A STUDY ON DISTURBANCE FACTORS OF TRAFFIC FLOW TO THE COMMUNITIES IN JALAN MARAN-GAMBANG (PEKAN GAMBANG), PAHANG DARUL MAKMUR

NOR AISYAH BINTI RUMIDI

A project submitted in fulfillment of the requirements
for the award of the degree of
Bachelor of Civil Engineering (Hons)

Faculty of Civil Engineering and Earth Resources
UNIVERSITI MALAYSIA PAHANG

JULY 2014

ABSTRACT

Traffic flow disruption had been rapidly increase in Malaysia This problem, which causes traffic problems and sometimes vehicles, had lined up (bumper to bumper). Problem in traffic flow occur because of some disturbance factors. Problem of traffic flow disruption during peak hours always occur and posed problem to community and their daily activities. Therefore, this research was conducted to evaluate the traffic flow performance based on link capacity analysis and parking occupancy and to identify the problems faced by the residents which affect to their daily activities. To achieve the objective, a link capacity and parking study was carried out alongside with the distribution of questionnaire to the residents. A straight road of Jalan Maran-Gambang was selected to serve as a study area. From the result it was shown that the occupancy of parking is 83.82%. Thus, it is may cause of traffic congestion because other vehicles need to slow down their vehicles and time delay also will be increase. If more short parking the more it affects the rate of traffic movements. Result also had shown from link capacity analysis. The Level of Service (LOS) of the traffic flow is LOS C and for the growth factor 15% the LOS remain same. From the questionnaire, the result shown that the major factors of traffic flow disruption is heavy vehicles. It can be conclude that the major disturbance factors are from heavy vehicles (91%), the pattern of the parking (87%) and also the narrow road (76%) that may pose danger to community.

ABSTRAK

Gangguan aliran lalu lintas semakin menular di Malaysia dari semasa ke semasa. Masalah ini disebabkan oleh aliran lalu lintas serta kenderaan yang kadang kala terpaksa berbaris sehingga hamper bertembung antara satu sama lain. Masalah aliran lalu lintas ini disebabkan oleh beberapa faktor. Masalah ini sering berlaku pada waktu puncak dan mendatangkan masalah kepada masyarakat sekitar serta aktiviti seharian mereka Oleh itu, kajian ini dijalankan bagi menilai prestasi aliran lalu lintas menggunakan analisis kapasiti pautan dan analisi penghunian tempat letak kereta serta mengenalpasti masalah yang dihadapi oleh penduduk yang memberi kesan kepada aktiviti harian mereka. Untuk mencapai matlamat tersebut, kapasiti link dan kajian tempat letak kenderaan telah dijalankan bersama dengan pengedaran soal selidik kepada penduduk. Satu jalan lurus Jalan Maran-Gambang telah dipilih untuk berkhidmat sebagai kawasan kajian. Dari hasil yang ia menunjukkan bahawa penghunian letak kereta adalah 83,82%. Oleh itu, adalah boleh menyebabkan kesesakan lalu lintas kerana kenderaan lain perlu memperlahankan kenderaan mereka dan kelewatan masa juga akan meningkat. Jika tempat letak kereta lebih pendek maka ia mempengaruhi kadar pergerakan lalu lintas. Keputusan juga menunjukkan daripada analisis kapasiti pautan. Tahap Perkhidmatan (LOS) aliran lalu lintas ialah LOS C dan atas faktor pertumbuhan 15%, LOS kekal sama. Daripada soal selidik, hasilnya menunjukkan bahawa faktor-faktor utama aliran gangguan trafik adalah kenderaan berat. Kesimpulannya, bahawa faktor-faktor gangguan utama adalah dari kenderaan berat (91%), corak tempat letak kereta (87%) dan juga jalan kecil (76%) yang boleh mendatangkan bahaya kepada masyarakat.

TABLE OF CONTENTS

CHAPTER 5 CONCLUSION AND RECOMMENDATIONS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS

Km/hr	Kilometer per hours
Mile/hr	Mile per hours
Veh/hr	Vehicle per hours
H	Hour
f_{LW}	Lane Width Factor
%	Percentages

LIST OF ABBREVIATIONS

LOS	Level of Services
DHV	Daily Hours Vehicles

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Nowadays, our country had developed rapidly which provide some facilities contribute to the high standard of living. However, the problems that occur on the highway and with the availability of transports facility provided a negative impact on some communities. This problem includes crashes, delays, parking difficulties and congestions. To reduce this negative impact, it is necessary to adequate the information to identify the problems.

Traffic problems are not a new thing that happened in our country. Traffic flow problem, not just only occurs at urban area, but also happen in rural route area. This problem arises when the route becomes one of the main roads from rural area to an urban area. Besides that, it is also become an issue when the road becomes the only one main road of heavy vehicles such as truck. This situation creates a lot of problems for other users especially for people living near the road and has their daily activities such as make a small business selling fresh food and fruits. Rapid development in the area will generate economic activity of the area. This will attract more people particularly the rural population focused on the area.

Therefore, this research should be evaluated by taking the data traffic volume and relate with time which is during peak hour. In addition, this research also important to assess the road situation which shows the maximum level of usage.

1.2 PROBLEM STATEMENT

In general, the traffic problem also occurs in rural areas, especially route where people conduct their daily routine activities. The problems that occur are:-

i. Problem of traffic flow disruption during peak hours.

ii. Problems faced by people living in the study area and their daily activities.

This research focused on the first problem often occurs during peak hours. This is caused by the varying classification of vehicles and which causes traffic problems and sometimes vehicles had lined up (bumper to bumper). This problem occurs when the society is undergoing their daily activities to run a business. They are sufficiently exposed to danger because the roads are narrow and pose a danger to anyone passing by the road. These problems become more prominent when vehicles are parked unorganized. The parking spaces that had been provided not be used but they used the road's shoulder as a car park. There were being more complicated when heavy vehicles such as truck with 3 axles or more parked their vehicles there. This incident will pose problems to communities and also to their daily activities. As shown in figure 1.1, the incident happens during peak hours which are during afternoon at Pekan Gambang.

Figure 1.1: Traffic flow at Jalan Maran-Gambang (Pekan Gambang)

1.3 AIM OF STUDY

The aim of this research is to identify the disturbance factors of traffic flow to the communities in Jalan Maran – Gambang.

1.4 OBJECTIVES

Data and observations will be taken at several locations of the study. To achieve the aim of this study, the objectives have been identified:

i. To evaluate the traffic flow performance based on link analysis capacity and parking occupancy.

ii. To identify the problems faced by peoples around Jalan Maran – Gambang in which affect their daily activities.

1.5 SCOPE OF STUDY

The scope of this research focused on the traffic flow in Jalan Maran – Gambang. The data of classification of vehicles, and the counting vehicles will be taken during peak hours according to specific time. Parking survey will be conducted to identify whether parking pattern is the major factor of traffic flow disruption. Besides that, a few of questions using questionnaire were distributed to the communities in the area of study such as workers, visitors etc. to support this research. Through information obtained, the data and observations will be analyzed and a histogram graph will be formed. Data of classification of vehicle will relate with time which is at 6.30 A.M to 7.30 A.M, 12 P.M to 1 P.M and 5 P.M to 6 P.M for 5 days. The observation of the number of vehicle also will be count to find the level of service (LOS) of the road.

1.6 SIGNIFICANT OF STUDY

To identify traffic flow problem, the author needs to identify input such as traffic volume and the characteristic of the road. The finding input needs to accurately analyze. Therefore, the result of this research is important to solve the problems that

occur. The information obtains can be recorded and subsequently analyzed. With data analysis,,some implementation will produce to upgrade the condition of the road. It will give a positive impact to the people around and other road users. This research will help to reduce traffic flow problems thus reducing the rate of danger to people cross the road or people around especially their health problem. This study is also necessary to identify the main cause traffic problems and be able to know the traffic flow problems always occur.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The obstructed of the traffic flow or also known as traffic congestion is some of the major consequence to the public safety. Analysis of traffic flow is one of the studies of interaction between drivers, vehicles and infrastructure. This analysis is for upgrading of traffic more efficiently and reduces the traffic congestion. The traffic flow at some places or area is different for example; in an urban area the traffic conditions may be more extreme than in rural areas or villages.

Traffic also affect various aspects related to communities' lives such as, walking or crossing the road, visitors parking, and also their health. Parking is one of the major problems that are created by the increasing of the traffic congestions.

2.2 TRAFFIC VOLUME

Traffic volume is the traffic intensity in a road for a period of time. To calculate the traffic volume through various ways such as people counting the number of vehicles manually or by using electronic tools which is nowadays another country starting to use because it is more effective. Traffic volume is calculated to identify the route that frequently used and have high traffic volume. If the route has an excessive number of vehicles, the council will add a new alternative route so that it will reduce the traffic congestion. According to the statement by Michael Z.F.Li, 1999, in Singapore, a restriction has been conducted which is known as the Whole-day Area Licensing Scheme (WALS) to road users to make payments as toll for each category of vehicles

with different costs. As the result, the problems of traffic flow are reduced especially during peak hours. But this restriction doesn't remain an automatically disbanded because of communities in Singapore who cannot afford at that time. To solve this problem, (McCarthy and Tay, 1992) start their research to get an estimate traffic congestion using traffic count data.

2.2.1 Vehicles Classification

Many research about this issue to identify the vehicle classification using data from traffic monitoring and data collection system. Reviews on this topic were provided by many researchers (e.g., Sun, 2000; Mimbela and Klein, 2000; Benekohal and Girianna, 2003). The importance of regional demand and emission control is the vehicle classification data (Sun and Bun, 2013). Roadway usage by large vehicles is one of the fundamental factors determining the lifespan of highway infrastructure (Coifman and Kim, 2009). According to (Sun and Bun, 2013) the uses of GPS data can easily know the speed, acceleration and deceleration rate with different classes of vehicles.

Table 2.1: Classification of Vehicles

Vehicle class	Vehicle type	Description
A	Small goods vehicle	Bicycle, motorcycle, cycle-trailers, oxcarts with pneumatic rollers, donkey carts and other NMT, pick-up, GVW ≤ 1.5 tos, length ≤ 6.5m, width ≤ 2.0m, and light trailer with GVW ≤ 1.0t.
B	Light truck	Rigid light truck: GVW > 1.5 and < 3.5t, length ≤ 6.5m, width ≤ 2.3m
C	Ligt truck	Rigid light truck: GVW > 3.5t and < 8t, length ≤ 6.5m, width ≤ 2.3m
D	Medium	Rigid light truck: GVW > 8t and < 12t, length ≤ 6.5m, width ≤ 2.3m. Or farm tractor or traction unit with trailer: GVW > 1.0t and < 8t, length ≤ 7.5m, width ≤ 2.3m.

Sources: UN-ESCAP (Study on Rural Road Transport 1991, p.22)

In summary, the vehicles classification method such as heavily rely on fixed location sensing and detection technique, and for the second is it just can collect data at the location that were determining by the existing traffic monitoring and the data collection systems, this both method will be very expensive to be applied in wide area (Avery et al., 2004).

2.2.2 Capacity

Capacity is defined as the maximum mean hourly rate and the maximum number of vehicles that pass through a point in a specified road and traffic conditions (John Van, 2004). The road capacity is different for each intersection and at a long route. To identify the capacity of each route, a study was conducted and showed the relationships between capacity of the road and the result of level-of-service offered to the user of the road.

Table 2.2: Level of Service for Basic Freeway Section of 70 Km/h Design Speed

LOS	Flow conditions	v/c limit	Service Volume (veh/hr/lane)	Speed (mile/hr)	Density (veh/mile)
A	Free	0.35	700	> 60	< 12
B	Stable	0.54	1100	> 57	< 20
C	Stable	0.77	1550	>54	< 30
D	High density	0.93	1850	2: 46	40
E	Near capacity	1.0	2000	2: 30	67
F	Breakdown		Unstable	< 30	> 67

Sources: (John van Rijn, Road Capacity, Edition 2004)

Table 2.2 shows the condition of the road according to the capacity and flow condition. The maximum capacity is 2000 veh/hr/lane that caused the flow of traffic is very congested. The purpose of road capacity study was conducted to find out the capacity of the road to accommodate the road. This is to avoid traffic congestion. Traffic congestion occurs because of the ability to accommodate the traffic exceeds the

capacity of the road. In a particular location, road capacity will not be increased to accommodate the growth of uses of the car but the h of vehicles must be in accordance with the existing capacity. To reduce the traffic growth and the amount of traffic time, the road capacity policy needs to focus more (Phil Goodwin). SACTRA concluded that the increases in road capacity in congested condition were likely to induce additional traffic.

Among the important factors that affect the value of the capacity is shoulder width, lane width, and traffic flow characteristic.

The shoulder of the road a s shown in **Table 2.3,** is the side of the road at every road. But there are some roads do not have the shoulder such a federal road. The shoulder of the road is often used by motorists as a place for vehicles that are damaged, or used by emergency vehicles such as ambulance or firefighters. Besides, the shoulder of the road is usually used to improve road safety by increasing visibility. In terms of its structure, it can support surface with the loading imposed by the road surface. Road users are also able to standardize their speed if collide with other vehicles. As shown in figure 2.3, JKR standardize the shoulder width according to the design road specification.

Table 2.3: Shoulder Width for Rural route with different location

Design road	Width of shoulder (m)		
	Types of area		
	Flat	Rolling	Terrain
R6	3.00	3.00	2.50
R5	3.00	3.00	2.50
R4	3.00	3.00	2.00
R3	2.50	2.50	2.00
R2	2.00	2.00	1.50
R1	1.50	1.50	1.50
R1a	1.50	1.50	1.50

Sources: (JKR, 1985)

As shown in **Table 2.4**, lane width is very important in avoiding an increase in road accidents. Lane width depends on the type of road designed. If the lane width is narrow, it will give problems to heavy vehicles. When a heavy vehicle meets with each other, they are going to be dangerous especially at night day.

Table 2.4: Lane Width with Different Classes

Design Road	Road Width (m)
R6/U6	3.50
R5/U5	3.50
R4/U4	3.25
R3/U3	3.00
R2/U2	2.75
R1/U1	(5.00)
R1a/U1a	(4.50)

Sources: (JKR, 1985)

Next is the characteristic of the traffic flow. The characteristic of traffic flow is greatly influencing the capacity of the road. This is because of the type of vehicles using the road at any one time is quite different. At one time, the various types of vehicles such as heavy vehicles and light vehicles will reduce the value of capacity. Heavy vehicles required more space than light vehicles such as cars. Heavy vehicles also have lower velocity or speed than light vehicles and cause traffic flow more slowly.

2.3 ROAD TRAFFIC PROBLEM RELATED TO HUMAN HEALTH

According to sources from the CMAJ (Canadian Medical Association Journal), the increasing of pollution and traffic problems may give a negative impact on public health. Pollution problems will occur when traffic flow problems occur and give a negative impact on the surrounding residents. This problem will become bigger when the road nears the public housing or relocation. The effect such as air pollution, noise from heavy vehicles causes difficulty to the route. More seriously, when people stay

around the road, it may cause suffering and ill from various kinds of diseases. According to the research (Nicole A.H, 2003), most of the children who live near a busy traffic may have impaired respiratory health. These problems result from exposure to exhaust vehicles. Air pollution occurs when pollutants released by vehicles such as fine particles, nitrogen oxides d diesel soot that can cause heart and breathing problems. This is also may pose problem when the traffic flows is inconsistent and always have traffic congestion. The pollution problems caused by traffic congestion not only an impact to health in the short term but also in the long term. This problem can also lead to death if the problem is not contained.

2.4 LAND USED ACTIVITY

The structure of land use is important to a transport demand and capacity of transport. The spatial location of activities like residence, work, shopping, production and consumption give some indications on the required travel demand and average distances between activities. The higher level of integration between transportation and land use will increase the level of accessibility of automobile travel (Jean Paul, 2003). Commercial uses are defined as areas that allow for trade and commerce. Permitted uses range from retail shopping to office and professional business parks. Commercial areas are those used predominantly for the sale of products and services. This resulted in unstable traffic flow. When the road is one of the major transportation routes, it is influence other land uses.

2.5 HEAVY VEHICLES

The numbers of uses of vehicles become increasing from year to year, between 1998 and 2001 the total distance travelled by the heavy vehicles increase by 17% from 2873 million kilometers to 3355 million kilometers (Baas & Bolitho, 2003). Before that, many researches that related with heavy vehicles is done by researcher. From Rabecca Luther, she found that the residents reported that traffic affected various aspects of their lives including visitor parking, walking/crossing road, and their health. The analysis of heavy vehicles shows that the highest percentages were found due to the decrease in car passenger car volume and in overall vehicular traffic (A.L Cunha & J.R Setti, 2010).

2.6 LEVEL OF SERVICE (LOS)

Level of service is a measure of the quality or the capacity of the traffic flow in a section of the road. The capacity of LOS can be measured by several parameters such as vehicles speed and volume of the vehicles at that time. The level of service (LOS) is measured during peak hours. While the measure of LOS, there are not include the safety. By Royer P. Roess statements, there are six types of road service level which is LOS A, LOS B, LOS C, LOS D, LOS E and LOS F.

Table 2.5: Level of Service (LOS)

Level of Service	Remarks
A	Free flow with low volumes, densities and high speeds. Driver can maintain their desired speeds with little or no delay.
B	Stable flow. Operating speeds beginning to be restricted somewhat by traffic conditions. Some slight delay.
C	Stable flow. Speeds and maneuverability are more closely controlled by higher volumes. Acceptable delay.
D	Approaching unstable flow. Tolerable operating speeds which are considerably affected by operating conditions. Tolerable delay.
E	Unstable flow. Yet lower operating speeds and perhaps stoppages of momentary duration. Volumes are at or near capacity congestion and intolerable delay.
F	Forced flow. Speeds and volumes can drop to zero. Stoppages can occur for long periods. Queues of vehicles backing up from a restriction downstream.

Sources: (JKR, 1985)

2.7 PARKING SYSTEMS

The data on the availability of parking such as the demand is important before taking any measure as an improvement. Some of parking provides parking fare. The duration of parking is depends on the vehicles park. Parking which are on the both sides of the road are allowed but sometimes, it is become one of the disturbances to the traffic flow disruption.

2.7.1 Parking Requirements

In Malaysia, there were many types of parking requirements. Parking types will be different in a different place, different building, and also according to the land use activity. For the residential area which have less than $300m^2$ area, it is just required the community parking space only. For space 500 to $1000m^2$ parking space need to be provided about one-fourth of the open area. So, that's means, the land use activity influence the parking pattern (NPTEL, 2006).

2.7.2 On-Street Parking

There are two types of parking which is on street parking and off street parking. On street parking means the parking provided at both or one sides on the road or street. There are many types of the pattern of on street parking such as parallel parking. Parallel parking is when vehicles park their car along the road either both sides or just one sides only as shown in **Figure 2.1**.

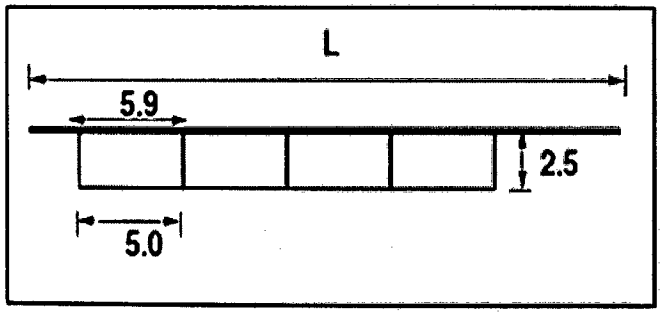

Figure 2.1: An Illustration of Parallel Parking

Sources: NPTEL, 2006

The equation (Eq. 1) shows the calculation of the length of road depends on the number of vehicles, N.

$$L = \frac{N}{5.9} \qquad \text{(Eq.1)}$$

30^0 angle parking, the capacity occupancy of this pattern is more than parallel parking. The times delay will be reduces and thus reduce traffic disruption. The examples of 30^0 parking pattern as shown in **Figure 2.2.**

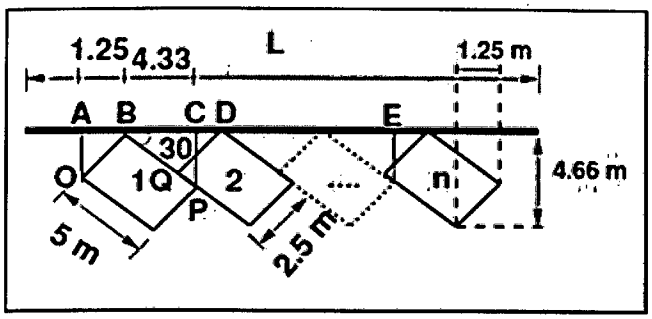

Figure 2.2: An Illustration of 30^0 Parking

Sources: NPTEL, 2006

2.7.3 Effect of Parking

The parking behavior has some affect towards the environmental, public safety and also to the traffic flow. Some example of the effects is congestion, accidents, pollution, and also fire-fighting operations. When the road shoulder is considered as parking bay, it is may pose problems such as congestion. The delay in time will be occurred to the other users because of in and out of the vehicles from the parking bay. The accidents will be occur if people careless to control their vehicles during parking. The small incidents will be happen such as hit the bumper and cause scratches. Others common type of parking accidents such as careless while open the doors, and while they bringing the vehicles out of the parking. Next effect is will cause pollution. The noise and fumes will be spread during parking or unparking. It is also occurred when traffic congestion occur. This will cause problems when road shoulder is used as parking and accidently it may prevent the passage of an emergency such as ambulance etc.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

In this chapter, the author will focus on the effective methods to get more detailed information. Through this chapter, it will develop a better understanding about the research in detail, particularly how research is conducted and the information that will be discussed. In a research, the important thing is a process and how the way to interpret the correct data so that the research will do smoothly and the information provided are true and have their evidence. In general, there are two methods of carrying out the research which is qualitative methods and quantitative methods but there is some research that carries both methods. In this research, the author uses quantitative methods in which the authors provide a questionnaire sample. The data is very useful to the author to gain more information.

3.2 RESEARCH PLANNING

A research process should prepare first to understanding about the process or flow that will do for the research. In this research, a flow chart is provided to show the research process. At the beginning of the research, some problem statement is defined and identified the objectives. After that, do the preliminary research, as a literature review, do fieldwork and lastly is analyze data. The types of data should be set up to observe the data. The location and appropriate methods should be identified to observed work on site. Next, the results of the study were analyzed and discussed based on the results.