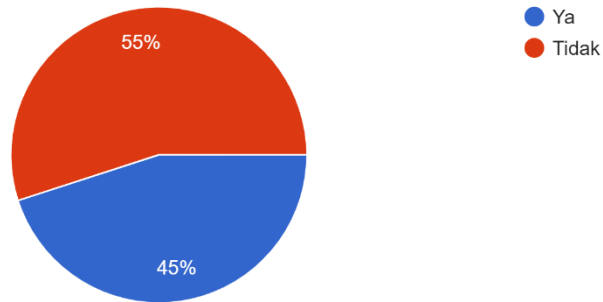


Figure 4.3.1. Road users that faced vehicle damage because of the road

Terdapat kemalangan berlaku sepanjang jalan tersebut
40 responses

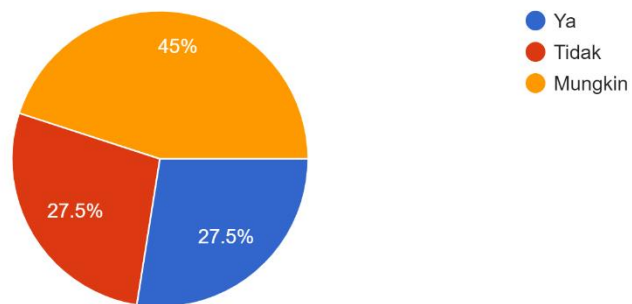


Figure 4.3.2. Respondent's experience about accidents

The data from the pie chart in figure 4.3.1 shows that 45% of those who use the road have experienced damage to their vehicles in the past, and 27.5% of respondents have witnessed accidents along Jalan Sempadan.

Figure 4.3.3 shows the damage that occurs alongside the road shoulder.



Figure 4.3.3. Road shoulder damaged with potholes and erosion

The road shoulder along Jalan Sempadan has bad potholes and erosion damage, as shown in figure 4.3.3. This will bring danger to road users, especially motorcycles. Excessive load factors, environmental variables (such as floods and the sufficiency of drainage channels), and poor road construction quality are the three main causes of road damage. Overloading a road significantly reduces the likelihood of it lasting as long as was intended. Overloaded roads are damaged before their time, which causes monetary losses. When buses or other large vehicles exceed their legal weight limits, it causes traffic load variations. The greater the frequency with which cars carrying excessive loads travel on a certain stretch of road, the shorter that stretch of road will last before its performance deteriorates. Water, an environmental issue, has a major impact on the state of the roads. The drainage coefficient, which depends on the quality of the drainage system and the saturation status of the pavement structure throughout the year, has been used to account for water in pavement structure design. Two functional condition characteristics of the road, the International Roughness Index (IRI) and the Surface Distress Index (SDI), are used in conjunction to determine the pavement quality (SDI). As a result of combining these two metrics, we can identify four distinct operational road situations (good, fair, slightly damaged, and severely damaged).

Punca utama kerosakan jalan tersebut
40 responses

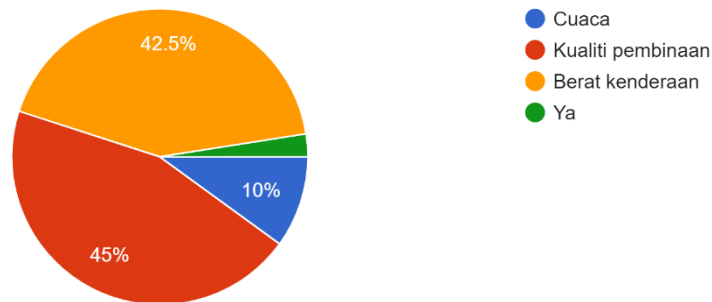


Figure 4.3.4. Pie chart of respondent’s opinions and experience on Jalan Sempadan.

Figure 4.3.4 shows that excessive vehicle traffic is a common occurrence on the road, which can lead to pavement deterioration.

Regarding the second objective, finding the ADT by proper analysis. For the six days of the investigation, we counted a total of 22793 vehicles and determined that 79.5% of those vehicles were cars. Evidence that the locals need and value this thoroughfare. In the transportation industry, two typical metrics are Average Annual Daily Traffic (AADT) and Average Daily Traffic (ADT), used by traffic planners and designers to evaluate a road's potential for traffic flow and safety segment. The standard practise in Malaysia is to employ ADT for traffic volume forecasting in the design year and the actual layout of the depth of the pavement.

$$16 \text{ hours} \times 1.2 = 24 \text{ hours}$$

$$\text{Average daily} \times 2.4$$

$$(28670/6) \times 2.4 = 11468$$

$$\text{ADT} = 11468 / 2 = 5734$$

The proposed alternative approach has better accuracy without imposing any additional cost or change to the current data collection program. However, it should be noted that the model is only applicable to the similar type of road functions and similar traffic patterns. Roads paved with tarmac or asphalt tend to last for quite some time, and the bases of some of our oldest roads are more than a decade old. Many big roads have potholes, alligator cracks, and uneven surfaces because asphalt doesn't endure forever and because roads are huge surfaces continually exposed to the weather. Pavement made of asphalt is usually rather sturdy, and any damage you might observe is probably the result of a confluence of factors. Road surfacing contractors should be called into either mend or replace a road's surface if the

damage is severe enough to make it unsafe for drivers to use. Some of the most common causes of severe road damage are listed below. Roads are intended to make driving easier. However, bigger vehicles can exert significant strain on the ground itself. This continuous pressure might eventually cause the road surface to develop flaws, which in turn lead to cracking. Because of this, the cracked area could eventually disintegrate into a pothole. Water is a major contributor to the deterioration of road surfaces, which is why tarmac sealants and pavement maintenance are essential. Water seeping in through cracks in the surface weakens the base course layer, leading to depressions in the road. This can develop over time or as a result of unusually heavy stresses on the road. Problems with traffic load and the development of cracks and potholes are commonplace if the road's base layer has been compromised, and these issues typically persist until the road is completely repaved. The rock, gravel, and sand that make up an asphalt surface are held together by the asphalt's binder. This binder can break down when exposed to sunlight for an extended period of time, turning the road into something akin to a haphazard pile of gravel. It is time to resurface the road after ravelling becomes noticeable. Do you ever stop to think about how and why new roads are black but turn to a lighter grey over time? The asphalt layer becomes less flexible as it deteriorates from exposure to oxygen. By its final stages, the tarmac layer has become more like concrete and can easily shatter underweight. Oil leaks from parked automobiles may not be a big deal if they're immediately cleaned up, but if they're left there for too long, they'll seep into the asphalt, ruining the top layers and making them nearly impossible to fix or remove. The surface under a road can shift and settle over time, producing fractures, sinkholes, and other severe this is due to the earth constantly moving on tectonic plates, earthquakes, and other natural events.

4.4 Summary

The results and discussion show that all three study goals have been met. The goals have been completed thanks to the analysis, data, and information gathered.

Objective 1's commendable conclusion is that potholes, shoulder potholes, erosion, and alligator cracks are the most common forms of road deterioration. Shoulder cracks are the worst.

In addition, it can be concluded for objective two results from all the information obtained from the traffic volume study that cars have the highest percentage compared to other vehicles with Average Daily Traffic.

Next, it can be concluded that all the recommendations and methods obtained to achieve objective three have been stated in the writing of the report above. Among the most appropriate methods and guidance is to pave the road shoulders or use laterite soil type road shoulders.

BAB 5: KESIMPULAN DAN CADANGAN

1.1 Introduction

In this chapter, I will discuss the study's findings and recommendations and the challenges I encountered throughout the research process. This procedure takes nearly a full academic year to complete, beginning in the fall of your fourth semester and continuing for another approximately six months in the spring of your fifth semester. Lots of new information has been gleaned from observing things like damaged roadways.

1.2 Conclusion

Road safety is an everyday concern because each of us uses significant thoroughfares. Problems with pedestrian safety on specific stretches of highway frequently end in tragedy. These issues need to be addressed immediately to reduce their frequency of occurrence and concurrently enhance highway safety network-wide. To address the road safety issue for commuters on major thoroughfares, it may be necessary to plan for and implement a more extensive infrastructure than is typically required, which can be an expensive and time-consuming endeavour. The current economic climate necessitates that all capital expenditures, including those for road projects and the installation of safety features, yield a return commensurate with those expenditures. In this regard, it is crucial to pick facilities that are well-suited to the task at hand and provide an adequate return on investment. Each of the facilities detailed in this guide serves a different purpose and reaches a different stage of effectiveness in addressing the issue of highway safety. Some situations call for more important facilities than others, whereas the converse is also true. Given the current state of affairs, more guidance beyond that which has already been provided should be sought from authoritative sources. Based on this study, I can conclude that more research of this kind needs to be conducted so that future generations can learn more about road safety, improve conditions for road users in Malaysia, and raise the country's profile in the same way the Japanese government has done through its promotion of a public works project that has helped many people. Many groups will use this research to expand their understanding of the world. Now that the study's objectives have been met, I consider the research I've done to be complete, and I hope that other parties will combine my findings with their own so that we can all feel confident about solving whatever problems face our country in the future.

1.3 Recommendation

Infrastructure built with less-safe elements for road users needs to be repaired quickly to prevent or worsen accidents. Elements that are less safe or potentially harmful need to be made public knowledge and eliminated through the implementation of appropriate and well-received safety measures. The factors that contribute to this problem must be identified, and the commonalities among them must be used as teaching tools in order to prevent the repetition of the same problems in the future. Many different kinds of road safety equipment and products are being put in place, or, more generally speaking, road safety infrastructure is being developed. It is possible to define road safety facilities as conveniences made available to the general public in order to improve the level of road safety experienced by those who travel on major roads. It is made available in areas where highway accidents are common and is suitable for most or all types of users. Each of these facilities serves a specific purpose and has the potential to have a positive impact on reducing incidents of violence on populated highways. It's possible that combining relevant facilities can boost their efficacy as well. For these facilities to provide the hoped-for solutions to the related highway safety issues, careful planning and selection are required. All road safety infrastructure may vary in effectiveness and utility (the ratio of benefits and implementation costs). Besides, it's crucial to consider the processes involved in providing a suitable and practical design. Despite this, many of these facilities still need clear instructions for proper use, proper assembly of components, or proper installation. This issue has also spawned confusion and inconsistency in usage and installation, with the worst of it harming motorists. Facility effectiveness-related issues are still being assessed, and the opposite effect, if any, is still not clearly understood in the traffic environment and road user conditions in Malaysia. The methodology for improving something is problem-focused, and choosing the appropriate methodology for a given set of inputs must be well-thought-out to solve the problem. There may be several potential solutions to a problem, but the best one will be determined through careful consideration of the context and analysis of causal factors. A thorough understanding of how well the method performs under similar conditions is essential.

1.4 Limits of Research

The study's sample size is limited, and the frequency with which roads are damaged presents a major restriction. Because of this, learning more about the phenomenon will be

challenging. And, of course, you have to contend with the locals. Even though this study is challenging because people in our country are still reluctant to leave their houses because of the recent cases of covid-19, we collect all of the data and information we need using a Google form.

1.5 Summary

The research has been ongoing for about a year now, and it has been carefully planned out in order to ensure its success. It can be surmised that despite the many difficulties encountered during the course of this research, progress will be made easier if we put in the effort, as every issue must have a means of resolution. I pray that research like this will be put into action to help our country grow and prosper, as we all know that a strong nation is built on a strong research base.

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APPENDIX

Gambaran proses

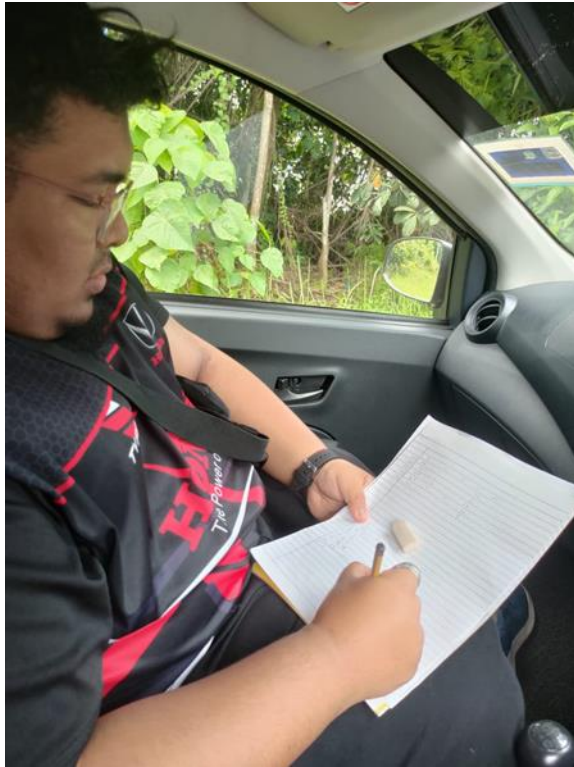
Langkah 1

Membuat site survey



Langkah 2

Membuat traffic volume study



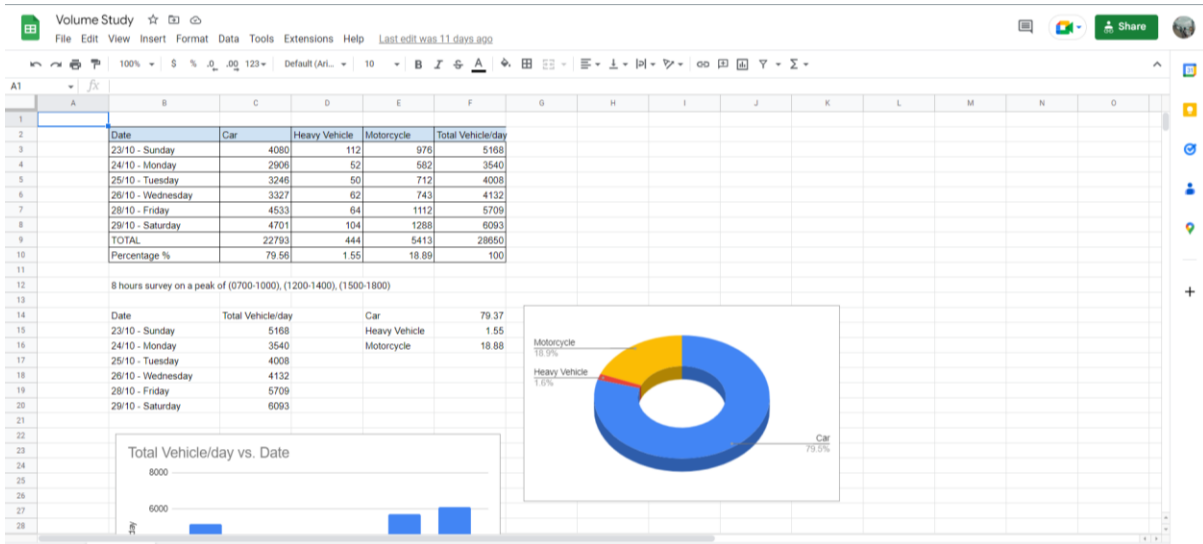
Langkah 3

Temubual penduduk sekitar



Langkah 5

Mengumpul dan membuat analisi maklumat yang telah didapati bagi menjayakan kajian ini serta membuat laporan kajian.



Membuat Slide pembentangan.



Ghant Chart Perancangan Kajian

GANTT CHART FINAL YEAR PROJECT 2

NO	ACTIVITIES	WEEK														
		W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15
1	PROJECT DISCUSSION	ESTIMATED TIME														
2	ISOLMS BRIEFING		ESTIMATED TIME													
3	LOOKING FOR LOCATION ACCORDING TO RESEARCH IMPLEMENTATION		ESTIMATED TIME	ESTIMATED TIME	ESTIMATED TIME											
4	CONTINUE THE STUDY METHOD				ESTIMATED TIME	ESTIMATED TIME	ESTIMATED TIME	ESTIMATED TIME	ESTIMATED TIME	ESTIMATED TIME	ESTIMATED TIME	ESTIMATED TIME				
5	PRESENTATION 1 : PROJECT PROGRESS									ESTIMATED TIME						
6	FINISH THE RESEARCH								ESTIMATED TIME	ESTIMATED TIME	ESTIMATED TIME	ESTIMATED TIME				
7	PRESENTATION 2: FINAL REPORT												ESTIMATED TIME			
9	SUBMISSION OF FINAL RESEARCH REPORT													ESTIMATED TIME	ESTIMATED TIME	
10	PITEC PSA															ESTIMATED TIME

