# ANALYSIS OF MOTORCYCLISTS' RISK PERCEPTION BASED ON COGNITIVE MAPPING TECHNIQUE: A CASE STUDY OF BATU KAWAN INDUSTRIAL PARK (BKIP), PULAU PINANG

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By

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## LIST OF ABBREVIATIONS

| | |
|---|---|
| WHO | World Health Organization |
| ASEAN | Association of South-East Asian Nations |
| GIS | Geographic Information System |
| BKIP | Batu Kawan Industrial Park |

## ABSTRAK

Jumlah kemalangan jalan raya di Malaysia meningkat setiap tahun dan merupakan negara ketiga yang mempunyai kadar kematian akibat kemalangan jalan raya tertinggi di kalangan negara-negara Asean. Ini disebabkan oleh tindakan untuk menyelesaikan masalah hanya dilakukan selepas kemalangan jalan raya tersebut berlaku. Kajian ini bertujuan untuk membantu dalam mengenal pasti lokasi yang mempunyai kebarangkalian berlakunya kemalangan jalan raya melalui kaedah pemetaan kognitif. Fokus kajian ini adalah pada penunggang motosikal yang bekerja di Taman Perindustrian Batu Kawan (BKIP), Pulau Pinang. Dalam kajian ini, pengumpulan data melalui tinjauan menggunakan "Google My Maps" mengenai persepsi risiko terhadap kemalangan jalan raya sepanjang perjalanan dari / ke tempat kerja telah berjaya menganalisis tahap risiko yang dirasakan dalam kawasan kajian. Menurut dapatan hasil kajian, sikap pengguna jalan raya adalah faktor yang mempengaruhi kemalangan jalan raya. Melalui pemetaan kognitif, kajian ini mendapati terdapat 2409 lokasi berisiko di sekitar Pulau Pinang dan wilayah utara semenanjung Malaysia dan 919 lokasi berisiko adalah terletak di sekitar kawasan BKIP. Analisis spasial dilakukan dengan menggunakan perisian Sistem Maklumat Geografi (GIS) iaitu perisian QGIS. Hasil kajian ini menunjukkan bahawa kaedah pemetaan kognitif dapat membantu dalam memberikan maklumat mengenai persepsi kemalangan penunggang motosikal di jalan raya. Analisis spasial akan menghasilkan peta yang menunjukkan lokasi berisiko atau kawasan *hotspot* yang boleh menyumbang kepada kemalangan.

## ABSTRACT

The number of road accidents in Malaysia increases every year and is the third country with the highest death rate of road accidents among ASEAN countries. This problem is due to the lack of oversight to mitigate the issue of accidents occurrence before they could happen on the road. This study aims to provide solutions before road accidents where the location with a probability of road accident needs to be identified through the cognitive mapping method. This study is focusing on motorcyclists who commuting to worked in Batu Kawan Industrial Park (BKIP), Penang. In this study, the survey using Google My Maps about risk perception towards road accidents along the journey from/to work has effectively analysed the level of perceived risk. The cognitive mapping method found that 2409 risky locations involved Penang and the northern area of peninsular Malaysia, and 919 risky points are located around the BKIP area. According to the result, attitude is a factor influencing road accidents. The spatial analysis was performed using Geographic Information System (GIS), which uses QGIS software. Using QGIS software, we could generate risk perception maps to demonstrate motorcyclists' ability to obtain risky perceptions of risky road locations and environments. The findings of this study demonstrated that the cognitive mapping approach could help provide information on the accident perception of motorcyclists on the road. The spatial analysis will generate a map that shows the risky location or hotspot area that may contribute to the accidents.

# CHAPTER 1

# INTRODUCTION

## 1.1 Background of the study

Fatal road accidents remain a global problem. The World Health Organization (WHO) reported that, in 2016, the number of people killed or injured in road traffic accidents continues to rise exceedingly over 1.35 million. Moreover, according to WHO's "Global Status Report on Road Safety 2018", more than half of global road traffic fatalities occur among pedestrians, cyclists, and motorcyclists, which is frequently overlooked in road traffic systems in many countries, and road traffic fatalities are the eighth leading cause of death for people of all ages.

Table 1.1: Leading causes of death, all ages (World Health Organization, 2018)

| Rank | Cause | % Of total death |
|---|---|---|
| 1 | Ischaemic heart disease | 16.6 |
| 2 | Stroke | 10.2 |
| 3 | Chronic obstructive pulmonary disease | 5.4 |
| 4 | Lower respiratory infection | 5.2 |
| 5 | Alzheimer's disease and other dementias | 3.5 |
| 6 | Trachea, bronchus, lung cancer | 3.0 |
| 7 | Diabetes mellitus | 2.8 |
| **8** | **Road traffic injuries** | **2.5** |
| 9 | Diarrheal diseases | 2.4 |
| 10 | Tuberculosis | 2.3 |

According to the World Health Organization (WHO) Report on Road Safety (2018), Malaysia is among the highest death rate road accidents for ASEAN Countries after Vietnam as shown in Figure 1.1 and experienced 7,152 fatalities on the road in 2016.

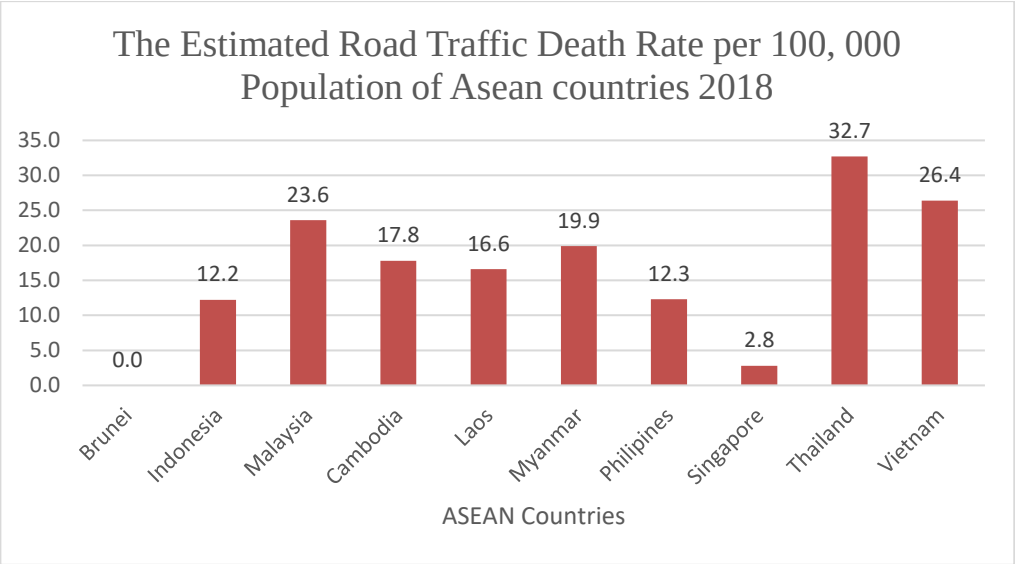


Figure 1.1: The estimated road traffic death rate per 100,000 population of ASEAN countries (World Health Organization, 2018)

Approximately 18 road accidents occur every day in the Peninsula of Malaysia, which cause an average of one death per hour, a condition that demands preventive action (Musa, et al., 2020). The cumulative number of road accidents has risen by 38% from the Malaysian Ministry of Transport data collection, corresponding to 393,330 and 548,598 occurrences in 2009 and 2018. The total number of vehicles involved in road accidents grew from 705,623 to 960,569 during the 2009 to 2016 period (approximately 36 % rise), and reduction happens to almost approximately 13% in 2018 with 837 695 total number vehicles involved. The number of vehicles involved shows that decreasing happens but the total number of road accidents still increasing till 2018 (Ministry of Transport Malaysia, 2018)

According to Transport Statistics Malaysia 2018, total fatalities reach 6 284 in 2018, and the highest state with total accidents is Selangor (163,078), followed by Johor (78,812), Kuala Lumpur (72,284), and Pulau Pinang (45,734) (Ministry of Transport Malaysia, 2018). Ministry of Transport Malaysia claimed that the total number of vehicles involved in road accidents in 2018 increased to 837,695 from 802,523 in 2017.

The number of road accidents involving a motorcycle increases from 2017 to 2018, as shown in Table 1.2. The causes of motorcyclist accidents that contributed to the fatalities are because the motorcyclist is vulnerable and has limited protection (Daniello, et al., 2010). From previous studies, Penang state in Malaysia has a high percentage of the motorcyclist. Due to the heavy traffic congestion on Penang Island, 33% of road users tend to use motorcycles during peak morning hours. Therefore, t number of road crashes and fatalities in Penang grows every year (Abdul Sukor, et al., 2016). Throughout the same study, all the motorcyclists involved in the study are commuting to work in Penang, Malaysia.

Table 1.2: Total motor vehicles involved in road accidents by type of vehicle, Malaysia from 2017 to 2018 (Ministry of Transport Malaysia, 2018)

| Years | Motorcycle | Motorcar | Van | Bus | Lorry | Four Wheel Drive | Taxi | Bicycle | Others | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|
| 2017 | 108,221 | 564,491 | 13,347 | 7,258 | 34,747 | 44,297 | 5,328 | 787 | 24,047 | **802,523** |
| 2018 | 113,288 | 591,339 | 17,226 | 7,328 | 36,915 | 45,757 | 3,912 | 727 | 21,143 | **837,695** |

Throughout this study, commuting accidents will refer to the accidents happening on the usual route between work in either direction (Rusli, 2014). According to Jamaluddin et al. (2015), around 20,810 contributors have been involved in an accident while commuting to work reported by SOCSO in 2009. According to the same researchers, commuting accidents include any accidents that occur while commuting from/to work during authorised rest time or any period related to work. In another study, Manan et al. (2018) stated that Malaysian motorbikes blend with other vehicles for

commuting purposes, which raises the risk of involvement in multi-traffic accidents. As a result, Awang et al. (2015) stated that most injured workers were young males who commuted to work on motorcycles.

Sarani et al. (2016) highlight the need to establish creative initiatives and effective interventions to avoid fatal road accidents and reduce fatalities. Sultan et al. (2016) propose that the Malaysian government, through its agencies, conduct a safety awareness campaign regularly to educate Malaysians about road safety to reduce the statistics that contribute to motorcycle accidents. Nowadays, motorcycle or road accidents' data collection only depends on reported road accident cases that already happen. However, how about the data that did not report to Royal Malaysian Police or identify the potential area that may cause accidents in the future.

The study aims to investigate and determine the risky location based on the motorcyclist risk perception. This study focuses on gathering motorcyclists' perceptions about road factor accidents and identifying the potential hot spot area that may cause accidents using cognitive mapping.

## 1.2 Problem statement

From the current practice that we already have in Malaysia, the hot spot areas or risky locations of accidents can only be identified after the accident and through the previous police report. Therefore, some of the potential risky places also may not be identified for future prevention. Therefore, it is needed to identify the potential risk accidents of the motorcycle to prevent the accidents to happens. To solve the problem, a study about identifying the risk location based on motorcyclists' risk perception would help forward the research on the risk perception of road fatalities. Furthermore, Halim et

al. (2017) indicate that motorbikes account for a large percentage of traffic on Malaysian roadways, as they do in many other cities in developing nations.

As described above, government and research have already made various efforts to identify the cause and identify the potential risk of accidents to prevent the increase in an accident that involved motorcycle riders, especially in Penang. However, according to the previous studies, some researchers use the environmental concept as the weather condition that affects the road condition, and some prefer the condition of the road (Sultan, et al., 2016). Therefore, the statement of the studies focused on the environmental factor concepts that may involve and cause road accidents.

The key factors that cause accidents are carelessness, lack of comprehensive safety procedures, over-speed, and awareness about road safety regulations for motorcyclists (Liyanage, 2020). According to Blackman & Haworth (2013), research in America showed that speeding (over-limit) and inappropriate speeds, impaired riding, unlicensed riding, unused helmets, inexperience, and leisure riding were factors causing road accidents. Much of the literature suggests that rider attitudes and the perception of the risks involved in motorcycling are the most crucial consideration when deciding to what extent motorcyclists are at risk from injury compared with other road users. According to Susilo et al. (2015), motorcyclist attitudes significantly influence the intention to violate traffic regulations and develop recurrent traffic infraction behaviour.

## 1.3 The objective of the study

The objectives of this study are as follows:

i. To investigate the level of perceived risk towards road accidents among the motorcyclists working in Batu Kawan Industrial Park.

ii. To generate the risk perception maps in the Penang and BKIP area based on motorcyclists' risk perception of getting involved in road accidents.

iii. To identify the risky location in the Penang and BKIP area based on motorcyclist's risk perception of getting involved in road accidents.

## 1.4 Scope of work

This study used a survey, where the respondents involved in the studies are the motorcyclist commuting from/to the workplace in Batu Kawan Industrial Park (BKIP).

The survey only focused on the cognitive mapping information collected from each respondent at the five companies involved. They need to describe how they commute to work every day and complete the cognitive mapping on the Google My Maps of the risky place along the road from/to their workplace at BKIP. They also need to state the level of risk perception towards road accidents and why they may cause the accidents to that risk perception. This study was conducted at BKIP that requires internet connection support to complete the survey of cognitive mapping. Throughout the research, the range of the cognitive mapping only at the northern area of Peninsular Malaysia. The target respondents for the project are around 500 respondents. The perception of the survey factor is based on environment, traffic loading, and attitude. The software that is used in the project to represent the data is QGIS software. All the data obtained during the survey were presented in the spatial analysis.

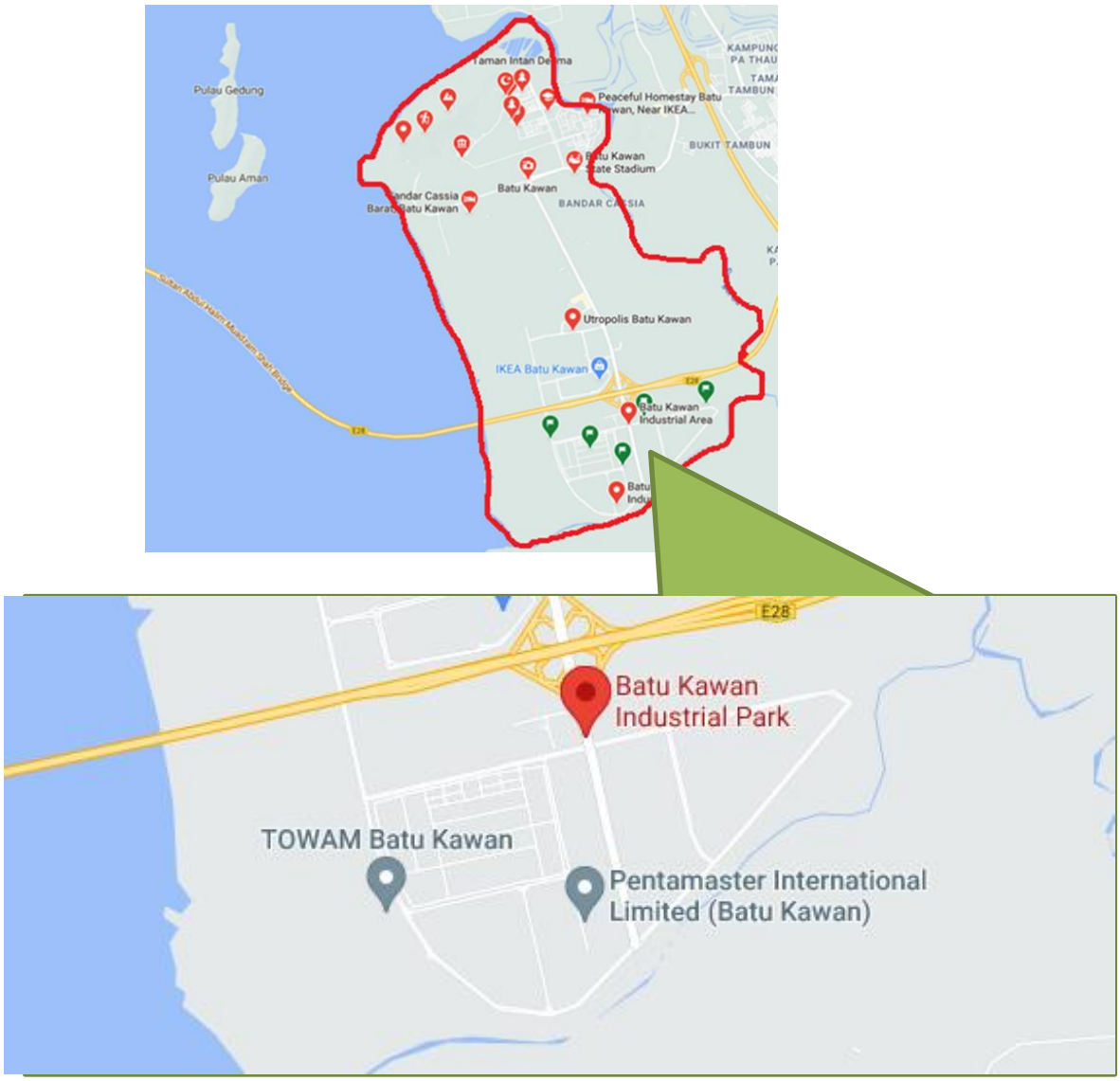


Figure 1.2: Batu Kawan Industrial Zone in Penang

## 1.5 Thesis outline

This chapter presents an introduction to the thesis with a brief explanation of the present study's problems and objectives. Chapter 2 introduces motorcyclist risk perception, its basic concept, definitions, dimension, and cognitive mapping application. While in Chapter 3 explains the methodologies used in this work, including the location of the studies. Selection of criteria, limiting factors, and survey data collection.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1 Introduction

This chapter is devoted to a brief description and a review of previous studies related to this research. Then, it discusses in detail the following:

i) Principal and definition of risk perception

ii) Factors affecting risk perception.

iii) Cognitive mapping and spatial analysis

## 2.2 Principal and definition of risk perception

### 2.2.1 Definitions of risk

This chapter starts with a brief understanding of the principle of risk and risk perception based on previous research. Bodemer and Gaissmaier (2015) explained that risk is a multidisciplinary term whose quantification varies across disciplines. The simplest definition comes from Amundrud et al. (2017), who defines risk as a combination of consequences and related possibilities or uncertainty. According to the same articles, risk can be described as an ‘expression of combination the possibility and consequences of an undesirable event. In comparison, Slovic (2016) defines risk as the result of people’s judgments of the severity and possibility of adverse outcomes.

According to Paek and Hove (2017), risk refers to the possibility of harm or hazard being experienced. Hazards lead to risks to people and to the items they value. Probability represents the probability of hazards, which appears to be perceived with a degree of uncertainty. The same author also claimed that risk perceptions are essential

indicators of health-related and other activities that experts prescribe for coping with or avoiding dangers.

### 2.2.2 Definition of risk perception.

From previous studies, risk perception is investigated in many research fields (e.g., safety engineering, psychology, and sociology). According to Kinateder et al. (2015), risk perception concepts can be broadly classified into expectancy-value and risk-as-feeling approaches. The concept of risk perception can be described as a psychological process that describes the subjective (conscious and unconscious) assessment (as contrasted to objective risk assessment) of the possibility of being affected by an inevitable unwanted event in a specific situation, and an assessment of one's own perceived consequences and coping resources.

A study has been conducted to examine risk perception, in which researchers define risk perception as a subjective evaluation of the possibility of an incident happening as well as how much consideration that individual gives to the consequences (Le & Arcodia, 2018). The term risk perception has also been described as subjective evaluation of the accident/incident and the awareness of the individual on the consequences (Huda & Lubis, 2020). Previous research has indicated that risk perception is the most common psychological aspect that directly and indirectly influences road safety attitudes. Aside from risk perception, a variety of additional factors influence road safety attitudes. The severity of the accidents relies on several factors, including the condition of the vehicle, the safety precautions, human mistakes and the time and location of the accident. (Ram & Chand, 2016)

### 2.2.3 The risk of road accidents.

A road accident can usually be described as an unexpected accident caused by the lost control of a vehicle or caused by the car crash causing property damage, passenger injury, and other road users (Kamaruddin, et al., 2018). Motorcyclists are at a higher risk of being killed or injured in accidents than any other road user. However, riding motorcycles is one of the most common ways of maintaining group mobility in many Asian countries (Cheng, et al., 2015). Moreover, for motorcyclists and their passengers, the possible dangers involved with any traffic accident are typically more significant because the vehicle structure does not protect them.

Meanwhile, some previous research indicated that one of the factors of youth motorcycle accidents appears to be primarily associated with risk perception. (Cordellieri, et al., 2019; Hosking, et al., 2010) The same author also discussed how the comparison between risk perception during driving behaviour is almost the same between the motorcyclist and car driver. These two groups only differ on the level of concern about risk, which the motorcyclist is less concerned about the risk of road accidents. Thus, this may lead to a high probability of risky behaviour in riding a motorcycle.

On the other hand, a study by Ngueutsa and Kouabenan (2017), discussed there are thus reasonable theoretical grounds to believe that accident history is related to risk perception and engagement in preventative actions. According to the findings stated in their research, the relationship between accident history and the adoption of preventive behaviours may be influenced by risk perception. Accident involvement generates various sensations and sentiments that are likely to stimulate risk perception, triggering a person's behaviours toward risks and safety. Some studies (Siya et al., 2019) have discussed that motorcyclists with less knowledge of road safety rules and regulations can

increase the risk of motorcyclist accidents. The motorcyclist behaviour in their study was also contributing to the perceived risk for accidents.

Another study in previous research by Cheng et al. (2015) states that traffic accidents also relate to the perception of the motorcyclist's risk, and the definition of risk is a theoretical understanding of the risk involved in different circumstances which rely on the driver's ability to perceive these risks correctly. The same author also reported that motorcyclists are more likely to be killed or injured in accidents than any other road user. They also claimed that driving-violation behavior and risk perception has significance to predicts motorcycle accidents involvement.

## 2.3 Factors affecting risk perception of road accidents.

### 2.3.1 Attitude

Many factors have been identified to influence risk perception. For example, Mohamed and Bromfield (2017) show e relationship between accident involvement, driving behaviours, and young male drivers' attitudes towards traffic accidents in Saudi Arabia. The same author also describes attitudes as the tendency to favour or disfavour an entity, often shown in cognitive, emotional, and behavioural reactions. The findings are supporting that driving behaviour influences the involvement in a road accident.

According to Sultan et al. (2016), accidents occur due to various factors and are typically not caused by a single factor. The same authors analyse Malaysian motorcyclists' driving behaviour, attitude, and habits, especially young students. The research findings show that human attitudes like driving over speed can cause accidents to other road users. The driver that over speed can contribute to the motorcyclist accidents when the driver tends to lose control.

On the other hand, a study by Cordellieri et al. (2016) shows that the study investigated the gender-related effects on road safety attitudes focusing on young drivers aged 18 – 22 years in nine different European countries. The results also show that young road users tend to have a negative attitude that can contribute to risk accidents. The findings also come out with three main factors in the attitude towards road safety which is “Negative attitude towards traffic rule and risky driving”, “Negative attitude towards drugs and alcohol”, and the third factor is “Tolerance towards speeding”.

Meanwhile, Liyanage (2020) stated that the key factors that cause accidents are carelessness, lack of comprehensive safety procedures, over-speed, and the lack of awareness about road safety regulations for motorcyclists. In addition, the previous research above indicates that the attitude of road users can contribute to road accidents, especially motorcycle accidents.

### 2.3.2 Environment

Sultan et al. (2016) has described the environmental concept contributing to road accidents, such as the weather condition affecting the road condition. Some of them prefer the road condition. The author claimed that urban areas have a high traffic density and a higher degree of infrastructure than rural regions through the same research. However, rural areas tend to have less congestion and fewer vehicles on the road. As a result, rural motorists can travel at higher speeds with less traffic and bad roads that are not designed for speed.

According to Afolabi and Kolawole (2017), road traffic accidents are classified into three basic categories: human factors, mechanical factors, and environmental. The study focused on Nigeria only. There is a heated debate about whether the high number of road accidents may be related to poor road conditions in Nigeria. The study's findings

show that human, mechanical and environmental characteristics are the primary elements that contribute to road traffic accidents in Nigeria.

Liyanage (2020) study shows that a few factors may contribute to road accidents in Sri Langka. Based on the study, the author also stated that Sri Langka is highly affected by road accidents and cause a significant number of fatalities per year. In the study, the factors involved are human factors, environmental conditions, vehicle conditions, road conditions and other factors. The results show that the road condition recognised as the incident's environment affects the accident risk.

### 2.3.3 Heavy traffic/High traffic volume

According to a study by Sultan et al. (2016), motorcycle fatalities have the highest number in Malaysia West Coast States rather than The East Coast Region with a lower motorcycle population and less built-up density. The result of the study stated that the police records show that a high percentage of fatalities which is 62% occurs in motorways and primary roads. The result shows that the majority of the fatalities occur on the primary roads with high traffic loading. Furthermore, Halim et al. (2017) also claim motorcycles occupy a high percentage of the traffic on highways in Malaysia, as do many other cities in developing countries.

On the other hand, Shariff & Mohamad Ibrahim (2020) claimed that congestion and traffic accidents are the leading transport problems worldwide. Heavy traffic and road accidents are a significant problem in developing countries such as Malaysia, affecting many sectors, especially the economic and social sectors. According to research by Manan et al. (2018), despite a relatively high volume of traffic in rural areas, the chance of a fatal motorcycle crash involving another vehicle increases by almost 7%, compared to a 17.5% decrease in motorcycle road accidents involving two or more other vehicles. Motorcyclists' behaviour may explain this particular outcome on various types

of low-traffic routes. For example, the same research discovered that while motorcyclists were approaching a route with low traffic volume, motorcyclists do not turn their heads to watch for vehicles, in contrast to their behaviour on roads with high traffic volume. Therefore, the risk of a fatal accident may increase if the motorcycle rider fails to notice an oncoming car while he is on the road.

According to Retallack and Ostendorf (2019), traffic congestion or heavy traffic might also influence the occurrence of road accidents, but not always in a way that would appear logical at first. While the number of vehicles on the roads may increase in accidents, they may also be decreased by reducing speed. Another study by Abdelfatah (2016) found that increased traffic volume, smaller lane width, and higher speed limits resulted in a worse perception of traffic safety.

## 2.4 Google My Maps Applications

Google My Maps is a computer programme that captures, sorts, edits, analyses, and reviews geographical data for various applications. Google My Maps not only combines data from Excel and Google Spreadsheets but also offers a framework for storing the data for future monitoring (Arumugam, et al., 2020). In a previous study, Abdul Sukor et al. (2016) a conducted survey has been done for mapping tasks using Google My Maps for respondents to select their daily routes to and from work on the maps. They also had to identify the area on the selected route, which they felt may lead to traffic accidents. This activity, also known as cognitive mapping, was required to recall the whole route and locations. Google Maps is used in another study by Borker (2017) to map routes or locations to evaluate the perceived safety of women's mobility on each route affected by street harassment.

## 2.5 Cognitive mapping

The term cognitive mapping will be defined as the cognition process of computational view of the mind that illustrated mental maps to helps people obtain, preserve, recognise, and decode information about the events occurring in their lives. (Almutairi, et al., 2019). Meanwhile, Upham and Perez (2015) stated that cognitive mapping, which was created to capture spatial cognition processes, has been widely utilised to construct multi-faceted environmental strategic planning issues. Aksan et al. (2015) used cognitive mapping to older drivers on road safety to identify which deficits in specific cognitive domains contribute to risk road accidents. Cognitive mapping has also been described as a natural human ability that allows us to interpret the environment by creating mental representations or "maps." It is a mental involvement with the spatial environment that allows people to analyse, understand, and utilise information about their surroundings (Stadler, et al., 2013).

## 2.6 Spatial Analysis

Spatial analysis has been used widely to understand the geographic pattern that involved locations and advance predictive models. Castro and Santos-Berbel (2015) used spatial analysis to investigate the use of GISs for integrated analysis, taking into consideration collisions and geometric road design factors such as design consistency which is the relationship of geometric properties of road between the driver expect to encounter and another cause are available sight distance, the distance that driver can see along the vehicle path of the road. A spatial analysis was done using GIS to determine whether accidents in the database occurred in segments with either poor design consistency or poor visibility circumstances. Using the GIS and a few tools analysis, GIS

can illustrate a profile view of the analysis of available sight distance of the road. Figure 2.1 shows that the example of analysis of available sight distance using GIS.

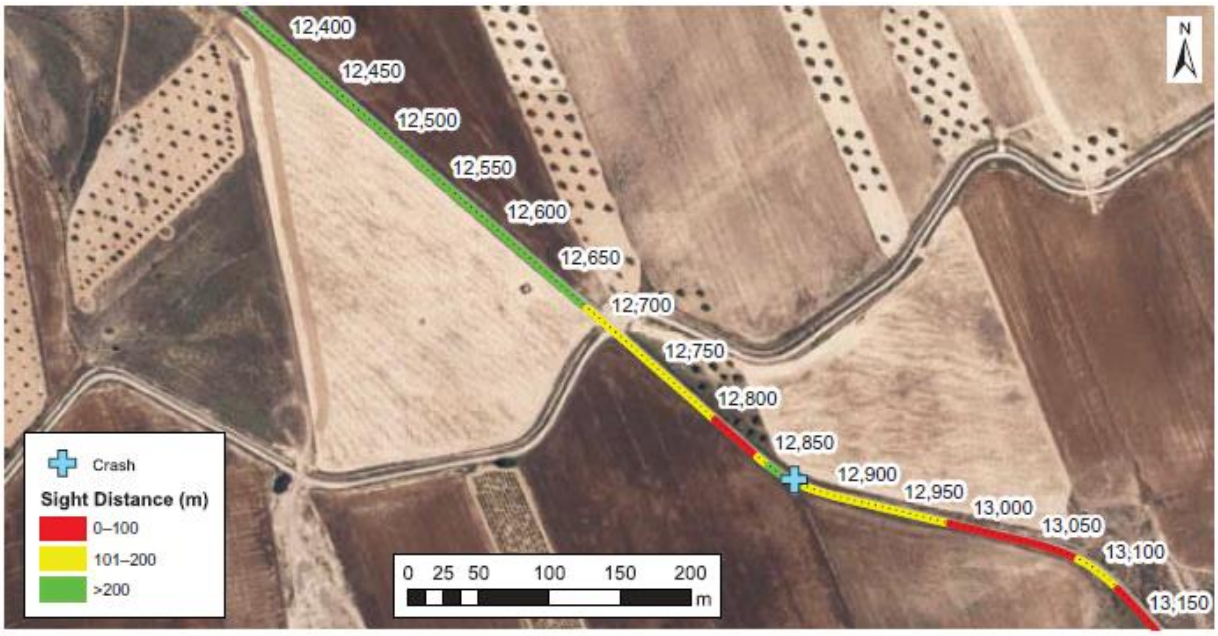


Figure 2.1: GIS analysis of available sight distance on the road (Castro & Santos-Berbel, 2015)

Meanwhile, a study by Shafabakhsh et al. (2017) has used spatial analysis to evaluate and show hot spots in Mashhad, Ir, to identify the location of accidents using the GIS. Spatial-temporal analysis can help identify hotspots and provide a solution to increase their safety. In the study, 9331 locations were registered for injury, fatalities, and property damage before analysing the hot spots. Using a few data sets, a few types of analysis (kernel analysis and nearest neighbour distance analysis) together with spatial analysis in GIS, spatial mapping can be produced as shown in Figure 2.2. The mapping will show the classification of intercity regions of Mashhad based on standard deviation in terms of distance between crashes by colour based. Red colour represents very high disaster-prone, and blue colour represents the low disaster-prone.

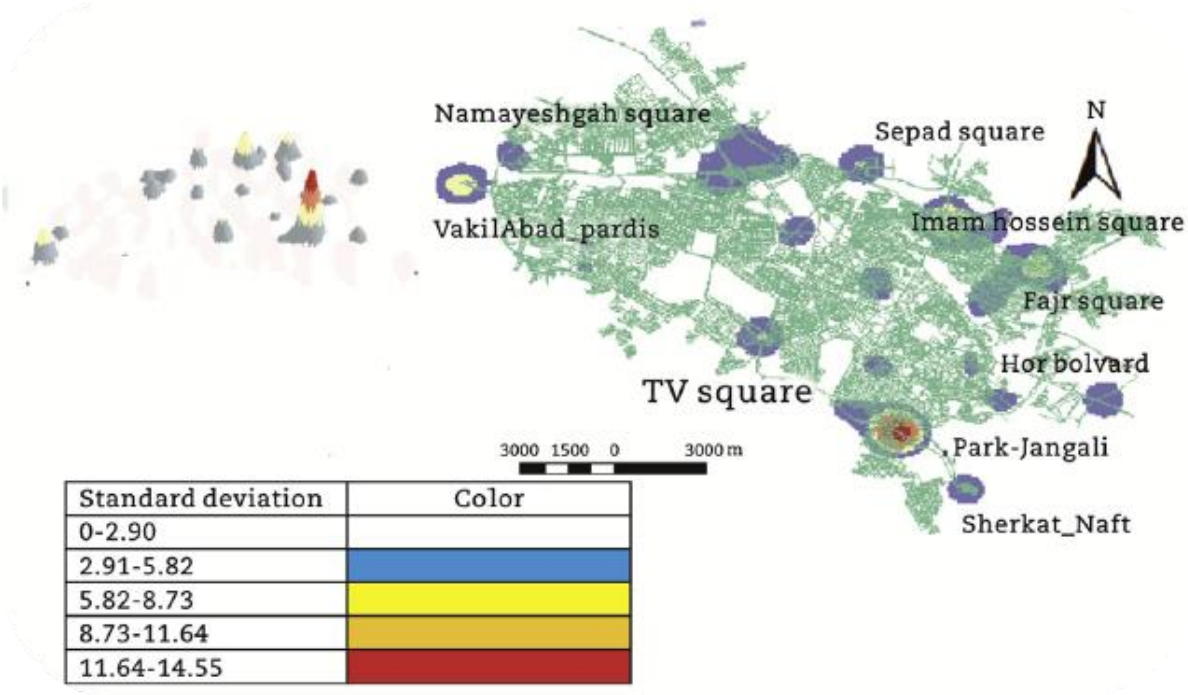


Figure 2.2: Results of kernel density level for accidents leading to death, injury and damage in Mashhad from March 21, 2011, to March 19, 2012 (Shafabakhsh, et al., 2017).

A study by Choudary et al. (2015) also uses spatial analysis and statistical analysis to analyse the hot spots of road accidents and compare two statistical techniques: Getis-Ord Gi statistics and Kernel Density suing GIS. The same author also describes that GIS has had a significant influence on finding road accident hotspots. The combination of spatial attributes and statistical analysis provides a more comprehensive understanding of traffic incidents. GIS-based approaches are generally easy to use and may transform raw statistical and geographical data into relevant information for spatial analysis, mapping, and detecting any factors contributing to accidents. The studies show that the method of GI Statistics over Kernel density, when used with inversed distance square conceptual of spatial relationship to identify hot spots, produces accurate and distinctive hot spots for given traffic conditions. The spatial analysis mapping result is shown in Figure 2.3.

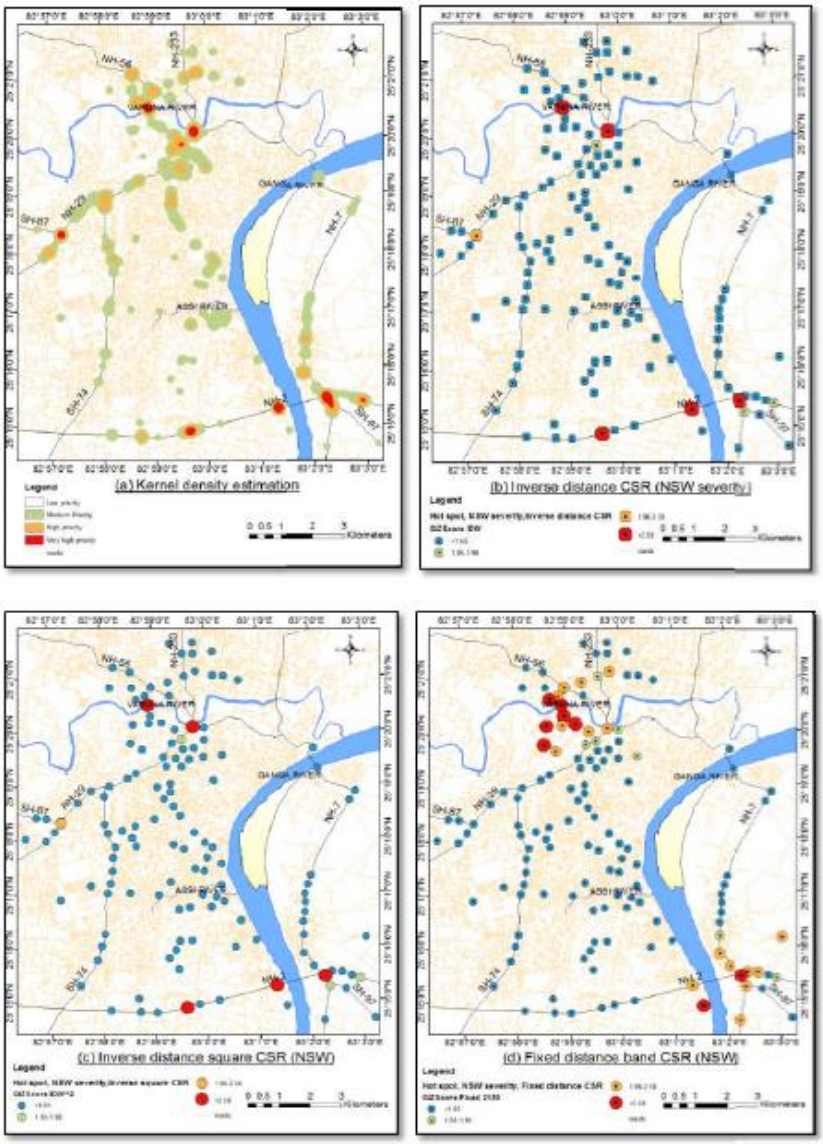


Figure 2.3: The spatial analysis mapping result for hot spots (Choudary, et al., 2015)

# CHAPTER 3

# METHODOLOGY

## 3.1 Introduction

A research's methodology is essential, which describes the techniques used to ensure that the study is more effective. In this study, the software being used is QGIS software, which was described in detail. This chapter also describes the method of data collection, selection area of study, and analysis that has been applied in this study.

The data was collected using the survey conducted at Batu Kawan Industrial Park (BKIP). The study was focusing the workers that using motorcycle that commuting to work at BKIP. During the survey, the respondent needs to map their daily routes to the workplace and input the other details needed in the Google My Maps using the cognitive mapping technique. The support of the internet is needed during the survey, and the strategic location to complete the survey has been selected. Each respondent needs to complete the survey by pin out the location of their workplace and their home on the map. The data collection was divided into three phases.

This data collection stage was then proceeded by the data analysis stage. The data analysis stage will be involved three processes. The first process is the extraction of the raw data from Google My Maps. During this process, each of the locations in the map will transfer to the excel format. The second process is to analyse the data. The raw data transferred to excel need to analyse and label into three factors involved in the study: Attitude, Environment and Traffic Loading. The third process identifies the risk percentage, latitude longitude of risky locations for each of the locations.

The following methodology is modelling. In this stage, data were analysed using QGIS software. The QGIS was used to determine the risk perception through spatial

analysis. Before the spatial analysis, the cognitive mapping was utterly obtained. The cognitive mapping will show the details of the risky perception area after completion.

The last stage of the methodology is the result and documentation of the research already accomplished. The results will show the risk perception of workers from BKIP that commuting to works by motorcycle based on cognitive mapping. Furthermore, the mapping will project the risky area contributing to potential accidents in terms of colour through spatial analysis. Figure 3.1 was illustrated the flow of this study.

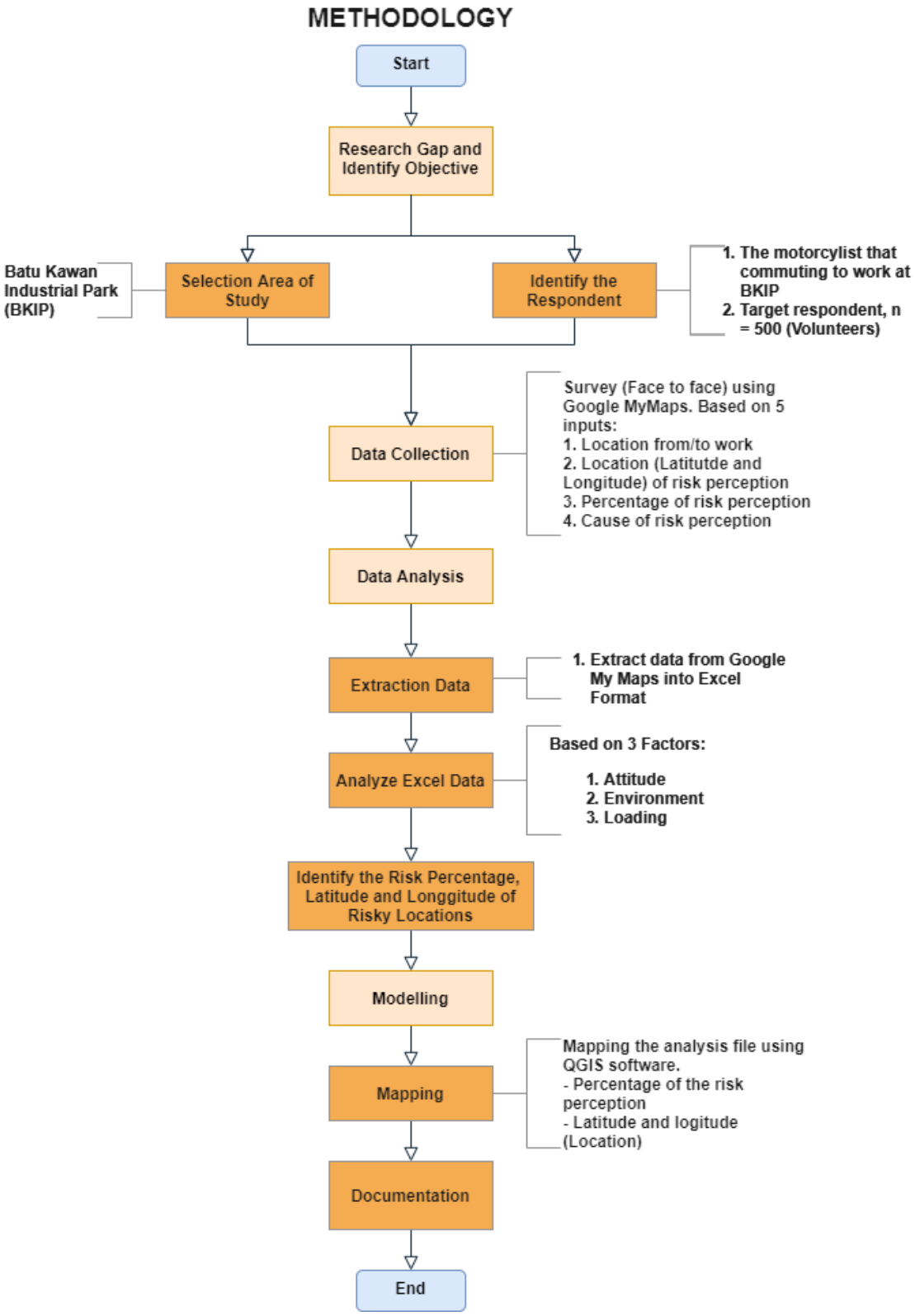


Figure 3.1: Detailed flowchart of the research

## 3.2 Participant/Respondent

A research survey was conducted on Batu Kawan Industrial Park (BKIP), Penang, to complete the survey that only takes around 15 to 20 minutes per respondent to finish the survey. As a result, the total data that completed the survey was 549 respondents

## 3.3 Data collection

To investigate the perceived risk of motorcyclists while riding to/from the workplace, the studies' data collection using Google My Maps to collect the location workers riding to/from the workplace. A few information will be obtained using Google My Maps, including the origin and starting point, selected route, points of risky location in latitude and longitude risky location, risk perception, and perceived causes of potential accidents. The respondent was asked to complete the survey by mapping the map at the route they perceived will have or maybe had the potential for accidents to happen as shown in Figure 3.2.

The respondent is required to rate the level of the perceived risk of each of the locations from 0 to 100% scale of the percentage that may cause the accidents along the route to/from the workplace, as shown in Figure 3.3. They were also asked to give specific reasons or cause for the percentage of risk given in the survey. These data then will be categorised into three parts of cause factor: the environment that may cause the accidents, the attitude of the road users, and the loading of the traffic congestion.

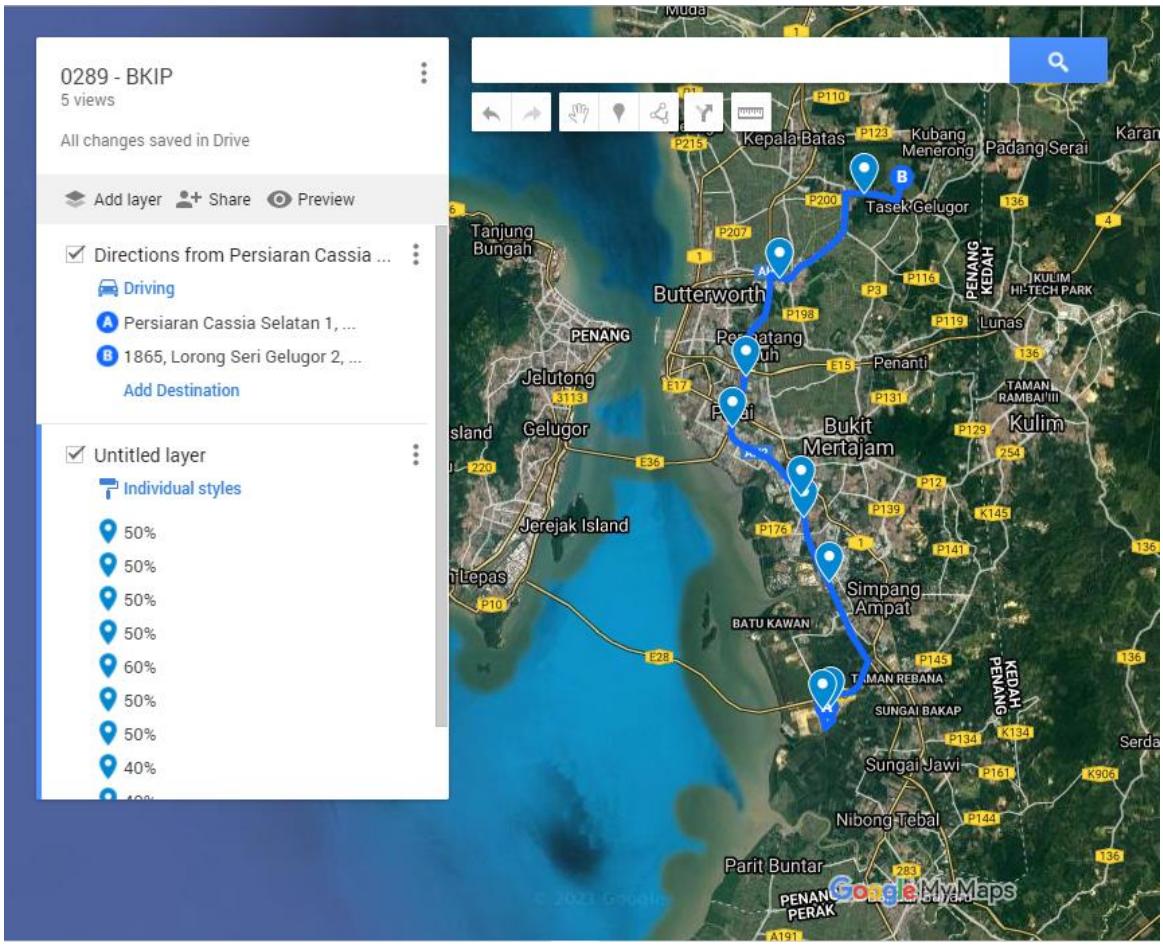


Figure 3.2: Respondent needs to be mapping the route to/from the workplace on Google My Maps

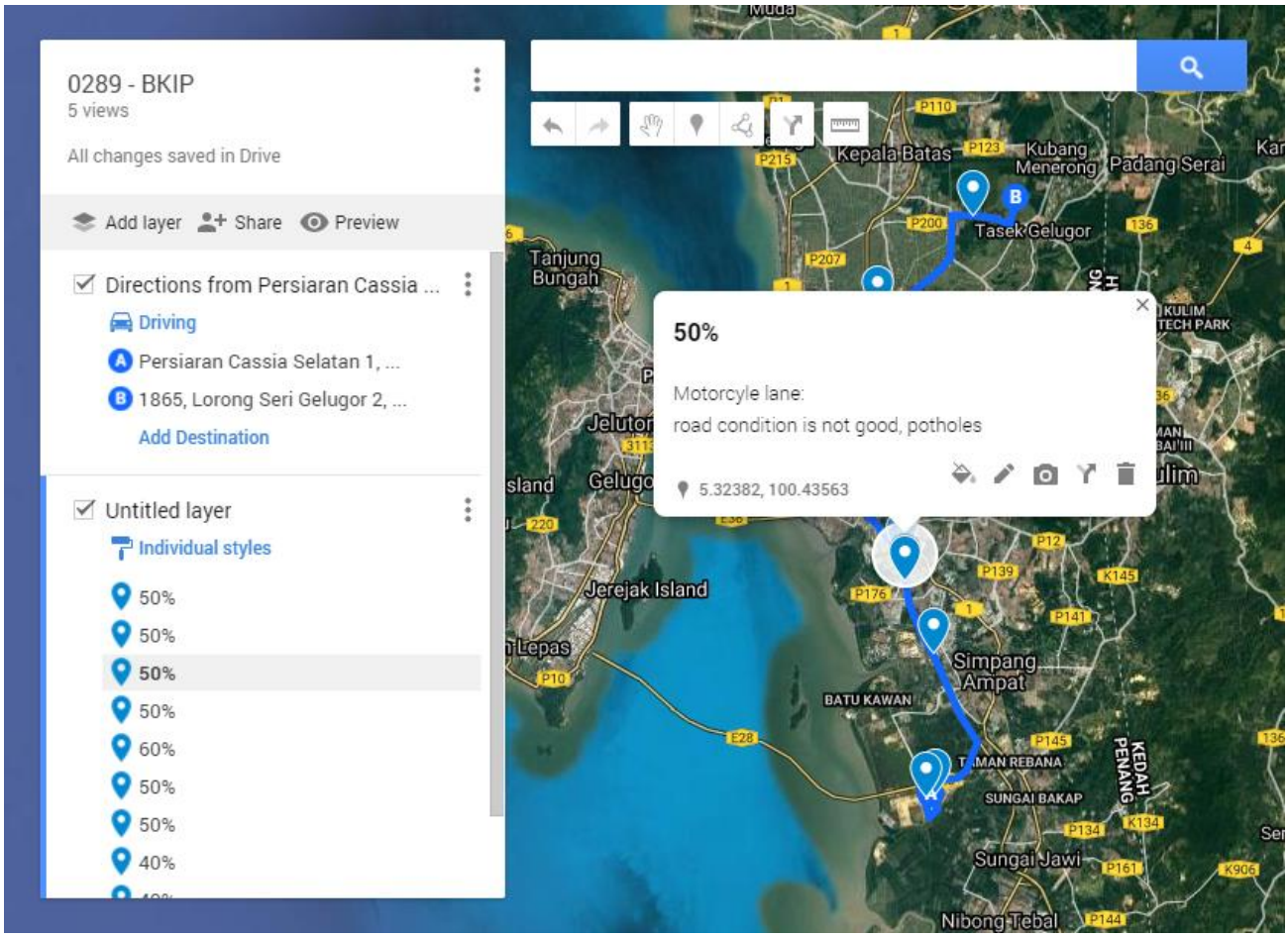


Figure 3.3: Respondents required to identify the perceived risk of the location being involved in a road accident.