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Date of Birth : 22 DECEMBER 1993

Title : RATE OF OCCUPANCY OF RAPID KUANTAN BUSES

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ASSOC. PROF. DR. SULISTYO ARINTONO  
ASSOC. PROF.  
FACULTY OF CIVIL ENGINEERING & EARTH RESOURCES  
UNIVERSITI MALAYSIA PAHANG  
JEBUHRAYA TUN RAZAK  
26300 GAMBANG, KUANTAN, PAHANG  
TEL: +609 549 2971/2999 FAKS: +609 549 2998

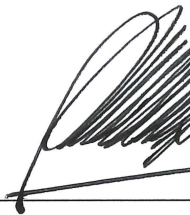
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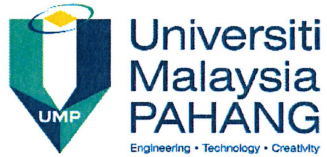
ASSOC. PROF. DR. SULISTYO ARINTONO  
ASSOC. PROF.  
DEPARTMENT OF CIVIL ENGINEERING & EARTH RESOURCES  
UNIVERSITI MALAYSIA PAHANG  
JALAN TEBUHRAYA TUN RAZAK  
26300 GAMBANG, KUANTAN, PAHANG  
TEL: +609 549 2971/2999 FAKS: +609 549 2998

(Supervisor's Signature)

Full Name : PROF. MADYA DR. SULISTYO ARINTONO

Position : SENIOR LECTURER OF CIVIL ENGINEERING AND EARTH  
RESOURCES

Date : JUNE 2017



## STUDENT'S DECLARATION

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A handwritten signature in black ink, appearing to read 'Noor Ainina', is written over a horizontal line.

(Student's Signature)

Full Name : NOOR AININA FAZLIA BINTI MOHAMMAD

ID Number : AA12156

Date : 16 JUNE 2017

RATE OF OCCUPANCY OF RAPID KUANTAN BUSES

NOOR AININA FAZLIA BINTI MOHAMMAD

Thesis submitted in fulfillment of the requirements  
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## ABSTRACT

In Malaysia, the public transport system has always been the government attention to be improved from time to time until government carried out the plan to improve the urban public transport. Public transport should be an incentive for people to move around easily without having to think about traffic congestion. However, people are still choosing to move on their own and do not make use of public facilities. In order to meet the basic needs of urban area and high employment demand, the performance indicators should be addressed. Which is why Rapid Kuantan should comply with several indicators such as bus utilization, time headways, cycle times, passenger ridership, load factor, etc. So, this study aims to assess the rate of occupancy in Rapid Kuantan. 6 bus routes based on short, medium and long route length have been selected to assess the occupancy of Rapid Kuantan bus services and identify routes with low occupancy. Data collections are completed by observing at the bus terminal and doing passenger counting on board the buses of peak and off-peak hour during weekdays and weekend. In this study, the results revealed that for time headway, Hentian Bandar to Ubai recorded the highest time of 70 minutes. Therefore, addition in number of buses can help to reduce the headway between buses. Routes Hentian Bandar to Terminal Sentral Kuantan and Hentian Bandar-Indera Sempurna have high cycle time of 464 and 471 minutes respectively. So, in these kind of cases, it would be better to reduce the waiting time of passenger considering the limited number of buses used. Lastly, routes from Hentian Bandar to Indera Sempurna received high passenger demand for Kuantan area because this routes has obtained 73% of load factor which more higher than the World Bank Standard (70%). Higher load factor than the standard can means that the routes having quite many passenger occupied on the buses but still they able to get seated.

## ABSTRAK

Di Malaysia, sistem pengangkutan awam sentiasa menjadi perhatian kerajaan untuk ditambah baik dari semasa ke semasa sehingga kerajaan mengadakan rancangan untuk penambahbaikan pengangkutan awam di bandar. Pengangkutan awam harus menjadi satu insentif bagi orang ramai untuk bergerak dengan mudah tanpa perlu berfikir tentang kesesakan lalu lintas. Walau bagaimanapun, masyarakat masih memilih untuk bergerak sendiri dan tidak menggunakan kemudahan awam. Dalam usaha untuk memenuhi keperluan asas kawasan bandar dan permintaan pekerjaan yang tinggi, petunjuk prestasi hendaklah ditangani. Itulah sebabnya Rapid Kuantan perlu mematuhi beberapa petunjuk seperti penggunaan bas, masa menunggu, masa kitaran, bilangan penumpang, faktor muatan, dan lain-lain. Oleh itu, kajian ini bertujuan untuk menilai kadar kenaikan di Rapid Kuantan. 6 laluan bas berdasarkan pendek, sederhana dan panjang laluan telah dipilih untuk menilai kadar kenaikan perkhidmatan bas Rapid Kuantan dan mengenal pasti laluan dengan kenaikan yang rendah. Pengumpulan data selesai dengan pemerhatian di terminal bas dan melakukan kiraan penumpang di atas bas pada waktu puncak dan waktu lantang pada hari bekerja dan hujung minggu. Dalam kajian ini, keputusan mendedahkan bahawa untuk jarak masa, Hentian Bandar ke Ubai mencatatkan masa yang paling tinggi iaitu 70 minit. Oleh itu, penambahan dalam bilangan bas boleh membantu untuk mengurangkan jarak masa di antara bas. Laluan Hentian Bandar ke Terminal Sentral Kuantan dan Hentian Bandar-Indera Sempurna mempunyai masa kitaran tinggi yang tinggi iaitu 464 dan 471 minit. Jadi, dalam kes seperti ini, ia akan menjadi lebih baik untuk kurangkan masa menunggu penumpang memandangkan bilangan terhad bas yang digunakan. Akhir sekali, laluan dari Hentian Bandar ke Indera Sempurna menerima permintaan penumpang yang tinggi untuk kawasan Kuantan kerana laluan ini telah mendapat 73% faktor muatan dimana ianya lebih tinggi daripada Standard Bank Dunia (70%). Faktor muatan yang tinggi daripada standard bermakna laluan tersebut mempunyai cukup banyak penumpang dinaiki dalam bas tetapi masih mereka mampu untuk duduk.

## TABLE OF CONTENTS

	<b>PAGE</b>
<b>SUPERVISOR'S DECLARATION</b>	ii
<b>STUDENT'S DECLARATION</b>	iii
<b>ACKNOWLEDGEMENT</b>	
<b>ABSTRACT</b>	
<b>ABSTRAK</b>	
<b>TABLE OF CONTENTS</b>	
<b>LIST OF TABLE</b>	
<b>LIST OF FIGURES</b>	
<b>CHAPTER 1 INTRODUCTION</b>	
1.1 Background of Study	1
1.2 Problem Statement	5
1.3 Objectives of Study	5
1.4 Research Questions	5
1.5 Scope of Study	6
1.6 Significance of Study	6
<b>CHAPTER 2 LITERATURE REVIEW</b>	
2.1 Introduction	7
2.2 Types of Public Bus Transport in Kuantan	8
2.2.1 Express Buses	8
2.2.2 Intercity Buses	9
2.2.3 Local City Buses	9
2.3 Components of Public Bus Transport System	10



2.3.1	Bus Station	10
2.3.2	Bus Terminal	10
2.3.3	Bus Depot	11
2.3.4	Bus Stops	11
2.3.5	Routes	11
2.4	Bus Operating Characteristics	11
2.4.1	Bus Utilization	12
2.4.2	Travel Distance	12
2.4.3	Ridership	12
2.4.4	Load Factor	13
2.4.5	Time Headway	14
2.4.6	Cycle Time	14
2.4.7	Number of Buses	15

### **CHAPTER 3 METHODOLOGY**

3.1	Introduction	16
3.2	Location of the Study	16
3.3	Route Characteristics of the Study Area	18
3.4	Data Collection	21
3.5	Data Analysis	21

### **CHAPTER 4 RESULT AND DISCUSSIONS**

4.1	Introduction	23
4.2	Data Results	23
4.3	Data Discussions	25
4.3.1	Time Headway Results	25

4.3.2	Number of Trips and Travel Distance per Bus per Day Results	27
4.3.3	Cycle Time Results	29
4.3.4	Number of Passenger Results	30
4.3.5	Average Travel Distance per Passenger Results	31
4.3.6	Load Factor Results	32

## **CHAPTER 5 CONCLUSION AND RECOMMENDATIONS**

5.1	Introduction	34
5.2	Conclusion and Recommendations	34

<b>REFERENCES</b>		<b>36</b>
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## **APPENDICES**

<b>A,B,C,D,E,F</b>	Sheet for passenger counting survey	37
<b>G</b>	Sheet for service frequency survey	46
<b>H</b>	Example calculation on-board survey	47

## LIST OF TABLES

1.1	Routes of Rapid Kuantan	3
3.1	World Bank standard for bus performance	22
3.2	World Bank standard for daily passengers per operating bus	22
4.1	No of passenger per trip for routes 200	23
4.2	No of passenger per trip for routes 303	24
4.3	No of passenger per trip for routes 600	24
4.4	No of passenger occupied for routes 101	24
4.5	No of passenger occupied for routes 500	24
4.6	No of passenger occupied for routes 402	24
4.7	Headway (Rapid Kuantan)	25
4.8	Number of trips per bus per day (Rapid Kuantan)	27
4.9	Travel distance per bus per day (Rapid Kuantan)	27
4.10	Cycle time (Rapid Kuantan)	29
4.11	Number of passenger (Rapid Kuantan)	30
4.12	Average travel distance per passenger (Rapid Kuantan)	31
4.13	The number of passenger and load factor (Rapid Kuantan)	32

## LIST OF FIGURES

1.1	Route flow from zone 1 to zone 2 of the bus route number 100	4
2.1	Express buses at Terminal Sentral Kuantan (TSK)	9
2.2	Rapid Kuantan at the Hentian Bandar	10
3.1	Flow chart of the study	17
3.2	Map show the location of Rapid Kuantan bus route 303 with the shortest route length	18
3.3	Map show the location of Route 200 of Rapid Kuantan with short route length	18
3.4	Map show the location of Routes 101 ‘Hentian Bandar – Indera Sempurna’ of medium route length	19
3.5	Map show the route location from Hentian Bandar to Balok Makmur (via Beserah) with medium route length	19
3.6	Map show the location of Route 500 ‘Hentian Bandar – Sungai Lembing’ with long route length	20
3.7	Map show the Route 402 from Hentian Bandar to Ubai with the longest route length	20

# CHAPTER 1

## INTRODUCTION

### 1.1 BACKGROUND OF STUDY

Kuantan is the state capital of Pahang, Malaysia which near the Kuantan River and faces the South China Sea (River et al., 2016). Kuantan is the twelfth largest city in Malaysia having approximately 366,229 of population. According to the World Gazetteer, a calculation indicates that the annual population growth in Kuantan is the greatest among the East Coast of Peninsular Malaysia, which are 3.88 percent per year in general.

In the recent years, along with the rapid growth of development and increasing population. Kuantan facing one of major problem is traffic congestion especially in the city centre. Numbers of vehicles on the road grow up each day because public prefer using private cars although they have acknowledged the traffic problem that getting bigger.

So in order to decrease the road congestion, the government introduced new efficient approach of public transportation services to be use by general public. Public transportation is a shared service with enormous capacity of passenger to move to any place in one time. Public transport modes are available all over the world including Malaysia which consists of carpool, buses, trains, taxis, airplane and ferries. Transport is one of the alternative communications between rural and urban communities to move from one destination to another destination with multipurpose of working, shopping, and entertainment etc.

Malaysia Institute of Road Safety Research (MIROS) proved that the risk of accidents when using public bus transport is seven times lower than driving their own vehicles and 48 times safer than riding a motorcycle. Despite the obvious advantage of public bus transport, the occupancy of passengers still seems lacking anyway. Hence, the effectiveness of public transport should be aligned with the rapidly evolving development in the country in order to maintain the sustainability of public transport. As a competitor to private vehicles, public transport should highlight improved properties such as frequency, good facilities, punctuality, longer routes and so on.

Therefore, in line with the government approach in enhancing public transportation, Syarikat Prasarana Negara Berhad (Prasarana) operates Rapid Kuantan buses in Kuantan city. Rapid Kuantan is an initiative of the central government through Bajet 2013 was launched on 1 December 2012 and currently have total of 80 Scania K-series buses and 17 routes operating within the city. It services serves for the journey starting at Hentian Bandar until the last stop according in the schedule. Operation hour starting at 6 in the morning then ended at 11 pm for weekdays, weekend and public holiday too. The number of routes of Rapid Kuantan with one-way trip is shown in Table 1.1.

The bus fares are different according to age. For children under the age of seven, the fares are not charged. Meanwhile the fares are charged half-price for school students. The adults are charged with RM2 travel across 30 km (Zone 1) and RM4 for travel above than 30 km (Zone 2). Figure 1.1 shows an example of Zone 1 and Zone 2 of Rapid Kuantan bus no 100. Besides, Rapid Kuantan Sdn Bhd gives an advantage to its users by introducing MyRapid concession card which would benefit with getting fares discount by 20 percent for various group of age.

**Table 1.1 Routes of Rapid Kuantan**

<b>Route No</b>	<b>Route Description</b>	<b>Route Length (km)</b>
303	Hentian Bandar - Terminal Sentral Kuantan	6.8
603	Hentian Bandar - Kolej PSDC	8
201	Hentian Bandar - Taman Gelora	9.5
302	Hentian Bandar - Indera Mahkota 1	10
200	Hentian Bandar - Teluk Cempedak	10
601	Hentian Bandar - Kolej Polisas	11
300	Hentian Bandar - Taman Impian	18
102	Hentian Bandar - Permatang Badak	18
101	Hentian Bandar - Inderapura/Indera Sempurna	18
600	Hentian Bandar - Balok Makmur (via Jln Beserah)	24.5
604	Hub Balok Makmur - Cherating	25
602	Hentian Bandar - Balok Makmur (via Jln Bypass)	27.8
103	Gugusan Felda Panching-Gugusan Felda Panching Utara	40
301	Hentian Bandar-Bukit Goh,Bukit Kuantan & Bukit Sagu	42
100	Hentian Bandar - Gambang Resort	46
401	Hentian Bandar - Kuala Pahang	48
500	Hentian Bandar - Sungai Lembing	50
400	Hentian Bandar - Pekan	53
402	Hentian Bandar - Ubai	61

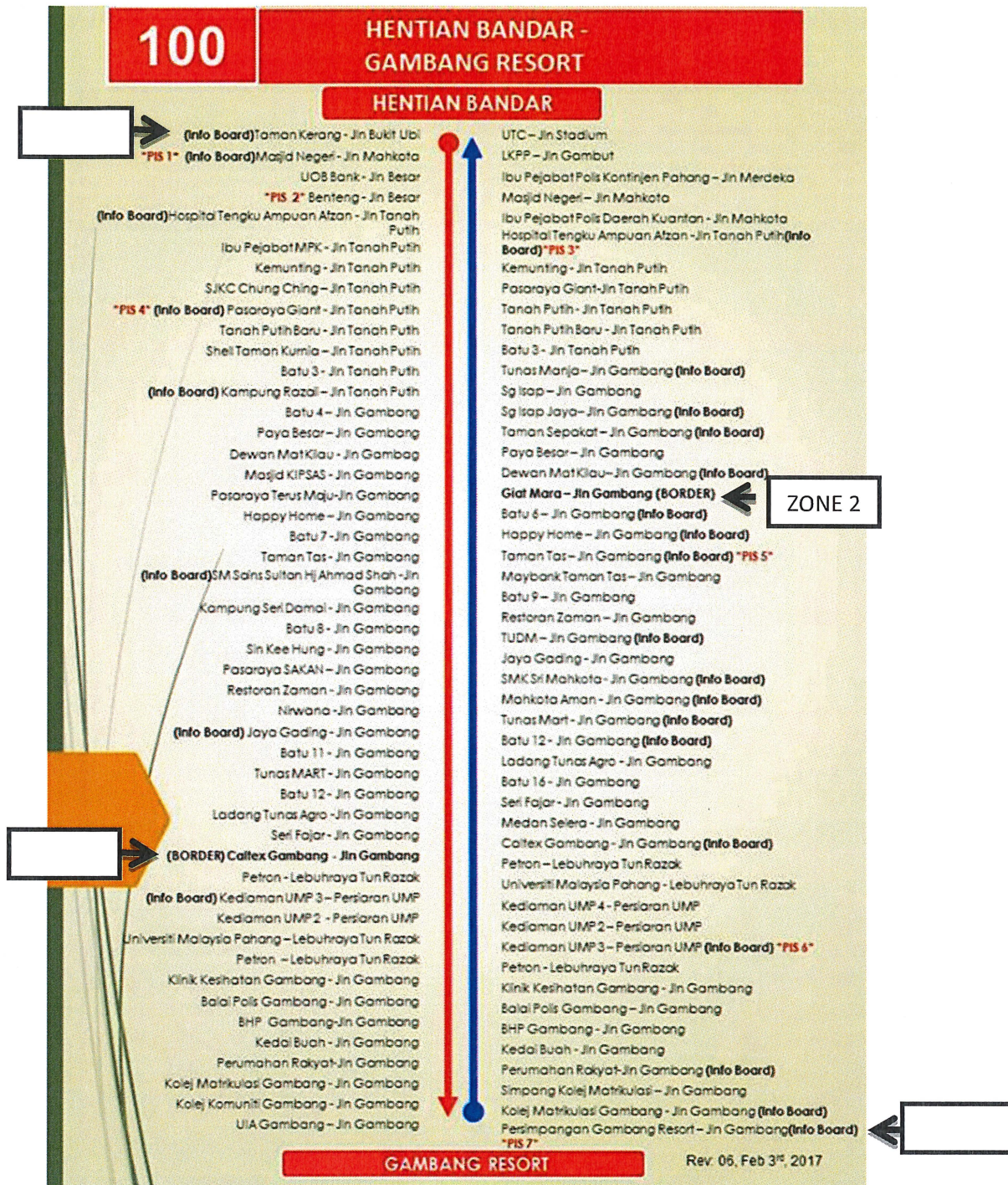


Figure 1.1 Zone 1 and Zone 2 of bus route number 100



## **1.2 PROBLEM STATEMENT**

Public transportation is one of the components in solving problems regarding traffic congestions especially during peak hours. But instead of using public transport, the citizen much prefer riding private vehicles. The bus occupancy is at low level because of the services itself making the usage of public transportation becomes poor and public get over-dependency on private cars. Most travellers prefer cars that are more cost and time effective than an unplanned public transport system (Almselati, et al., 2011).

The problem identified is the bus transport is not fully occupied with passengers and does not have an efficient time schedule which be followed accordingly and punctually. The buses are rarely full and mostly empty all the time especially buses number 100 that coming in UMP. Lacking in bus users can cause unproductive activities in the course of public transportation and rates of fares slightly. Therefore, does Rapid Kuantan can survive with no subsidies?

## **1.3 OBJECTIVES OF STUDY**

The main objectives of this study are as follows:

- To assess occupancy of the Rapid Kuantan bus services
- To identify routes with low occupancy
- To make improvements to the bus service

## **1.4 RESEARCH QUESTIONS**

- Is Rapid Kuantan can survive on its own with current occupancy?

## **1.5 SCOPE OF STUDY**

The scope of this study is to perform an observation on occupancy of the Rapid Kuantan passengers at the main terminal, bus stop and passengers on/ off of the bus in the Kuantan city. The data collection will be conducted according to short, medium and long routes of Rapid Kuantan such as routes to Terminal Sentral Makmur, Balok Makmur, and Pekan. The survey will be conducted based on the objectives mentioned earlier.

## **1.6 SIGNIFICANCE OF STUDY**

The importance in using public transport would reduce the number of private cars on the road yet reducing the traffic congestion in the city. Using public transport can also reduce consumption rates of rising price fuel where it can create a better environment for the community. Furthermore, the provider, Syarikat Prasarana Negara Berhad (Prasarana) can identify the weaknesses of the system and making an improvement so that Rapid Kuantan will be the main preference by people to move within the city.

In addition, public users will be more relaxed during the trip without the pressure of facing a traffic jam and of course it would saves money too. In conclusion, the users will be able to enjoy the benefits provided by Rapid Kuantan in terms of mobilization with comforts.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 INTRODUCTION

Public transportation is the contributor to the nation's economy. During these years, Malaysia has developed well in terms of transport network and communication. Transportation in larger cities is good with many different kind of transport for daily mobility and links between people and their job, education and etc. Most domestic transport in Malaysia is well connected, comfortable and reasonably priced for its own people goods.

Transportation in Malaysia started in the days of British rule. As the era advances, transport in the country thriving in terms of networks that are also growing. In fact, Malaysia's road network reached 144,403 km which includes 1,821 km of expressways. Meanwhile the main highway in the country covers 800 km from Singapore to the Thai border.

The main mode of transport in Malaysia consists of land, air and waterways. Currently, buses, taxis, trains and airplanes are presenting the public transport modes in Malaysia. However, public transportation in larger cities sometimes unable to fulfil up to customer's satisfactory. The utilization rate is still poor and the use of private cars is constantly rising. This situation indicates that the current approach has flaws in it. So, public bus services must operate efficiently and effectively. Although the general terminologies of "efficiency" and "effectiveness" seem to be closely related, these two parameters need to be considered separately in public transit system (Hstry 1980; Chu et al.1992). Therefore, good quality services will be able to meet these demands.

## **2.2 TYPES OF PUBLIC BUS TRANSPORT IN KUANTAN**

Kuantan was a part of Chih-Tu Empire in the first century. Kuantan has being identified as one of the future growth centre and hub for trade, commercial, transportation and tourism in the National Physical Plan 2005. Hence, the progress of Kuantan city is improved by the presence of public transportation that available within the city.

The cheapest way to reach Kuantan is by coach. There are numerous bus operators operating between Kuantan and within Peninsular Malaysia. There are three different types of public bus transport in Kuantan which is express buses, intercity buses and local city buses. Local city buses operate at Hentian Bandar located behind General Market (Pasar Besar Kuantan) meanwhile express buses and intercity buses operate at Terminal Sentral Kuantan (TSK).

### **2.2.1 Express Buses**

Express bus is a bus services that connects people from a state to another state in Peninsular Malaysia. An express bus runs faster than a normal bus services because the bus does not making as many stops as the normal bus do along the journey and usually taking highways and expressway to reach the destination. This type of bus always following schedule and depart on time. That's also explains why the passengers need to buy the bus ticket first before boarding.

Express bus companies that available at the terminal which is Cepat Express, Maju Express, Sani Express, Plusliner, Transnasional, Maraliner Express and Utama Express. These bus operators served to anywhere destinations in all over Peninsular Malaysia. Figure 2.1 shows the express buses at Terminal Sentral Kuantan (TSK).



**Figure 2.1 Express buses at Terminal Sentral Kuantan (TSK)**

Sources: Terminal Sentral Kuantan ( TSK ), 2016

### **2.2.2 Intercity Buses**

Intercity buses are bus services operated over long distances between cities. Intercity bus runs for the place surrounding Pahang state which is Muadzam Shah, Temerloh, Jerantut, Jengka and etc. This bus services intended to bring the people between the path of two major cities especially in rural areas and small towns to come to Kuantan. The bus that still serves these services is Transnasiona Coach Services and Utama Express. These buses also known as stage bus.

### **2.2.3 Local City Buses**

Rapid Kuantan buses are accessible to most places in Kuantan even to Pekan, the neighbouring town of Kuantan city. Rapid Kuantan have served for four years from the end of 2012 until now. Rapid Kuantan provide the path with different route lengths in Kuantan including the longest routes to Ubai which covers until 61 km for one-way path. They also provide the journey to the famous tourist spot such as Teluk Cempedak, Taman Gelora and Bukit Gambang Waterpark City. Figure 2.2 shows Rapid Kuantan at the Hentian Bandar.



**Figure 2.2 Rapid Kuantan at the Hentian Bandar**

Sources: More et al., 2016

## **2.3 COMPONENTS OF PUBLIC BUS TRANSPORT SYSTEM**

According to (KYTE, 2016), a good public transport system must be easy and convenient to use, fast, safe, clean and affordable.

### **2.3.1 Bus Station**

This structure is where the pickup and drop off process of passengers of a bus. A bus station much larger than a bus stop. A bus station platform usually fixed for the assigned bus or it is variable in combination with the passenger information system.

### **2.3.2 Bus Terminal**

This structure is where a bus starts or ends its scheduled route for a long journey between states. Bus terminal usually bigger than a bus station because of number of express buses and intercity buses availability. Its schedule would be followed punctually therefore the bus will not wait for the passengers on the contrary.

### **2.3.3 Bus Depot**

A place which also called as bus garage, bus barn, and bus base is where the bus is stored and maintained for any inconvenience purposes such as damages and maintenance. Most of bus garage have the following elements of inspection pits, bus wash, brake test lane, fuel storage tanks and etc.

### **2.3.4 Bus Stops**

Bus stops is usually just a place by the roadside to pick up the passengers who want to board the bus and drop off the people who want to stop by that location. It also may be intended to be the transfer station for the number of routes where the journey will continue.

### **2.3.5 Routes**

The permanent roads that travelled by the bus operators to send the passengers from the station or terminal to the location they want along the routes designated. All of the roads has a number of routes on the bus to enable the bus users recognize the destinations that they want are on which routes.

## **2.4 BUS OPERATING CHARACTERISTICS**

Many public bus services are running on a specific timetable with specific time of departure and arrival along the route. However, these schedules are often difficult to maintain in the event of traffic congestion, breakdowns, bus incidents, road blockages and bad weather.

Operating practice can have a significant impact on operating costs, and hence profitability, fare levels, service capacity, reliability and frequency. According to CIRT, performance measurement has become the focus in a variety of public sector. Therefore, public transportation should have the indicator to be used as a reference for comparison to the standards that have been set by the World Bank public transport.

### 2.4.1 Bus Utilization (%)

Bus utilization will compares the time spent in the revenue-earning service to idle time. It expresses the number of buses in service as a percentage of the buses available for the services.

Bus utilization should be 100% unless there are reasons to keep a few of the buses on standby. It might because of the surges in demand or cover for any breakdowns due to accidents or event of high traffic problem.

$$\text{Bus utilization (\%)} = \frac{\text{No of operating bus}}{\text{No of available bus}} \times 100\%$$

### 2.4.2 Travel Distance (km/bus/day)

The indicator for average (km/bus/day) is the sub-criteria which indicate the average of kilometres operating per bus per day during a statistic period. It is define by ratio between average kilometres per day to total fleets available in the depot.

The travel distance will be counted such as how long the buses have been used in a day and kilometre that the buses have moved on the road. All of the bus will be recorded with the determination of travel distance to evaluate the efficiency of the bus. Well, according to the standard of World Bank, high efficiency of a bus will move around 230 km to 260 km each day.

$$\text{Kilometer travel/bus/day} = \text{No of trip/bus/day} \times \text{route length}$$

### 2.4.3 Ridership (Pass/km)

Ridership is the number of persons who occupied and ride the particular public transportation systems in a given period of time.

$$\text{Ridership (pass/km)} = \frac{\text{Total boarding passenger}}{\text{Total hour travelled}}$$



#### 2.4.4 Load Factor (Pax/Seat/km)

Load factor is an important parameter for the assessments of the performance of any transport systems. Almost all transport systems have high fixed costs and these costs only can be enhanced through selling tickets. Passenger load factor, or load factor is an indicator that measures the capacity utilization of public transport services like buses, airlines, and railways.

This indicator shows the average load on a bus route throughout the day by dividing passenger kilometres by place kilometres. The higher the load factor, the more profitable the operation, provided that the fares are set high enough. Well, if they are too low then there can be a significant loss even on a full occupancy buses. The theoretical maximum of 100% is never achieved in urban services; buses are rarely full for the entire journey and usually there are directional imbalances in demand at different times resulting in buses running with heavier loads in one direction compared in the other.

In many cases, the load factor will depend on the nature of the route but in practice should normally be about 30% to 40% for larger buses and up to 65% for a very busy bus routes. Certain types of electronic ticket machines, as well as smart cards which may provide data to enable the load factor to be calculated (World Bank Group, 2006).

$$\text{Load factor} = \frac{\text{pass} - \text{km}}{\text{seat} - \text{km}} \times 100\%$$

An example of load factor calculation is by conducting a sample boarding and alighting survey and multiplying the occupancy between any stops by the stop distance. For urban services with fairly regular stop spacing it is usually adequate to divide the route length by the number of stops to calculate the average stop distance. Seat-kilometres are simple to measure being the kilometres operated by all the buses on a route times the average capacity of the buses on the route.

Passengers and reliability that represent comfort and convenience of the level of service of a bus route vary significantly, so they may be appropriate for assessing service level of bus operation. The reliability can be evaluated by the data collected, while the estimation of the passenger load factor requires the data on passenger loading and unloading at every stop.

#### **2.4.5 Time Headway (Minutes)**

Headway is the measurements of minimum possible distance between the first bus and the second bus on the roads. Additionally, headway is a consistency or evenness of the interval between successive bus vehicles of missed trips and a number of passing-ups (Amirah, 2010). It is the key input to calculate the overall route capacity which has to be improved through the use of larger vehicles (February, 2011).

The time headway is directly computed from the service frequency, i.e if the service frequency is 4 buses per hour, then the time headway is 15 minutes (Sebayang et al, 2005). World Bank has stated that the standard for headway is around 1 to 12 minutes only, but it also needs to consider the day of the survey and the route is chosen.

$$Headway \text{ (min)} = \frac{\text{bus frequency}}{1 \text{ hour}}$$

#### **2.4.6 Cycle Time (Minutes)**

Cycle time is defined as the time difference between two consecutive appearances from the same observation point in a similar direction of movement of a vehicle. In simple terms, the cycle time is the time for one complete cycle of the route by a vehicle. It is double the length of the route added with speed divided by the average layover time at the end of the route. Cycle time will be counted from the difference of time between two successive departures or arrivals of the same bus at the bus terminal (Arintono et al, 2005). Vehicle requirements can be computed as a function of the cycle time and the time headway.

$$Cycle \text{ time} = \frac{(\text{Route length})^2}{\text{Average speed}}$$

#### 2.4.7 Number of Buses (Fleet Size)

This indicator shows the extent to which the vehicle fleet is available for revenue-earning work and to a large extent reflects the effectiveness of the maintenance arrangements. All of the vehicles owned or licensed in the bus system must be tracked regularly by the authority.

$$\text{No of buses} = \frac{\text{Cycle time}}{\text{Headway}}$$

The number of bus of effective capacity of the fleet is influenced by the availability and utilization. Availability may be expressed in terms of average days available per year. The most relevant time for calculating vehicle availability is at the time of peak vehicle requirement, and it is appropriate to record the number of vehicles available at this time each day, and to calculate the average over a period, such as a week or month.

There will rarely be 100% availability except possibly for short periods, since every vehicle requires time out of service for routine maintenance, and there will always be an element of unscheduled maintenance and accident repairs. But some operators may achieve 100% availability during peaks if routine maintenance can be co-ordinated with operational requirements so that all maintenance is undertaken during the inter-peak periods, although this is unlikely to be achieved on a regular basis.

## **CHAPTER 3**

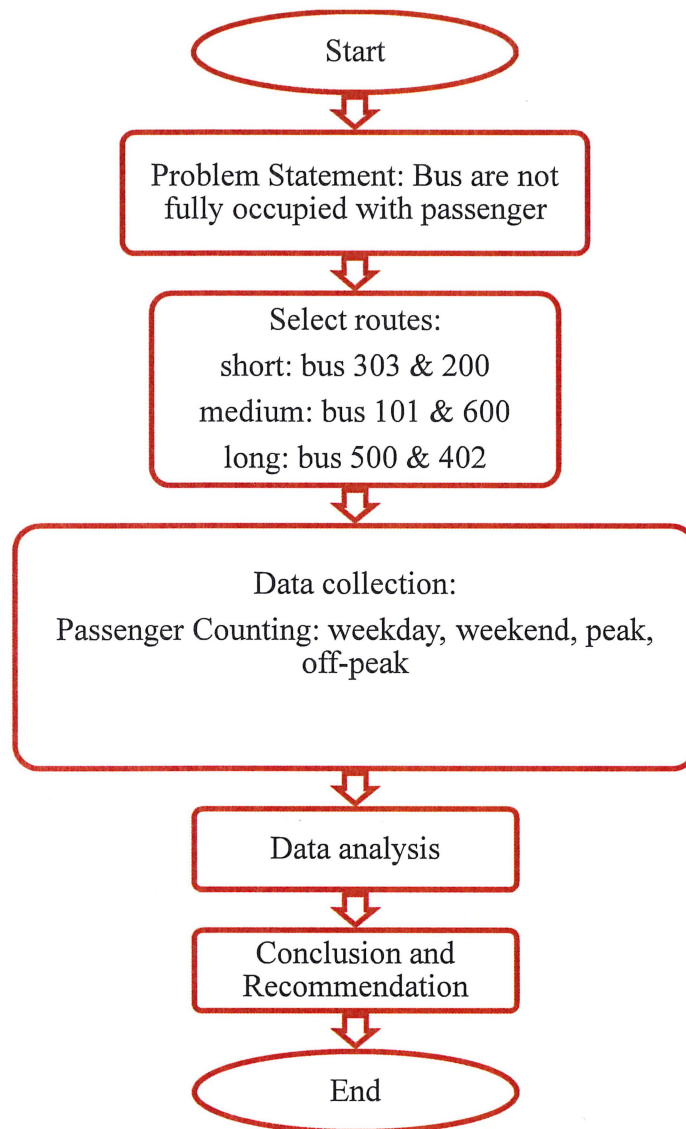
### **METHODOLOGY**

#### **3.1 INTRODUCTION**

Methodology is a method for the investigation or research which is acts as a procedure to achieve the objective of the research. This is important for the study research because from the methodology, it can avoid any delay or wastage and focus on the objectives that have been set. Based on the methodology, the flow of this research can be planned. This chapter discusses on how the research process during the observation. The data collection for the analysis is doing by the direct field for passenger surveys.

#### **3.2 LOCATION OF THE STUDY**

This research was conducted in the area Kuantan, Pahang. Based on the location indicated by studies to be carried out is referring to three types of roads that are having the short route length, medium route length and long route length. By referring the way of Rapid Kuantan routes, the route with the short route length around Kuantan are Route 303 from Hentian Bandar to Terminal Sentral Kuantan and Route 200 between Hentian Bandar to Teluk Cempedak. For medium route length is Route 101 between 'Hentian Bandar-Indera Sempurna and between 'Hentian Bandar-Balok Makmur (via Beserah), Route 600. Meanwhile the long routes is representing by route between 'Hentian Bandar- Sungai Lembing' which is Route 500 and Route 402 from Hentian Bandar to Ubai.



**Figure 3.1** Flowchart of the study

### 3.3 ROUTE CHARACTERISTICS OF THE STUDY AREA

The short routes in Kuantan city are less than 15 km. Hence, bus routes of Rapid Kuantan at Figure 3.1 and Figure 3.2 show the map of journey from Hentian Bandar to Terminal Sentral Kuantan and Hentian Bandar to Teluk Cempedak that operates with the short route length covering distance of 6.8 km and 10 km respectively. Bus frequency for both route 303 and 200 is between 20-30 minutes.



**Figure 3.2** Map show the location of Rapid Kuantan bus Route 303 with the shortest route length



**Figure 3.3** Map show the location of Route 200 of Rapid Kuantan with short route length

Then, distance between 15 km to 30 km is the range for medium route length of Rapid Kuantan. Figure 3.3 and Figure 3.4 showing the map of bus routes of Rapid Kuantan from Hentian Bandar to Indera Sempurna and from Hentian Bandar to Balok Makmur (via Beserah) with the medium route length of 18 km and 24.5 km respectively. Route 101 has bus frequency of 20-30 minutes while Route 600 has 30-40 minutes.



**Figure 3.4** Map show the location of Routes 101 ‘Hentian Bandar –Indera Sempurna’ of medium route length



**Figure 3.5** Map show the route location from Hentian Bandar to Balok Makmur (via Beserah) with medium route length

Meanwhile, the long routes lengths are over than 30 km which from Hentian Bandar to Sungai Lembing and from Hentian Bandar to Ubai that have distance of 50 km and 61 km. The bus frequency for Route 500 is between 30-60 minutes and Route 402 is between 60-80 minutes. The map of the route involve are shown in Figure 3.5 and Figure 3.6.



Figure 3.6 Map show the location of Route 500 ‘Hentian Bandar – Sungai Lembing’ with long route length



Figure 3.7 Map show the Route 402 from Hentian Bandar to Ubai with the longest route length



### **3.4 DATA COLLECTION**

Extensive surveys were carried out on all of the six routes. For the observation, the observer doing passenger counting at the terminal, bus stops and passenger on/off along the routes involved. The purpose of this observation is to evaluate the rate of occupancy among the short, medium and long routes of Rapid Kuantan buses.

Based on this observation, this data will be collected for 4 days for each route representing weekdays and weekends. Each day of data collected will consist of peak time and off-peak time.

For the passenger counting, the observer were on board the buses will count manually each person who boarding and drop off of the bus. There is no need to record himself as a passenger. This task is done by repeating at each bus stop starting from the departure until arrival of bus in one-way direction. The passengers are still counted even in between of bus stop along the way as long the bus is still in operation. Figure 3.7 is showing the process of the passenger survey.

### **3.5 DATA ANALYSIS**

The data for the passenger survey which contain some performance indicators are including the average distance per passenger, number of passenger per bus per day, load factor, and number of passengers occupied per trip.

These performance indicators are referring to the World Bank standard which is used for comparison shown in Table 3.1. Meanwhile, Table 3.2 shows the standard for daily passengers per operating bus. This World Bank standard reflects government policy and the needs of society and it also reflects the steps that are consistent with best professional practice. Hence, these standards are applied particularly to urban buses in the world.

**Table 3.1 World Bank standard for bus performance**

Indicators (units)	Standard
<b>Operating ratio</b>	Min 1.05 – 1.08
<b>Load factor (%)</b>	70
<b>Availability (%)</b>	80 - 90
<b>Number of passengers (pas/bus/day)</b>	440 - 525
<b>Travel distance (km/bus/day)</b>	230 km – 260 km
<b>Headway</b>	1 – 12 minutes

**Table 3.2 World Bank standard for daily passengers per operating bus**

Type of bus	Crush capacity	Minimum daily passengers per bus
<b>Single-deck</b>	80	1000 - 1200
<b>Single deck</b>	100	1200 - 1500
<b>Single or double-deck</b>	120	1500 -1800
<b>Articulated or double-deck</b>	160	2000 - 2400

Source: Measures and Standard (Public Transport Planning and Regulation)

## CHAPTER 4

### RESULT AND DISCUSSIONS

#### 4.1 INTRODUCTION

This chapter shows the data result for the passenger counting that have been collected on board in the buses. The data result was collected on six routes of Rapid Kuantan which is 200, 303, 600, 101, 500 and 402.

Based on this observation, the details of each buses are recorded on the registration number, total number of buses operated on each routes, arrival and depart times and destination on the route that has been assigned.

This chapter also will discuss on the performance indicator that have been used to determine the data result. Those indicator are time headway, number of trips per bus per day, travel distance per bus per day, cycle time, the number of passenger, average travel distance per passenger, and load factor.

#### 4.2 DATA RESULTS

The data that have been obtained are shown in Table 4.1, 4.2, 4.3, 4.4, 4.5 and 4.6. These data of passenger counting are taken on board buses which consist of two weekdays and two weekends.

**Table 4.1 No of passenger per trip for route 200**

<b>Hentian Bandar – Teluk Cempedak (200)</b>		
<b>Date</b>	<b>Peak hour</b>	<b>Off-peak hour</b>
3/5/2017	13	7
7/5/2017	32	17
10/5/2017	16	19
14/5/2017	18	7
Average	19.75	12.5
Average pax/trip	16	

**Table 4.2 No of passenger per trip for route 303**

<b>Hentian Bandar – Terminal Sentral Kuantan (303)</b>		
<b>Date</b>	<b>Peak hour</b>	<b>Off-peak hour</b>
3/5/2017	6	10
7/5/2017	13	5
10/5/2017	15	3
14/5/2017	8	17
Average	10.5	8.75
Average pax/trip	10	

**Table 4.3 No of passenger per trip for route 600**

<b>Hentian Bandar – Balok Makmur via Beserah (600)</b>		
<b>Date</b>	<b>Peak hour</b>	<b>Off-peak hour</b>
3/5/2017	24	22
7/5/2017	14	7
10/5/2017	18	2
14/5/2017	42	9
Average	24.5	10
Average pax/trip	17	

**Table 4.4 No of passenger per trip for route 101**

<b>Hentian Bandar – Indera Sempurna (101)</b>		
<b>Date</b>	<b>Peak hour</b>	<b>Off-peak hour</b>
2/5/2017	22	30
6/5/2017	16	16
9/5/2017	17	13
13/5/2017	27	17
Average	20.5	19
Average pax/trip	20	

**Table 4.5 No of passenger per trip for route 500**

<b>Hentian Bandar – Sungai Lembing (500)</b>		
<b>Date</b>	<b>Peak hour</b>	<b>Off-peak hour</b>
2/5/2017	26	4
6/5/2017	13	3
9/5/2017	24	18
13/5/2017	27	8
Average	22.5	8.25
Average pax/trip	15	

**Table 4.6 No of passenger per trip for route 402**

<b>Hentian Bandar – Ubai (402)</b>		
<b>Date</b>	<b>Peak hour</b>	<b>Off-peak hour</b>
2/5/2017	15	7
6/5/2017	9	3
10/5/2017	26	1
13/5/2017	24	5
Average	18.5	4
Average pax/trip	11	

### 4.3 DATA DISCUSSIONS

The data is analysed according to the performance indicator that were used which is time headway, number of trips per bus per day, travel distance per bus per day, cycle time, the number of passenger, average travel distance per passenger, and load factor.

In this study, these performance indicators are following the standard that been stated in the World Bank. These data result will be compared with data result of urban public bus in Terengganu and Sabah.

#### 4.3.1 Time Headway Results

The time of headway was directly taken from the service frequency data result. Tables 4.1 show the headway time for Rapid Kuantan.

**Table 4.7 Headway (Rapid Kuantan)**

<b>Route</b>	<b>Headway ( minutes)</b>		
	<b>Min</b>	<b>Max</b>	<b>Average</b>
Hentian Bandar – Teluk Cempedak (200)	8	71	32
Hentian Bandar – Terminal Sentral Kuantan (303)	4	88	30
Hentian Bandar – Balok Makmur (via Beserah) (600)	5	74	41
Hentian Bandar – Indera Sempurna (101)	5	98	50
Hentian Bandar – Sungai Lembing (500)	17	93	65
Hentian Bandar – Ubai (402)	46	100	79

According to the Table 4.7, shows that the six routes of Rapid Kuantan have higher time than the World Bank Standard which clearly state that the time headway of public transportation need to be between 1 to 12 minutes. From the result shown, routes 200 and 303 has the average headway of 32 and 30 minutes respectively since these routes only cover the short route length. For the medium short length, routes 101 and 600 have the headway of 50 and 41 minutes while the long route length of routes 500 and 402 have the longest headway which is between 65 to 79 minutes.

Meanwhile, for the headway of Terengganu City Bus showing for routes to Chendering, the average headway is 94 minutes and 85 minutes for routes to Gong Badak. These two routes fall far behind from the World Bank Standard. The time headway for Kota Kinabalu area is about 26 to 28 minutes for all routes. Route of Kota Kinabalu to Sepanggar showing the highest headway in 28 minutes which also differ the standard that been stated in World Bank.

However, when comparing the headway in Kuantan, Terengganu and Sabah, Kota Kinabalu City Bus serves the passenger with numerous number of bus but limited number of bus service at Kuala Terengganu and Kuantan. Therefore, the addition of number of buses of routes for both city can reduce the time headway.

### 4.3.2 Number of Trips and Travel Distance Per Bus Per Day Results

In order to calculate the number of passenger, the number of trips (trip/bus/day) and travel distance (km/bus/day) need to be recorded as the data result for service frequency. The data result is shown in the Table 4.8 and 4.9.

**Table 4.8 Number of trips per bus per day (Rapid Kuantan)**

Route	No of trips (trip/bus/day)		
	Minimum	Maximum	Average
Hentian Bandar – Teluk Cempedak (200)	26	28.7	27.4
Hentian Bandar – Terminal Sentral Kuantan (303)	17	19.7	18.3
Hentian Bandar – Balok Makmur (via Beserah) (600)	9.6	10.2	9.9
Hentian Bandar – Indera Sempurna (101)	9.3	14.7	12
Hentian Bandar – Sungai Lembing (500)	5.8	6	5.9
Hentian Bandar – Ubai (402)	6.7	6.7	6.7

**Table 4.9 Travel distance per bus per day (Rapid Kuantan)**

Route	Travel distance (km/bus/day)		
	Minimum	Maximum	Average
Hentian Bandar – Teluk Cempedak (200)	260	287	274
Hentian Bandar – Terminal Sentral Kuantan (303)	115.6	134	122.4
Hentian Bandar – Balok Makmur (via Beserah) (600)	235.2	249.9	242.6
Hentian Bandar – Indera Sempurna (101)	167.4	264.6	216
Hentian Bandar – Sungai Lembing (500)	290	300	295
Hentian Bandar – Ubai (402)	408.7	408.7	408.7

Based on the data result in Table 4.8, routes Hentian Bandar-Teluk Cempedak has the highest number of trips per bus per day. This is because this route length is the shortest among others which is 10 km only. Which also means that the operating buses is very few. Its operating buses are limited to 2 buses only, but added to be 3 on weekend because of passenger demand. Therefore, when the number of operating buses are minimum, then the frequency for the same bus is high.

On the other hand, Table 4.9 showing the travel distance obtained for routes of Rapid Kuantan. Routes 600 has obtained 242.6 km/bus/day which achieved the standard. According to the World Bank Standard, the travel distance is in range of 230 – 260 km only. Well, the average travel distance per bus per day of Rapid Kuantan is highest on routes 500 Hentian Bandar-Sungai Lembing which fall far than the World Bank Standard. The reason of this is because of the limited number of operating buses while the distance are so far. Since the average speed for this routes are higher, so the routes can be well demanded.

Then, the number of trips and travel distance for Rapid Kuantan is compared with Kota Kinabalu City Bus. The highest average number of trips of Sabah is 13.33 and the average travel distance is 178.70 km/bus/day. Between Sabah and Kuantan, Rapid Kuantan has the highest number of trips and travel distance which is 14 and 518.5 km/bus/day compare to Kota Kinabalu City Bus. However, these two states still not fit the World Bank Standard as Rapid Kuantan has high value of travel distance and Kota Kinabalu City Bus has too low of travel distance.



### 4.3.3 Cycle Time Results

Table 4.10 shows the data result for the cycle time of bus routes of Rapid Kuantan operating in 6 routes. For cycle time, Rapid Kuantan will be compared with Kota Kinabalu City Bus and Terengganu City Bus.

**Table 4.10 Cycle time (Rapid Kuantan)**

Route	Cycle time (minutes)		
	Minimum	Maximum	Average
Hentian Bandar – Teluk Cempedak (200)	71.2	78.8	75
Hentian Bandar – Terminal Sentral Kuantan (303)	68.3	75.9	72.1
Hentian Bandar – Balok Makmur (via Beserah) (600)	164.3	182.6	173.5
Hentian Bandar – Indera Sempurna (101)	121.9	131.8	126.9
Hentian Bandar – Sungai Lembing (500)	238	239	238.5
Hentian Bandar – Ubai (402)	217.5	219	218

In Table 4.10 shows the average cycle time of Rapid Kuantan buses on six routes. Routes Hentian Bandar – Terminal Sentral Kuantan has the lowest average cycle time which is 72 minutes compared to others because of its shortest route length covering 6.8 km for one-way trip. So that, the buses has to depart on time because of its limited number of buses and also to avoid for passenger from missed their express buses. Routes to Teluk Cempedak also has the second lowest cycle time because the route length estimated to 10 km only. The medium cycle time which are routes Hentian Bandar – Balok Makmur and routes Hentian Bandar – Indera Sempurna are having the cycle time of 174 minutes and 127 minutes respectively. Routes Hentian Bandar to Sungai Lembing and Hentian Bandar - Ubai have high cycle time because the route length for both routes are long, making the driver to depart a bit late and wait for the passenger first.

Meanwhile in Sabah, Kota Kinabalu City Bus has the highest cycle time of 129 minutes travelling from Kota Kinabalu to Sepanggar. Then, for Terengganu City Bus, the cycle time that is recorded are 117 minutes on routes between Kuala Terengganu to Chendering and 203 minutes on routes to Gong Badak from Kuala Terengganu.

When comparing these three states, it shown that Kuantan has the highest cycle time that is on the journey to Sungai Lembing. This is maybe because of limited number of operating bus of Rapid Kuantan to this destination.

#### 4.3.4 Number of Passenger Results

The number of passenger per trip is determined by calculating the summation of the number passenger that riding in the bus along the route starting from the terminal to the other stops then average the number of the observed trips. So, the total number of passenger is calculated by the number of trip per bus per day. Therefore, the data result for number of passenger is shown in the Table 4.11 for Rapid Kuantan and Table 4.12 for Terengganu City Bus.

**Table 4.11 Number of passenger (Rapid Kuantan)**

Route	Pax/trip	Trip/bus/day	Pax/bus/day
Hentian Bandar – Teluk Cempedak (200)	16	27.4	438.4
Hentian Bandar – Terminal Sentral Kuantan (303)	10	18.3	183
Hentian Bandar – Balok Makmur (via Beserah) (600)	17	9.9	168.3
Hentian Bandar – Indera Sempurna (101)	20	12	240
Hentian Bandar – Sungai Lembing (500)	15	5.9	88.5
Hentian Bandar – Ubai (402)	11	6.7	73.7

Based on the Table 4.11, shows the number of passenger per bus per day of Rapid Kuantan. It shown that routes Hentian Bandar to Ubai has the lowest value of number of passenger in a day which is 74 while routes to Teluk Cempedak has the highest number of passenger of 438. Well, Teluk Cempedak is one of the attraction place for tourist coming to Pahang. The routes to Teluk Cempedak are getting high passenger in a day because the driver is holding the time of headway for long enough and because of limited number of buses too. Despite of that, the result is not achieved the standard of the World Bank (440 – 525).

Meanwhile, the number of passenger per bus per day in Kuala Terengganu shows two routes which both are recorded to be below of the World Bank Standard. Routes from Kuala Terengganu to Chendering has the highest number of passenger which is 205 compare to routes to Gong Badak of 141 passenger but lower than the routes to Teluk Cempedak of Rapid Kuantan. The main reason of this may because of the limited number of bus of that route.

#### 4.3.5 Average Travel Distance Per Passenger Results

These performance indicators is calculated from the distance between bus stop times with number of passenger (pax.km) and then divided with the total number of passenger. Table 4.13 showing the result from the analysis.

**Table 4.12 Average travel distance per passenger (Rapid Kuantan)**

Route	Pass-km/no of passenger
Hentian Bandar – Teluk Cempedak	8.53
Hentian Bandar – Terminal Sentral Kuantan	10.68
Hentian Bandar – Balok Makmur (via Beserah)	23.98
Hentian Bandar – Indera Sempurna	19.52
Hentian Bandar – Sungai Lembing	48.78
Hentian Bandar – Ubai	59.07

Table 4.12 show the result of average travel distance per passenger for six routes services of Rapid Kuantan in Kuantan city. The highest travel distance per passenger is from Route Hentian Bandar to Ubai which is 59.07 pass-km/pax, while the lowest travel distance per passenger is from Hentian Bandar to Teluk Cempedak (8.53 pass-km/pax).

Since the average travel distance per passenger are related to the distance of the routes, then it is proven that the routes from Hentian Bandar to Ubai which has the longest route length of 61 km has the highest of average travel of distance per passenger.

#### 4.3.6 Load Factor Results

**Table 4.13 The number of passenger and load factor (Rapid Kuantan)**

<b>Route</b>	<b>Minimum (pax)</b>	<b>Maximum (pax)</b>	<b>Average (pax)</b>	<b>Capacity</b>	<b>Load Factor (%)</b>
Hentian Bandar – Teluk Cempedak (200)	7	32	16	57	32
Hentian Bandar – Terminal Sentral Kuantan (303)	3	17	10	57	20
Hentian Bandar – Balok Makmur (via Beserah) (600)	2	42	17	57	34
Hentian Bandar – Indera Sempurna (101)	13	30	20	57	40
Hentian Bandar – Sungai Lembing (500)	3	27	15	57	30
Hentian Bandar – Ubai (402)	1	26	11	57	22

Load factor is a performance indicator which means the ration between the number of passenger and seat availability. Based on the observation of the passenger survey on boarding an alighting passenger, the load factors on each section of every trip and routes can be computed that can be averaged across the total number of the observed trips of the bus. The result from the analysis is shown in the Table 4.13 for Rapid Kuantan.

So, according to the Table 4.13, the load factor results on all of 6 routes are obtained. By following the World Bank Standard shown in Table 3.1, all of the route have not been able to meet the standard of 70%. This might be because of the low number of passenger boarding on these routes. Besides, higher load factor than the standard can means that the routes having quite many passenger occupied on the buses but still they able to get seated.

In Terengganu, the average passenger of the two routes to Chendering and Gong Badak are not exceeding by 70%. Routes to Chendering and Gong Badak obtained the result of load factor of 44% and 37% respectively. All routes in Kuantan and Kuala Terengganu area hasn't able to meet the standard. All of these routes need to reschedule back their current schedule of operating bus service such as number of bus operating in a day in order to be able meet the standard stated in the World Bank.

## **CHAPTER 5**

### **CONCLUSION AND RECOMMENDATIONS**

#### **5.1 INTRODUCTION**

This chapter discussed about the conclusion of this research. The conclusion in this chapter are made through by the analysis that have been done in Chapter 4. Include with this chapter is the recommendation that will contribute to the body knowledge of public transportation literature. In the same time, it can serve as a source of reference for other researchers who seek information regarding this topic in the future.

#### **5.2 CONCLUSION AND RECOMMENDATIONS**

The objectives of this study are achieved successfully through the study on rate of occupancy of Rapid Kuantan which also can identify the routes with low occupancy and making improvements to the bus services.

To achieve the objectives of this study, the data have been collected by doing passenger counting on board the buses of the selected routes. The data are determined based on the performance indicator of time headway, cycle time, number of trips per bus per day, travel distance per bus per day, number of passenger and load factor.

As it can see as a result, the headway or interval time between one bus to another shown that it's far from the World Bank Standard because of the time waiting of passenger at the terminal before depart. So, as an improvement, make sure to depart on time without waiting the passenger to be full on board.

In terms of travel distance per bus per day, the limited number of buses used in a day will increase the efficiency of travel distance of the bus. This can be prove on routes Hentian Bandar – Ubai which less buses are used making the travel distance by the bus equal to 305 km. As a recommendation, add on a few more buses operating on high travel distance.

Well, for cycle time, it is depends on the movement of the bus. If the bus keep on waiting for passenger, the cycle time will be increase as it depends on the distance of the routes too. Moreover, the number of passengers are obtained depending on the number of trips. Even if the number of trips is higher but if the pax per trip is lower, then still the standard of World Bank could not be achieved.

Therefore, in order to obtain the load factor, seat availability and number of passenger are needed to calculate the result. If a bus is fully with passenger, then the load factor will be higher as the number of passenger is more than the seat provided in the bus.

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## APPENDIX A

### PASSENGER COUNTING SURVEY

<b>Route no : 200 (Hentian Bandar – Teluk Cempedak)</b>		
<b>Bus registration no : CDH 2338</b>	<b>Date : 10/5/17</b>	<b>Day : WEDNESDAY</b>

Route	Peak		Off-peak	
	Time depart : 5.00 pm		Time depart : 5.40 pm	
	Time arrived : 5.30 pm		Time arrived : 6.05 pm	
Bus stops	Boarding	Alighting	Boarding	Alighting
Hentian Bandar	5	0	0	15
UTC	0	0	0	0
Kompleks Belia – Jln Tun Ismail	0	1	-	-
LKPP – Jln Gambut	0	0	0	3
Berjaya Megamall – Jln Tun Ismail	7	0	0	0
Shell – Jln Beserah	0	0	0	0
Hotel Seri Malaysia – Jln Teluk Sisek	1	0	1	0
Vistana Hotel	0	0	1	0
Homebox Design – Jln Tun Sisek	0	0	0	0
Satay Zul – Jln Teluk Sisek	0	3	0	0
Kampung Selamat	0	1	1	0
Kubang Buaya – Jln Kubang Buaya	0	1	0	0
Pusat Bimbingan JTS – Jln Kubang Buaya	0	0	0	0
Kuarters IKIP – Jln Kubang Buaya	0	0	0	0
Kolej IKIP 1 – Jln Dato Bahaman	0	0	1	0
Flat Kubang Buaya – Jln Dato Bahaman	0	0	0	1
Jab. Kimia Malaysia Pahang	0	0	0	0
Kolej Vokasional – Jln Tgku Muhammad	0	0	1	0
SK Assunta – Jln Tgku Muhammad	0	0	0	0
Klinik Kesihatan Bukit Pelindung	0	0	0	0
Kuarters Kastam – Jln Tgku Muhammad	0	0	0	0
Teluk Cempedak	0	7	14	0

## APPENDIX B

### PASSENGER COUNTING SURVEY

<b>Route no : 303 (Hentian Bandar – Terminal Sentral Kuantan)</b>		
<b>Bus registration no : CDH 2337</b>	<b>Date : 3/5/17</b>	<b>Day : TUESDAY</b>

Route	Peak		Off-peak	
	Time depart : 5.10 pm		Time depart : 9.40 am	
	Time arrived : 5.34 pm		Time arrived : 9.51 am	
Bus stops	Boarding	Alighting	Boarding	Alighting
Hentian Bandar	5	0	0	10
Kospek MPK – Jln Sg Lembing	0	0	0	0
Pejabat Kemas – Jln Sg Lembing	0	0	0	0
JKR – Jln Sg Lembing	0	0	0	0
Masjid Indera Mahkota – Jln Sg Lembing	1	0	0	0
Indera Mahkota 8 – Jln Sg Lembing	0	0	0	0
Simpang Kompleks Tun Razak	0	0	0	0
Felda Wilayah Kuantan	0	0	0	0
Pejabat Kesihatan Negeri Pahang	0	0	0	0
Sek Berasrama Penuh Integrasi Kuantan	0	0	0	0
Klinik Kesihatan Indera Mahkota	0	0	0	0
SK Tunku Azizah	0	0	0	0
Wisma Belia – Jln Sultan Abdullah	0	0	0	0
Terminal Sentral Kuantan	0	6	10	0

## APPENDIX C

### PASSENGER COUNTING SURVEY

<b>Route no : 600 (Hentian Bandar – Balok Makmur (via Beserah))</b>		
<b>Bus registration no : WUY 4969</b>	<b>Date : 10/5/17</b>	<b>Day : WEDNESDAY</b>

Route	Peak		Off-peak	
	Time depart : 7.50 am		Time depart : 9.57 am	
	Time arrived : 8.48 am		Time arrived : 10.45am	
Bus stops	Boarding	Alighting	Boarding	Alighting
Hentian Bandar	0	8	1	0
Taman Kerang – Jln Bkt Ubi	0	0	0	0
Masjid Negeri – Jln Mahkota	0	2	1	0
Ibu Pejabat Polis Kontinjen Pahang – Jln Merdeka	0	0	0	0
LKPP – Jln Gambut	0	0	0	0
Kompleks Belia – Jln Tun Ismail	0	0	0	0
Kemaman Kopitiam – Jln Tun Ismail	0	0	0	0
Dewan Galing – Jln Beserah	0	2	0	0
SK Galing – Jln Beserah	0	0	0	0
Restoran Zam Zam – Jln Beserah	0	0	0	0
SMK Sultan Abu Bakar – Jln Beserah	1	2	0	0
CIMB Bank – Jln Beserah	0	0	0	0
Petron – Jln Beserah	0	0	0	0
Kota Motor – Jln Beserah	0	1	0	0
Gedung Ten Ten – Jln Beserah	1	0	0	1
Pasaraya Tunas Manja – Jln Beserah	1	1	0	0
JPAM – Jln Beserah	0	0	0	0
Poliklinik Komuniti – Jln Beserah	0	0	0	0
PMC – Jln Beserah	0	0	0	0
Astaka – Jln Beserah	0	0	0	0
Masjid Beserah – Jln Beserah	1	1	0	0
Taman Satelit – Jln Beserah	1	0	0	0
Kg Alor Ladang – Jln Beserah	0	0	0	0
Duta Sand – Jln Beserah	0	0	0	1
Kg Batu Hitam – Jln Beserah	0	0	0	0
SMK Beserah – Jln Beserah	0	1	0	0
Giat MARA – Jln Beserah	0	0	0	0
Taman Batu Hitam – Jln Beserah	2	0	0	0
Kg Sg Karang – Jln Beserah	0	0	0	0
Masjid Tengku Panglima Perang – Jln Beserah	0	0	0	0

Kg Sg Karang Darat – Jln Beserah	2	0	0	0
Swiss Garden Resort Spa – Jln Beserah	0	0	0	0
Kg Sg Karang Pantai – Jln Beserah	0	0	0	0
Kg Chengal Lempong – Jln Beserah	1	0	0	0
Natural Batik Village – Jln Beserah	0	0	0	0
Taman Balok Jaya 2 – Jln Beserah	1	0	0	0
Kg Balok – Jln Beserah	0	0	0	0
Masjid Pantai Balok – Jln Beserah	3	0	0	0
SK Balok – Jln Beserah	2	0	0	0
Perkampungan Balok Baru – Jln Beserah	0	0	0	0
Kg Seberang Balok 1 – Jln Beserah	0	0	0	0
Taman Aishah – Jln Beserah	1	0	0	0
Taman Cahaya – Jln Beserah	0	0	0	0
Kompleks Perumahan TLDM – Jln Beserah	0	0	0	0
Kg Seberang Balok – Jln Beserah	0	0	0	0
Perumahan Balok Perdana – Jln Balok Perdana	0	0	-	-
Kuarters TLDM – Jln Balok Perdana	0	0	-	-
SMK Pelabuhan – Jln Balok Perdana	0	0	-	-
Hub Balok Makmur	1	0	0	0

## APPENDIX D

### PASSENGER COUNTING SURVEY

<b>Route no : 101 (Hentian Bandar – Indera Sempurna)</b>		
<b>Bus registration no : CDH 7752</b>	<b>Date : 13/5/17</b>	<b>Day : SATURDAY</b>

Route	Peak		Off-peak	
	Time depart : 4.45 pm		Time depart : 5.25 pm	
	Time arrived : 5.25 pm		Time arrived : 6.00 pm	
Bus stops	Boarding	Alighting	Boarding	Alighting
Hentian Bandar	9	0	0	16
Taman Kerang – Jln Bkt Ubi	14	0	0	0
Masjid Negeri – Jln Mahkota	0	0	0	1
UOB Bank – Jln Besar	0	0	0	0
HTAA – Jln Tanah Putih	0	0	0	0
Ibu Pejabat MPK – Jln Tanah Putih	0	0	0	0
Kemunting – Jln Tanah Putih	0	0	0	0
SJKC Chung Ching – Jln Tanah Putih	0	0	0	0
Pasaraya Giant – Jln Tanah Putih	0	0	0	0
Tanah Putih Baru – Jln Tanah Putih	0	1	0	0
Shell Taman Kurnia – Jln Tanah Putih	0	0	1	0
Batu 3 – Jln Tanah Putih	0	0	0	0
Kg Razali – Jln Tanah Putih	0	0	0	0
Batu 4 – Jln Gambang	0	0	0	0
Paya Besar – Jln Gambang	0	1	0	0
Dewan Mat Kilau – Jln Gambang	0	1	4	0
Masjid Kipsas – Jln Gambang	0	0	3	0
KIPSAS – L/Raya Pekan	0	0	3	0
Perkampungan Rasau Perdana – L/Raya Pekan	0	0	1	0
Taman Inderapura – Jln Seri Inderapura	0	5	-	-
Perumahan Inderapura – Jln Seri Inderapura	0	2	-	-
Padang Bola Inderapura – Jln Seri Inderapura	0	10	-	-
Lot Kedai Inderapura – Jln Seri Inderapura	0	0	-	-
Perumahan Inderapura – Jln Seri Inderapura	3	0	-	-
Taman Inderapura – Jln Seri Inderapura	0	0	-	-
SMK Mat Kilau – L/Raya Pekan	0	0	0	0
Jejantas Indera Sempurna – L/Raya Pekan	0	0	0	0
Simpang Lorong Indera Sempurna 3	0	0	0	0
Sempurna Resort- Lorong Indera Sempurna 3	0	0	-	-
Fasa Zon B – Jln Indera Sempurna 3	0	2	-	-
Pondok KRT – Lorong Indera Sempurna 3	1	0	-	-
Pusat RELA – Lorong Indera Sempurna 3	0	0	0	0
Surau Al-Zahraa – Jln Indera Sempurna 2	0	5	5	0

## APPENDIX E

### PASSENGER COUNTING SURVEY

<b>Route no : 500 (Hentian Bandar – Sungai Lembing)</b>		
<b>Bus registration no : CDD 1447</b>	<b>Date : 11/5/17</b>	<b>Day : Thursday</b>

Route	Peak		Off-peak	
	Time depart : 4.56 pm		Time depart : 6.58 pm	
	Time arrived : 6.27 pm		Time arrived : 7.45 pm	
Bus stops	Boarding	Alighting	Boarding	Alighting
Hentian Bandar	13	0	0	4
Taman Kerang – Jln Bkt Ubi	1	0	-	-
Masjid Negeri – Jln Mahkota	2	0	-	-
Ibu Pejabat Polis Kontinjen Pahang – Jln Merdeka	0	0	-	-
LKPP – Jln Gambut	0	0	-	-
7Eleven Bkt Ubi – Jln Bkt Ubi	3	0	0	0
Kospek MPK – Jln Sg Lembing	0	0	0	0
Pejabat KEMAS – Jln Sg Lembing	0	0	0	0
JKR – Jln Sg Lembing	0	0	0	0
Masjid Indera Mahkota – Jln Sg Lembing	3	0	0	0
Indera Mahkota 8 – Jln Sg Lembing	1	0	0	0
SMK Indera Mahkota 2 – Jln Sg Lembing	0	0	0	0
Kolej Profesional MARA – Jln Sg Lembing	0	0	0	0
Kg Padang – Jln Sg Lembing	0	0	0	0
SK Kg Padang Jaya – Jln Sg Lembing	0	0	0	0
SM Pendidikan Khas Vokasional – Jln Sg Lembing	0	0	0	0
Gudang Ten Ten – Jln Sg Lembing	3	2	3	0
Kg Padang Perdana – Jln Sg lembing	0	4	0	0
Pejabat Renjer Hutan Pahang – Jln Sg Lembing	0	0	0	0
Simpang Bkt Kuin – Jln Sg Lembing	0	6	0	0
Kg Batu Sawar – Jln Sg Lembing	0	1	0	0
Simpang Bkt Kuin 3 – Jln Sg Lembing	0	0	0	0
Pasir Kemudi – Jln Sg Lembing	0	0	0	0
Simpang Jln Jelawat – Jln Sg Lembing	0	0	0	0
Simpang Sg Pandan – Jln Sg Lembing	0	2	0	0
Surau Kg Baru Atong – Jln Sg Lembing	0	0	0	0
Tong Ah Estate – Jln Sg Lembing	0	1	0	0
Kg Baru Atong – Jln Sg Lembing	0	0	0	0

Kg Panching – Jln Sg lembing	0	0	0	0
SK Panching – Jln Sg Lembing	0	0	0	0
Pekan Panching – Jln Sg Lembing	0	1	0	0
P.A.K.R Panching – Jln Sg Lembing	0	1	0	0
Kg Sg Charu – Jln Sg Lembing	0	0	0	0
Kg Sg Derhaka – Jln Sg Lembing	0	0	0	0
Kg Kolek – Jln Sg Lembing	0	2	0	0
Kg Nadak – Jln Sg Lembing	0	0	0	0
Kg Batu 6 – Jln Sg Lembing	0	0	0	0
Simpang Kg Kawah – Jln Sg Lembing	0	0	0	0
Klinik Kesihatan Sg Lembing – Jln Sg Lembing	0	0	0	0
Loji Air Sg Lembing – Jln Sg Lembing	0	0	0	0
Kg Kuala Kenau – Jln Sg Lembing	0	2	0	0
SK Sg Lembing – Jln Sg Lembing	0	0	0	0
Pintu Gerbang – Jln Sg Lembing	0	1	0	0
Hub Sungai Lembing	0	0	1	0

## APPENDIX F

### PASSENGER COUNTING SURVEY

<b>Route no : 402 (Hentian Bandar – Ubai)</b>		
<b>Bus registration no : CDH 7532</b>	<b>Date : 11/5/17</b>	<b>Day : Thursday</b>

Route	Peak		Off-peak	
	Time depart : 4.30 pm		Time depart : 6.10 pm	
	Time arrived : 5.46 pm		Time arrived : 7.28 pm	
Bus stops	Boarding	Alighting	Boarding	Alighting
Hentian Bandar	7	0	0	4
Taman Kerang – Jln Bkt Ubi	3	1	0	0
Masjid Negeri – Jln Mahkota	2	0	0	2
Tanjung Lumpur	0	1	0	0
Rangkaian Delima – Jln Teluk Sisek	1	0	0	1
Gedung Ten Ten – Jln Tanjung Lumpur	0	2	1	0
Furindo Furniture – Jln Tanjung Lumpur	0	0	1	0
Pejabat KEMAS – Jln Tanjung Lumpur	0	1	0	0
Peramu Baru – Jln Tanjung Lumpur	0	1	0	0
Peramu Maju – Jln Tanjung Lumpur	1	1	0	0
Maahad Tahfiz – Jln Tanjung Lumpur	0	0	0	0
Yayasan Pahang – Jln Tanjung Lumpur	0	1	0	0
Bandar Putra – Jln Tanjung Lumpur	0	0	0	0
Astana Village – Jln Tanjung Lumpur	0	1	0	0
Surau Tanah RTK – Jln Kg Pak Mahat	0	1	-	-
Taman Desa Putra – Jln Kg Pak Mahat	0	0	-	-
Kempadang Damai – Jln Kg Pak Mahat	0	0	-	-
Perumahan Rakyat Pak Mahat – Jln Kg Pak Mahat	0	3	2	0
Kempadang Damai – Jln Kg Pak Mahat	0	0	-	-
Taman Desa Putra – Jln Kg Pak Mahat	0	1	-	-
Surau Tanah RTK – Jln Kg Pak Mahat	1	0	-	-
Kempadang Futsal – Jln Tanjung Lumpur	0	0	0	0
SK Kempadang – Jln Kempadang	0	0	1	0
SMK Tanjung Lumpur	0	0	0	0
Kg Pak Mahat – Jln Tanjung Lumpur	0	0	0	0
Kempadang Futsal – Jln Tanjung Lumpur	0	0	0	0
Perumahan Kempadang Perdana – Jln Sg Soi	0	0	0	0
Petronas Sg Soi – Jln Sg Soi	0	0	0	0
Bandar Baru Kuantan Putri – Jln Sg Soi	0	1	0	0
Perkampungan Sg Soi – Jln Sg Soi	0	0	0	0



Kempadang Aman – Jln Sg Soi	0	0	0	0
Perkampungan Sg Soi Jaya – Jln Sg Soi	0	0	2	0
Seri Melati – Jln Kuantan / Pekan	0	0	0	0
Penjara Penor – Jln Kuantan / Pekan	0	0	0	0
Kuarters Penjara Penor – Jln Kuantan / Pekan	0	0	0	0
Kg Batu Putih – Jln Kuantan / Pekan	0	0	0	0
Kg Semangat – Jln Kuantan / Pekan	0	0	0	0
Klinik Kesihatan Kg Ubai – Jln Kuantan / Pekan	0	0	0	0
Kg Lamir – Jln Kuantan / Pekan	0	0	0	0
Tanah Putih – Jln Kuantan / Pekan	0	0	0	0
Asrama SM Dato Mahmud Mat – Jln Kuala Selangor	0	0	0	0
Klinik Kesihatan Kuala Selangor – Jln Kuala Pahang	0	0	0	0
SK Serandu – Jln Kuala Pahang	0	0	0	0
Masjid Cherok Paloh – Jln Cherok Paloh	0	0	0	0
Kg Cherok Paloh – Jln Cherok Paloh	0	0	0	0
Kg Ubai – Jln Kg Ubai	0	0	0	0
Ubai – SK Jln Kg Ubai	0	0	0	0

**APPENDIX G**

**SHEET FOR SERVICE FREQUENCY SURVEY**

<b>Route No : 500 ( Hentian Bandar – Sungai Lembing)</b>
<b>Date : 05\07\2017</b>

<b>No Bus : WVA 3152</b>		<b>No Bus : CDH 2331</b>		<b>No Bus : CDH 3781</b>	
<b>Depart time</b>	<b>Arrival time</b>	<b>Depart time</b>	<b>Arrival time</b>	<b>Depart time</b>	<b>Arrival time</b>
<b>6:15</b>	<b>9:03</b>	<b>6:35</b>	<b>10:05</b>		<b>7:31</b>
<b>10:03</b>	<b>13:07</b>	<b>11:00</b>	<b>13:57</b>	<b>8:10</b>	<b>11:00</b>
<b>16:01</b>	<b>17:16</b>	<b>14:59</b>	<b>18:08</b>	<b>12:00</b>	<b>18:54</b>
<b>18:02</b>		<b>19:22</b>			
<b>No Bus : CDH 2343</b>					
<b>Depart time</b>	<b>Arrival time</b>				
<b>9:10</b>	<b>12:07</b>				
<b>13:00</b>	<b>16:05</b>				
<b>17:04</b>	<b>19:51</b>				

## APPENDIX H

The table shows the example calculation on-board survey

**Route no : 200**  
**(Hentian Bandar – Teluk Cempedak)**

Bus stops	Route length (m)	Boarding (N)	Alighting	m * N
Hentian Bandar		21	0	23100
Kompleks Belia – Jln Tun Ismail	1100	0	0	
Berjaya Megamall – Jln Tun Ismail	350	0	0	
Shell – Jln Beserah	482	0	0	
Hotel Seri Malaysia – Jln Teluk Sisek	663	10	0	1410
Vistana Hotel	141	0	0	
Satay Zul	415	0	1	
Perabot Woon Wah	417	0	0	
Pusat Bimbingan JTS – Jln Kubang Buaya	611	1	1	392
Kubang Buaya – Jln Kubang Buaya	392	0	0	
Kolej IKIP 1 – Jln Dato Bahaman	230	0	0	
Flat Kubang Buaya – Jln Dato Bahaman	213	0	0	
Jab. Kimia Malaysia Pahang	330	0	4	
Kolej Vokasional – Jln Tgku Muhammad	340	0	0	
SMK Tengku Ampuan Afzan	117	0	15	
SK Assunta – Jln Tgku Muhammad	406	0	0	
Pejabat Kesihatan Bukit Pelindung	438	0	1	
SMK Tok Sira	709	0	0	
Teluk Cempedak	1050	0	10	
<b>TOTAL</b>	<b>8404</b>	<b>32</b>	<b>32</b>	<b>24902</b>

$$24902/32 = 778.1875 \text{ m/pax}$$