FEASIBILITY STUDIES OF GOVERNMENT SUBSIDIZED BUS RAPID TRANSIT (BRT) IN KUALA LUMPUR

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Feasibility Studies of Government Subsidized Bus Rapid Transit (BRT) in Kuala Lumpur.

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CERTIFICATION OF APPROVAL

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CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

NURUL SAADIAH BT. ABDUL MANAN

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ABSTRACT

Recently, the price of the petroleum sky rocketed from RM 1.92 per Liter to the range of RM 2.50 to RM 2.70 per Liter. Due to this, public transport usage is encouraged among citizens as an alternative. Instead of paying for the high price of the petrol, citizens can pay a certain amount of money over a period of time in term of fees. It is possible to reduce the cost of living per person through this method. Thus, a subsidized system from the government is proposed in this paper. As a developing country availability, affordability, mobility and efficiency of public transport is in high demand worldwide. Research is necessary to solve and improve current system in operating problems, and to introduce innovations into the transit industry. This paper describes an attempt made to study the feasibility studies on subsidized bus rapid transit (BRT) in Kuala Lumpur. The aim of the study was to propose a new system on more effective public transport, and to encourage the citizen to use public transport. Promoting transit as a viable option with other transportation alternatives is essential in ensuring success of the new program.

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CHAPTER 1

INTRODUCTION

1.1 Background

In June 2008, the petrol price in Malaysia increased by 41% of its original price, giving the nation huge impacts. Less number of cars coming into the city centre was reported. People are looking for alternatives as effective as possible to reduce the consumptions of fuel. The usage of public transport is expected to be high where the citizens avoid using cars to move around in the city. Hence, the public transport.

American Public Transport, APTA [2006] once defined that public transportation is transportation by a conveyance that provide regular and continuing general or special transportation to the public but not including school houses, charter or sightseeing services. Bus Rail Transit (BRT) is a mode of transportation that can provide the quality

of rail transit and the flexibility of busses with potentially minimal costs and greater efficiency in operation and services.

The case study report was organized to present a general synthesis of the case studies, as well as more detailed information on BRT system. This case study material will be useful to communities that are considering BRT as a potential solution to mobility issues, communities that are planning to develop BRT system and communities that are examining strategies for upgrading their existing services.

1.2 Problem statement

According to Transport Research Board – National Research Council [2001]; "The nation's growth and the need to meet mobility, environmental and objective place demand on improved public transit system". To accommodate the high number of people using the public transport, Malaysia need to improve its public transport services.

As well known as it is the service's efficiency and availability of Malaysia's public transport is not on the customers' best opinion. However, these customers have no other choice but to go along with the treatment as the high price of fuel. Some may even opt to pay for the fuel rather than use public transport.

1.3 Objective(s)

The report was organized to present a general analysis on the current public transport and to conduct a study on a new improved technology to be implemented to solve the problems stated. The main objectives of the study are:

i. To propose a new system of public transport enhanced in service, availability, flexibility, and efficiency to the government.

ii. To identify the main issue causing the problem.

1.4 Scope of work

The case study analyzes BRT system and services in cities of its implementation in China. The study is to conduct a feasibility study on BRT system to be implemented in Kuala Lumpur. The research of findings will be concentrated in existing facilities and public transport system in Kuala Lumpur, citizens of the city, preference of the public to and from work and also the authority govern the current system. The case study sites represented a broad cross-section of services, technologies, costs analyses, availability and impact to the nation. Kuala Lumpur is selected due to population concentration, existing infrastructure, accessibility and conveniences; Kuala Lumpur is the most likely city in Malaysia to have this new technology.

CHAPTER 2

LITERATURE REVIEW

2.1 Transportation Impact on Livability.

According to **Vuhich** (1999), transportation plays a major role that is unique and particular as one of the basic utilities. It is one of the components that influence the shape of character of cities and their livability.

Livability is a subjective life satisfaction and quality of life of the population in the city that measures relating to population of the city, state, or country but not the individual level. In other word, how satisfactory the citizen find when living in the city.

Transportation must satisfy the required need for capacity, while providing reasonable quality of service and economic efficiency. Street congestion, poor quality of transit services and unsafe walking conditions is a serious problem and obstacle to livability. Planning and implementing an efficient transportation system that satisfies diversified population needs for mobility and contributes to livability is a major challenge for cities.

2.2 BRT System in China

Bus Rapid Transit (BRT) is a new public transport development mode that has been successfully applied by many countries in the recent years. **Lin Zheng, Wu Jiaqing** (2007) has been doing research on the impact of application of BRT in China. They have observed that the BRT system successful operation has been given benefits to passengers, enterprises, and line transit system by fulfilling the purpose of service level. These benefits are mainly concerned in: saving travel time, speed improvement, decrease in delay, punctuality rate improvement, transit efficiency improvement, the evident priority of intersection signal and the improvement of passengers' satisfaction rate.

However, from the yield point of view, the overall effect can be seen as advantage in cost for BRT system compared to the rail transit. BRT is inexpensive in terms of lower investment and operating cost and it also has prominent flexibility. This is discussed in the result part of this report.

2.3 Type of BRT System.

As a new public transport development mode, BRT has been successfully applied by many countries in the recent years. Hence, improvements have been made rapidly in terms of design scenarios on BRT performance. In fact, such researches become most evolving research area in the field of transportation. According to **Chen, Yu, and Guo** (2007), two core techniques that are recently developed are exclusive bus lanes and transit signal priority (TSP) were introduced. In this research, X. M. Chen et al. introduced the background of BRT development in China, and the evaluation of BRT effectiveness. BRT in China has been operated since 2004. Thus, the first stage route of North-South central Axis BRT is designed for comparison purpose. Microsimulation model VISSIM is used to simulate the scenarios and traffic flow characteristics under different scenarios are analyzed.

From the analysis, it is concluded that exclusive bus lane and signal priority should be implemented simultaneously in order to effectively improve the BRT's operational performance. After the signal priority is applied, the traffic flow status of the intersections along the BRT route is considerably improved. The third point in the analysis to be take note is that with respect to the exclusive lane layout, divider provided to avoid intrusion cars from other lanes by physical infrastructure.

2.4 BRT Identity

Hess and Bitterman (2008) conclude that BRT identity may help to further build and reinforce a positive perception of BRT service and, by extension, a positive public image for public transit in general. We conclude that BRT identity must be flexible in design to accommodate future needs, plans for expansion, and technological evolution. These identities and brands, however, rely largely on perception and emotional reaction, which are difficult to quantify.

Transit officials are working to capitalize on these changes in public consciousness, and many hope to increase the demand for public transit by improving the quality and quantity of service and, in particular, by implementing new bus rapid transit (BRT) systems, which offer passengers faster, more convenient, and more comfortable travel through service enhancements.

2.5 Fixed-Route Buses

Buses are certainly the cheapest type of public transportation and the type which carries the most passengers. For an urban bus, average speed about 10 miles/hr, the cost is about $4 per mile. For long-distance, rural travel, the cost is about $1.50 to $2.00 per mile. If an average local trip is 3 or 4 miles and a full fare is $1, the passenger is paying between $1/4 and $1/3 per mile. If the bus carried an average of 16 full fare passengers, the income would be $4 to $5 per mile, enough to cover the cost of providing the service.

It is not easy to maintain an average of 16 passengers even on a bus with 50 seats. The bus is nearly empty at one end of the line (maybe both). If it carries 50 at the maximum load point, it may have an average of only 25 in the direction of heavier travel, perhaps very few in the opposite direction.

It is possible to provide all sorts of special services to factories, schools, etc. during peak periods. For now we will consider only the circumstances under which one can provide some reasonable bus service in a residential area during off-peak. Bus routes seldom provide service at longer than 1/2 hr headway (except maybe in the late evening). Headways of 1 hr or more would be unacceptable for people who have appointments or whatever. The 1/2 hr maximum headway may be somewhat arbitrary but this is the norm. If we expect a bus to carry an average of say 16 passengers, then we must have a flow of at least 32 passengers per hour past some typical point along the route. If this service is provided for 10 hours per day of off-peak travel, then we must have about 300 passengers per day passing some point.

CHAPTER 3

METHODOLOGY

3.1 Project Identification.

This project will focus on studies to foresee having a new public transport system in term of Bus Rapid Transit (BRT) system. It is a feasibility study of having the system subsidized by the government in terms of the journey fees.

3.2 Case Study.

- The efficiency, reliability, convenience, advantages and disadvantages and mobility of BRT system and its implementation.
- Government subsidized on public usage (public transport).
- Operation and management of BRT system in other developing countries.
- Analysis on existing system in Kuala Lumpur and is effectiveness.

3.3 Existing Public Transport.

Research on the existing public transport namely bus system in Kuala Lumpr; RapidKL is important in this report to examine the efficiency of both system and also for the comparison method later on. Other than buses, there are also alternatives for mode of public transport in Kuala Lumpur such as light transit; LRT (STAR), PUTRA, MONORAIL, KOMUTER and taxies. However, this alternatives offer low convenience, mobility, reliability, safety and effectiveness. Publics have no choice but to ride on these modes since it is not wise to drive private cars in the city centre especially at peak hours. Such condition will cause distress among the consumer of public transport. Besides, these public transports only reach certain parts of the city centre and cover limited parts of the outskirt of Kuala Lumpur.

3.4 Data Collection

Data collection is a crucial part on this project since there are no field work involve in the work related. There are a few methods of data and information gathering throughout this project. As a preliminary effort, telephone calls were made to some local authorities in Kuala Lumpur to collect some of the earliest data. These interviews were brief and were intended to capture some basic operational data and an understanding of the existing system of public transport and also a few statistics info were gathered.

Information are also extracted from journals published on the internet, books, term papers published legally, related researches and also information that can easily collected from the internet. Implementation by other countries is used as example and guideline in this report. Formal letters were send to the government bodies such as Jabatan Pengangkutan Bandar Kuala Lumpur to acquire some not disclosed to the public for instance the number of cars coming into Kuala Lumpur on daily basis.

Early information given by the supervisor for this project were also utilized. Additionally, important data were also collected from the government website such as CHKL, IT IS, RapidKL, and others.

3.5 Data Assessment

3.5.1 Comparison method

- Comparing BRT system with the existing system in terms of management, operation, public acceptance, efficiency, and also effect of the implementation.

3.5.2 Feasibility study

- Preparing the parameters needed for the feasibility studies.
- Doing research on the government subsidized.

3.6 Report Compiling and Documentation

The issues to be discussed include: various service types, operations sizes, and geographic regions, plus technology types implemented. Then, BRT service is introduced, few related topics were summarized, and all the data gathered will be analyze. The findings will be document in the final comprehensive report.

CHAPTER 4.1

4.1.1 BUS RAPID TRANSIT (BRT)

4.1.1.1 FLEXIBILITY

The flexibility of the Bus Rapid Transit system is not available with any rail transit system. The rail transit can only be realized after the completion of all lines, stations, vehicles, charge system and operation control system while the BRT system can be put into commercial operation when part of the functional facilities are completed. For instance, the operation of BRT of South-Center Corridor, China is implemented in two phases, the first phase was opened to public on December 25, 2004 and the second phase was opened on December 30, 2005. **Lin Zheng, Wu Jiaqing** (2007)

4.1.1.1 Operation

The best feature for BRT is to have many different type of right of way. BRT is provided with its exclusive bus lane. The aim of a bus lane is to give priority to buses and save journey time in places where roads are congested with other traffic. A bus lane is not necessarily very long, as it may only be used to 'detour' a single congestion point such as an intersection some cities have built large stretch of bus lanes which in some places amount to a separate local road system, often called a "busway system".

4.1.1.2 Different Service Type

BRT system provides the customer with many different service types;

- Nonstop express route – the bus have only one destination and it does not stop to other stations along the way.
- Limited stop single route – the bus stops at all stations along the way to the last destination.
- All stop express route – the route is longer and have more than one destination and stop at all stations.
- Combination route – the route of the bus overlapping all the stop routes and the express routes.

4.1.2 AVAILABILITY

4.1.2.1 Station

All the stations are named to accommodate the public and have much longer stop spacing than a typical bus services. The designs and the amenities are similar to LRT stations. The stations are place not just at the city centre but also at the outskirt of the town so that BRT is accessible and equally distributed in the area.

4.1.3 EFFECIENCY

4.1.3.1 Intelligent Transportation System (ITS)

Intelligent Transportation Systems (ITS) encompass a range of advanced technologies that are applied to surface transportation needs including transit and highway needs. The concept of ITS was introduced in the 1960s when urban areas attempted to deal with increasing traffic congestion. The ITS system is to improve the speed and also the reliability of BRT system. In some countries, BRT have the traffic signal priority. They can request for red light or green light period and other transport mode will stop to give way to BRT.

A queue jump is a type of roadway geometry that consists of an additional travel lane on the approach to a signalized intersection. This lane is often restricted to transit vehicles only. The intent of the lane is to allow the higher-capacity vehicles to cut to the front of the queue, reducing the delay caused by the signal and improving the operational efficiency of the transit system.

Bus arrival information will be stated before the bus reaches its destinations to inform the passenger. This info can be seen on the screen provided and also an automated stop announcement will announce the stations before arrival. Route guidance for extra info to accommodate passenger is also provided using ITS.

4.1.3.2 Vehicle

BRT is a distinctive vehicle and it will not be similar to the common bus used in the existing system. This bus will be easy to recognize for the user. According to the BRT system in China, each vehicle is 18 m long, 2.55 m wide and 3.25 m high, with the passenger capacity of 180 persons at one time. The special lane of lines is a physically isolated central two-way lane, and the designed transportation capacity is 20 000 passenger/ hour/direction of 87 vehicle in the system. The doors are at the left side of the body. The buses are mounted with GPS satellite positioning terminal equipments. The average speed of buses on the special line reaches about 25 km/h. the central-island type of platform is 60 – 80 m long and 5 m wide, the height of which is as that of the bus floor and the height to road is 0.3 m. the buses will enter and leave the stations in order.

At the intersection, the active signal priority is also adopted. Electronic information services plates have been set up in all stations: the content includes the time of the first and last bus, the location of station, the trend of lines, and other information.

Figure 4.1: low floor to accommodate passengers during loading.

4.1.4 AFFORDABILITY

4.1.4.1 Promoting BRT

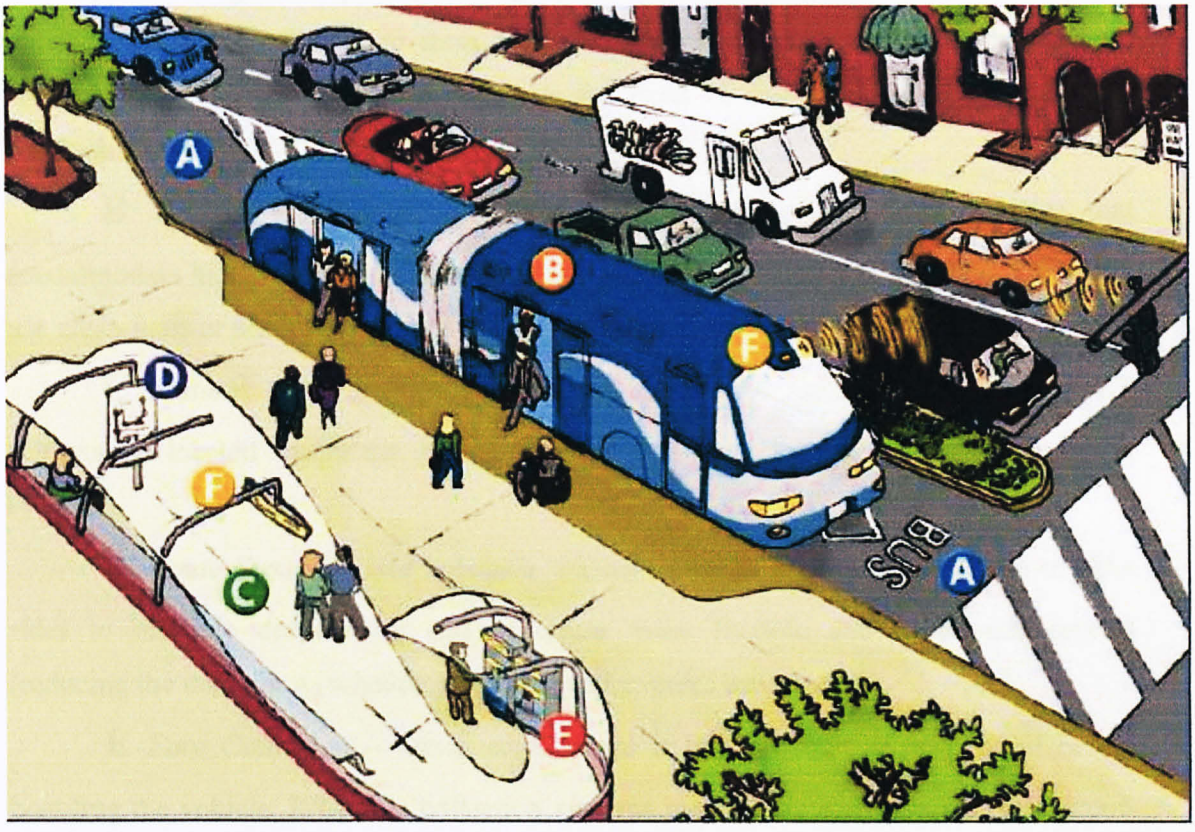
Promoting transit as a viable option in the mix of transportation alternatives is essential to the success of a transit agency. Citizens in the service area may be unaware of the convenience of using transit for their daily activities. It is a good practice to enhance the perception of transit as an effective alternative form of transportation and perhaps lead to new riders who may be unaware of its availability or advantages of using it.

The authority should encourage the public to use the BRT as a mode of transportation. This can be achieved by limiting the usage of cars coming into the city centre. To limit commercial cars into coming into the city;

- Putting up tolls or fee for commercial cars coming into the city on certain days or on weekends.
- Extra exclusive bus lane.
- Provide less parking space or expensive paid parking lot.
- Expensive or limited car ownership per family who lives in the city.

Another solution is to terminate or reduce the finance for subsidized petrol and treat the BRT system as subsidized system to the customers. A customer can pay the fee for BRT passes monthly or annually with minimum rate to promote the usage of BRT. Since the price of petrol is exorbitant, provide finance fund in BRT system and have public using BRT and less fuel consume in the city.

4.5 COMPONENTS OF BUS RAPID TRANSIT (BRT)



Source: Adapted from Transportation Research Board – Transit Cooperative Research Program, *Bus Rapid Transit – Why More Communities are Choosing Bus Rapid Transit,* 2001.
Figure 4.2: Components of BRT

A BRT system combines flexible service and new technologies to improve customer convenience and reduce delays. While specific BRT applications vary, the components may include:

A *Running Ways* – exclusive guideways or dedicated lanes that allow BRT vehicles to be free of onflicting automobile traffic, parked or stopped vehicles, and other obstructions – maximizing BRT operating speeds. In some situations, BRT vehicles also may operate in general traffic, trading speed and reliability for flexibility. "Queue jumper" is a term that refers to short exclusive lanes at signalized intersections that are used to allow BRT vehicles to jump to the head of the line and bypass stopped automobiles and traffic.

B *Vehicles* – Modern, low-floor, high capacity rubber-tired vehicles that accommodate high volumes of riders and fast boarding and exiting. BRT vehicles often use clean fuels or alternative power.

C *Stations* – Ranging from protected shelters to large transit centers, BRT stations are located within the communities they serve and provide easy access to the system.

D *Route Structure and Schedule* – Established to maximize direct, no-transfer rides to multiple destinations and to create more flexible and continuous service (reducing the need for a (schedule) for local and express bus service.

E *Fare Collection* – Designed to make it fast and easy to pay, often before boarding the vehicle, BRT fare collection systems include the use of self-service proof-of-payment systems or pre-paid stored-value fare cards, such as a "Smart Card" system.

F *Advanced Technology* – The use of advanced technologies (or Intelligent Transportation Systems) to improve customer convenience, speed, reliability, and safety. Examples include systems that provide traffic signal preference for buses at intersections and cross streets, as well as Global Positioning Systems (GPS) to provide passenger information such as real-time bus arrival information.

4.1.6 PROBLEMS AND SUGGESTION

During the process of investigation and analysis, some problems were determined and suggestions were made to solve the problem. It is mainly due to the problem that may occur during implementation of the new system in the existing complete facilities of Kuala Lumpur with highly concentrated of Central Business District (CBD) and population.

Following is a synopsis of the comparison factors between BRT and conventional bus and light rail.

Table 4.1: BRT vs. Conventional bus service

Table 4.2: BRT vs. Light Rail Transit

BRT vs. Light Rail Service

Factor	Bus Rapid Transit	Light Rail
Lower Upfront Cost	✓	
Speed / Reliability	Studies show BRT can equal LRT speeds and reliability	
Operating Flexibility	✓	
Neighborhood Penetration	✓	
Comfort / Amenities	Can be similar	
Carrying Capacity	Studies show this to be similar	

4.1.6.1 Special lane

It is well known that Kuala Lumpur is a city that is highly congested with population, existing facilities, existing public transport, vehicles and high rise commercial buildings. For BRT to operate smoothly, a special lane must be constructed where two-lane two-way (2.5 m each lane) provided for route provision. It is crystal clear here that the availability of lane to be constructed is limited or close to none. If no special lane for BRT is provided, BRT vehicles will be mixed with social vehicles. Running time of BRT is thus increased, which leads to the great reduction of operating speed and punctuality rate. Physical isolations o the BRT route in some section of the city center is irrelevant and impossible to be done to avoid removing and dismantling. Furthermore, when no divider introduced between the special lane and he existing lane for commercial vehicle, the social cars can enter into the special line at discretion, which affects the operation of BRT.

Figures 4.3: BRT stations

The bus station stop is between the two BRT lanes. Riders must exit to the streets via an underpass.

4.1.6.2 Short station distance.

The in between stations' distance is what influence the operation speed of BRT. The average station distance of BRT need to undergo further research to come up with an appropriate and rational distance to operate efficiently.

4.1.6.3 Dwell time.

One of the major drawbacks in dropping the efficiency of BRT is the time delayed that may occur while serving the public. This delay time is called dwell time where time spent stopped to serve passengers including opening and closing the doors. Dwell time is influenced by passengers demand, fare payment method and vehicle design.

What really causes this de\well time to occur are the frequent stopping incite by the passengers which is the biggest source of travel time saving for on-street BRT route. Thus, BRT system needs to have proper distance between the stops to avoid delays. Passengers boarding at each stop may cause delay due to the time taken in load and unload passengers. To shorten the time taken when load and unload occur, certain issues need to be taken into considerations when designing the operations; passenger's demand, fare collection method, floor height, door configuration, and on-board crowding.

Traffic signals and traffic congestion also can delay time of services for example, after stopping, the bus have to wait for the turning vehicles, red lights, pedestrians, delays after leaving the stops and doubled parked vehicles.

CHAPTER 4.2

RANGKAIAN PENGANGKUTAN INTEGRASI DERAS KUALA LUMPUR (RAPID KL)

4.2.1 Introduction

Rapid KL was formed in 2004 under the government's ambit to drastically improve the quality of public transport in and around Kuala Lumpur under the Valley Transport Plan. This calls for an amalgation of bus companies and routes, as well as ticketing system to rationalise resources and make the public transport network friendlier to use. The largest public bus company, Intrakota, was merged with Cityliner of Park May Bhd to form the bus division of Rapid KL, along with a livery change. Putra LRT and STAR LRT are also merged, along with a slight livery change and commonalisation of ticketing system. In 2006-2007, the bus network was re-organised into a hub network consisting of Tempatan, Bandar, Utama & Ekspres routes. New buses, including wheelchair-accessible buses, were also brought into to replace the old fleet.

Figure 4.4: rapid KL

4.2.2 Rangkaian pengangkutan integrasi deras (RAPID KL)

Rangkaian Pengangkutan Integrasi Deras Sdn Bhd (RapidKL) is the company tasked to provide an integrated public transport system in the Klang Valley incorporating rail and bus services.

Incorporated in July 2004 and operational since November the same year, RapidKL today transports approximately 4 million customers per week: 2.1 million on the Ampang Line (formerly known as STAR) and Kelana Jaya Line (formerly known as PUTRA) and 1.9 million on the bus system, previously Intrakota and Cityliner. RapidKL provides services across 48 rail stations and 165 bus routes.

A 100% government-owned company under the Ministry of Finance, RapidKL's operating agreement is conditional upon its ability to meet a set of key performance indicators monitored independently of the company.

4.2.3 KELANA JAYA LINE (Formerly known as PUTRA)

Kelana Jaya Line uses the state-of-the-art driverless system by Advanced Rapid Transit Mark II technology from Canada. It has a proven record of very high performance specification in North America and Europe and is designed to meet the demands of a modern city of Kuala Lumpur.

The alignment starts from the Depot in Subang and ends at Terminal Putra in Gombak totaling to 29km in length with a total of 23 stations.

Its first operation commenced on 1st September 1998 between Subang Depot to Pasar Seni Station and section two, between Pasar Seni to Terminal Putra in June 1999.

In 2002, the system carried its 150 millionth passenger, with an average of 160,000 passengers riding the system daily. Today, it carries over 170,000 passengers a day and over 350,000 a day during national events.

Figure 4.5:integrated Bus rapid KL

4.2.4 AMPANG LINE (Formerly known as STAR)

Adtranz German is the maker of trains and system for Ampang line. Phase I was opened in September 1998 between Sultan Ismail Station to Sri Petaling and Ampang Stations and in December 1998 from Sultan Ismail Station to Sentul Timur.

Today this line carries over 130,000 to 150,000 per day on a weekday basis and an average of 120,000 per day on weekends.

It has 25 stations throughout the 27 km, transporting passengers from the northern, north-eastern and south-western suburbs in the Klang Valley .

4.2.5 RAPID KL BUS

Today, RapidKL operates 165 bus routes within the Klang Valley which consist of 10 City Bus routes, 87 Local Bus routes, 65 Trunk Bus routes and 3 Express Bus routes. We currently have 11 bus depots spreading across the Klang Valley and over one thousand buses in operation.

Every day we transport over 192,000 passengers. To continuously encourage the use of public transport and to provide services to the general public, RapidKL is also continuously studying new bus routes with the arrival of more new buses.

CHAPTER 5

FINDINGS AND ANALYSIS

5.1 Study Area Context

The Kuala Lumpur Federal Territory covers an area of 243 square kilometres. Besides Kuala Lumpur Federal Territory, four other districts of Petaling, Klang, Hulu Langat and Gombak within the state of Selangor make up the Klang Valley Region. The Kuala Lumpur Metropolitan Region (KLMR) has been used to refer to the entire Klang Valley Region and further includes the Kuala Langat District and the Sepang District where more recent development such as the Kuala Lumpur International Airport (KLIA), the seat of Federal Government at Putrajaya and 'intelligent city' of Cyberjaya are located. It covers a total area of approximately 4000 square kilometres, which is about 40 percent larger than the existing Klang Valley Region area of 2843 square kilometres.

The city of Kuala Lumpur originated as a tin-mining settlement but has developed rapidly in tandem with the country's growth and is the nerve centre today of the Malaysian economy. To the west of Kuala Lumpur is an urbanised corridor punctuated by main development nodes at Petaling Jaya, Subang Jaya, Shah Alam and Port Klang. Petaling Jaya was a new township set up in 1952 as an overspill area to overcome the squatter problems in Kuala Lumpur. Shah Alam, now of city status, was to replace the loss of Kuala Lumpur to Federal control and was designated as the state capital of Selangor.

A new southern growth axis is currently being developed as the Multimedia Super Corridor. This is an area of 15 by 40 km and comprises several major development projects mentioned above including Cyberjaya, Putrajaya, High Tech Park and the KLIA.

The Kuala Lumpur Federal Territory, with approximately 1.4 million populations, has a third of the KLMR total population of four million. The population of Kuala Lumpur city has since 1980 been growing at only about 2 percent per annum, which is much lower than the national average population growth of 2.6 percent per annum. The population of the KLMR is projected to double at between eight to nine million by the year 2020 while the projected population of Kuala Lumpur city is 1.6 million. The declining population growth rate is in part due to the projected continued trend in net out-migration and in part to the projected decline in natural growth rate.

5.2 Travel Demand

Traffic congestion has been reported on the roads and highways of Kuala Lumpur during peak and off-peak hours. A total of 8.3 million person-trips are reported to be made daily within the Klang Valley. Around 75 percent of these trips are attracted to and from home. Population within the Kuala Lumpur Central Planning Area (CPA) accounts for only 3.3 percent of the region, whilst travel demand within the CPA accounts for 19 percent of the region. Under the 1984 Kuala Lumpur Structure Plan, the city centre was designated as the principal urban core (CPA) to provide specialized metropolitan services, national and international commercial and business activities, central government activities, specialized comparison and convenience goods shopping for residents. Considering the regional role of Kuala Lumpur, it is not surprising that other significant person-trip producing areas appear along the major corridors such as the Kuala Lumpur – Klang, Kuala Lumpur – Kajang and Kuala Lumpur – Seremban corridors.

Private vehicle (consisting of motorcycles and cars) ownership in Kuala Lumpur, as obtained from registration figures, is 225031 motorcycles and 514552 private cars. By dividing the numbers with the population, these average about 164 motorcycles per 1000 population and 211 cars per 1000 population. In broad terms, the distribution of motorised trips by mode indicated that 80.3 percent of trips were by private transport and only 19.7 percent by public transport, whilst 23.7 percent of person trips were by motorcycles with 56.6 percent by private car.

Table 5.1: Vehicle Ownership in the Klang Valley

District	Number of Private Vehicles			Ownership per 1000 person		
	Motorcycle	Car	Total	Motorcycle	Car	Total
Kuala Lumpur	225,031	289,521	514552	164	211	375
Gombak	83143	88818	171961	174	186	360
Hulu Langat	110466	109829	220295	194	193	388
Petaling	140891	192222	333113	169	231	400
Klang	99056	107356	206412	190	206	396
Total	658587	787746	1446333	175	209	383

Source: JICA SMURT Person Trip Survey 1996

Table 1 shows the car ownership figure for the component district of the Klang Valley area. This data is required by a survey data done by Japan International Cooperation Agency (JICA) (MMUTIS 1998). Car ownership in the Klang Valley area is approximately 50% higher than the average national level. Petaling district shows the highest ownership rate in the area followed by Klang district.

Table 5.2: Change in modal composition: 1985 - 1997

Mode	Person Trips/Day		Composition (%)	
	1985	1987	1985	1997
Motor Cycle	884200	1492200	19	23.7
Car	2170000	3555200	46.7	56.6
Private Mode (Total)	3054200	5047400	65.7	80.3
Stage Bus/Mini Bus	1129900	493900	24.3	7.9
Factory Bus/School Bus	465900	638700	0	10.2
Rail	0	103200	0	1.6
Public Mode (Total)	1595800	1235800	34.3	19.7
Total	4650000	6283200	100	100

Source: JICA SMURT Person Trip Survey 1996

It is observed from Table 3 that between 1985 and 1997, the modal share of public transport decreased from 34.3 percent to 19.7 percent; and that the modal share of stage bus/mini bus within the public transport component decreased from 24.3 percent to 7.9 percent. Modal share, or Modal split, is a traffic / transport term that describes the percentage of travelers using a particular type of transportation.

The existing transport system in Kuala Lumpur is dominated by the highway network. The road network is currently used for the movement of private vehicles, commercial trucks and public transport vehicles. The network is radial in layout, focussing on the city centre. The available network within Kuala Lumpur in 1980 comprised some 706 km of which only 89.3 km were expressways and 268.9 km were primary distributor routes, with the vast majority of the network consisted of local/distributor access roads (347 km). In 1997, Kuala Lumpur had 1200 km of major roads. Almost all highways have a major arterial road function with full access control. User access is through well-constructed interchanges. Most of the minor roads consist of four lanes while others are dual-lane single carriageways.

Road based public transport (bus network) is operated throughout the highway and arterial road networks by the use of large buses with a capacity of around 70 persons including standing room. At present there are about 15000 bus trips per day all operated by private

companies. Intrakota operates 112 routes, Cityliner (Park May) operates 59 routes and Metro Bus operates 20 bus routes. Generally bus routes are radial in nature terminating at the City Centre and covered 67 percent of the population within a 350 meter radius from the bus stops in 1997.

Railway services are provided by KTMB suburban service and two Light Rapid Transit systems. The Light Rapid Transit Systems consist of at-grade, elevated and underground corridors within the metropolitan area servicing the suburbs and city centre. The Monorail Project is to be completed within the city centre as an inner city people mover. The express rail link (ERL) is a dedicated railway between KL Sentral and Kuala Lumpur International Airport. The ERL will facilitate the concept of a city airport terminal for KLIA. At the integrated hub of KL Sentral, an intermodal facility will be provided with KTMB, PRT and LRT System II whereby users can transfer between the various modes to their desired destination. On the completion of all planned and committed future rail lines, the services will cover 4.2 percent of the population within a walking distance of 350 metres from the stations. This increases to over 50 percent of the population within a 2 km radius of all stations.

Kuala Lumpur was served by three major bus companies before RAPIDKL operated i.e., Intrakota, City Liner and Metrobus. Together, a total fleet of 728 air-conditioned buses provide the much needed services in and around the city, serving about 175 different routes. Passenger volume averages 494000 per day. This constitutes about 7.9 percent of the total motorized trips made in Kuala Lumpur in 1997. Improvements to the bus network are being facilitated by Kuala Lumpur City Hall and the Highway Planning Unit in providing exclusive bus lanes both inside the Central Planning Area and on surrounding highways to further develop the bus priority lanes and the ticketing system to offer passengers a quick, comfortable and convenient transport option. The present structure of the bus routes is radial in nature emanating from the Central Planning Area of Kuala Lumpur. Routes of a circuitous nature away from the City Centre require transfers.

5.3 Fuel Subsidies and Transport Policy

A review of the fuel subsidy seems imminent as the Government and national oil company Petroliam Nasional Bhd (Petronas) have said fuel and gas subsidies now cost a combined total of RM40bil a year due to the surge in crude oil and natural gas price globally. When the price of crude oil was US$147 (RM515) a barrel in June, the government was forced to respond to the spike. The increase of 78 sen per litre for RON97 and RM1 for diesel was unprecedented and resulted in a public outcry. The government's response was to provide a rebate of RM625 per vehicle and subsidies to selected groups. Now that the price of crude oil has dropped to as low as US$42 a barrel, the time has come to review the policy on fuel subsidies and public transport.

It has been reported that speculators are waiting for a global crisis to push the price back to previous levels. The explanation by experts that the recent price hike was due to supply and demand factors is not true; the fluctuations are mainly due to speculators manipulating the futures market. The price of fuel should not go below the present RM1.90 for RON97 and RM1.80 for RON 92 and diesel. The government should maintain a minimum or floor price for the product to make sure that the country's development is not affected. It is the duty of the government to come up with a long-term economic strategy to enable the country to maintain an acceptable growth rate. This can only take place with the necessary funds for the purpose. If the benefits of the present low price were to be passed on to consumers, what would happen if the price were to revert to the old price of US$147 a barrel? There would be another outcry.

Hence, removal of the need to increase or decrease the retail price of petroleum products and provide adequate funding for the development of a public transport system must be proposed. The fund could also be used to develop a more efficient and affordable public transport system. Over time, when the public transport system is developed, the government could withdraw the subsidy for car owners, which at the moment is in the form of petrol subsidy

or other incentives to the automotive sector. This disincentive could be directed towards encouraging the public to switch to public transport.

With the end of the era of cheap oil, many experts see Malaysia's current oil and gas subsidies as unsustainable and inefficient. A high subsidy level is not efficient from a welfare perspective because those who can afford to pay for higher fuel prices are also benefiting from the subsidy that is aimed at alleviating the burden faced by the low-income groups. It is also not efficient from a distributional perspective because of leakages, hoarding and smuggling to countries with higher fuel prices. In addition, given that oil is a scarce and non-renewable resource, it would not be wise to encourage high consumption by keeping domestic prices way below the international level through subsidies. The best way to keep sustainability of fuel is by reducing gradually and ultimately remove the subsidy altogether, this can be shown in the figure below by removing up to 30%, the government can save almost RM 10 billion.

Table 5.3: Fuel price adjustment vs. subsidy savings

Fuel price adjustments vs subsidy savings

	Current price	*Retail prices based on*		
		15% rise	*20% rise*	*30% rise*
Petrol Ron 97 (RM/litre)	1.92	2.21	2.30	2.50
Petrol Ron 92 (RM/litre)	1.88	2.16	2.26	2.44
Diesel (RM/litre)	1.58	1.82	1.90	2.06
Liquefied petroleum gas (RM/kg)	1.75	2.01	2.10	2.28
Estimated reduction in subsidies (RMbil)		4.91	6.55	9.83

Source: RAM Economics Research

5.4 BRT Route Model

The route model will be printed and attached as an appendix in this report. This model was generated by the number of cars coming into Kuala Lumpur. The information was collected from Integrated Transport Information System (ITIS), a branch of department from City Hall Kuala Lumpur (CHKL). The number of cars was recorded by the CCTV situated at a few chosen roads inbound into Kuala Lumpur and recorded every 3 minutes. Below are extracted information from the number of cars;

Table 5.4: Numbers of cars coming in KL

Inbound road	Number of cars		Speed (km/hr)	
	Peak	Off-peak	Peak	Off-peak
A138	9272	24316	60-70	70-90
A038	17019	15248	50-60	70-80
A532	24163	32182	40-60	90-110
A271	15143	23164	50-60	70-90

Peak hour: 7-10 am and 5-7 pm

From the table above, these are the highest number of cars that are coming into the city center during peak hour and off-peak hour. There are not much difference in terms of the figure of cars because usually the car owners live in the city center itself. Less number of cars coming from outside the Kuala Lumpur city center (CBD) for work only. This is assumed at peak hour of commuters on and off office hour. This information is collected in 30 June 2008. Since the number of cars in this road are quite heavy and causing congestion at either peak and off-peak hour, certain measure must be done to solve the congestion problem. Thus, the route model is generated from here.

CHAPTER 6

CONCLUSION

Well organized transportation system provides transit, automobiles, cyclist and pedestrian with a contemporaneous environment and attractive alternative to traffic congestion. BRT is a great solution and provide the community with new and improved public transportation that play a significant role in developing sustainable transport. BRT system improved in a lot of ways in terms of performance and fulfilling the public's satisfaction. A high subsidy level is not efficient from a welfare perspective because those who can afford to pay for higher fuel prices are also benefiting from the subsidy that is aimed at alleviating the burden faced by the low-income groups. From the analysis and the investigation done so far, it is possible to have BRT system applied in Kuala Lumpur. These findings can be used to form the basis for developing public transport corridor in present Kuala Lumpur.

APPENDIX

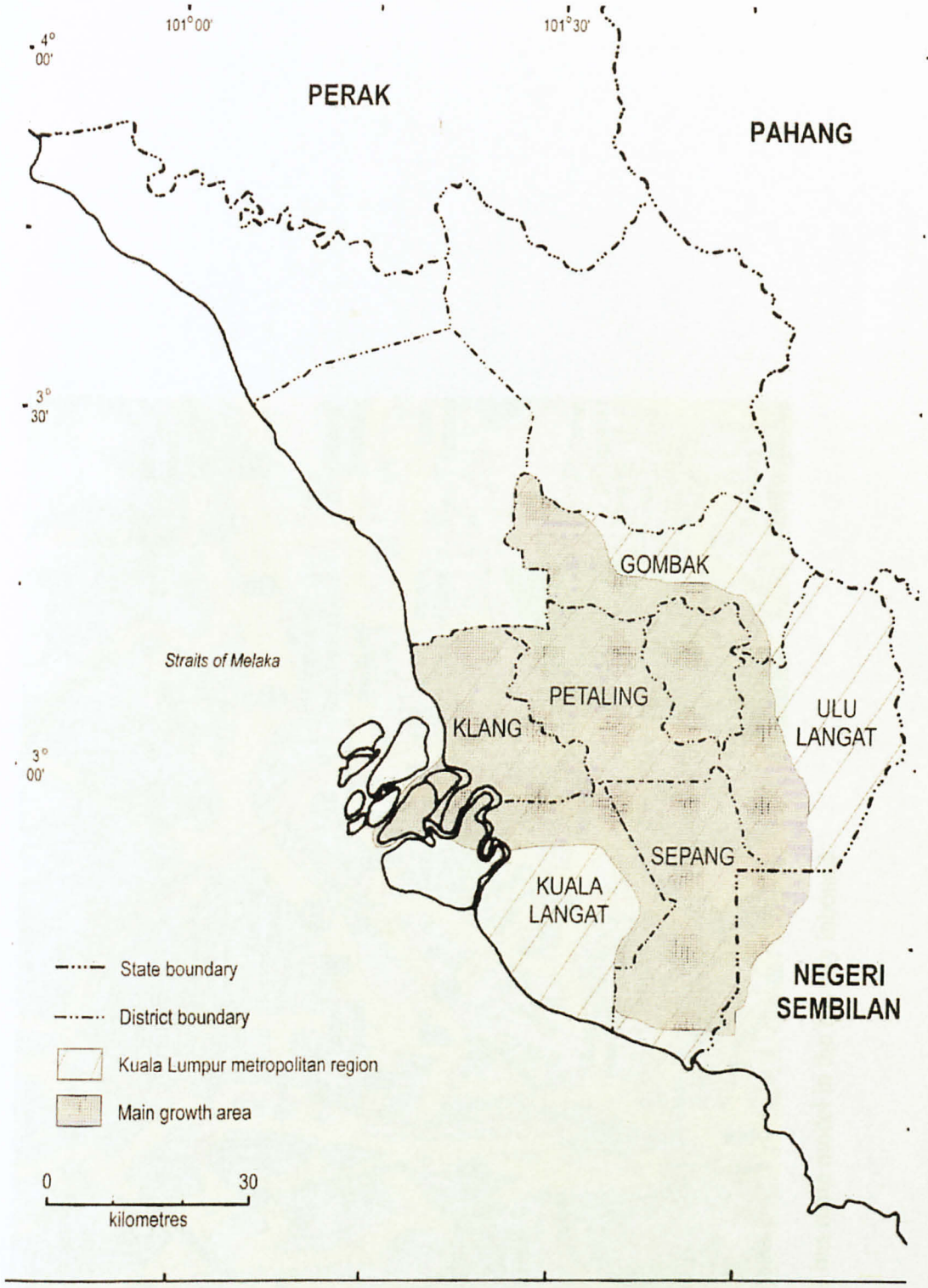


FIGURE 2 : KUALA LUMPUR METROPOLITAN REGION

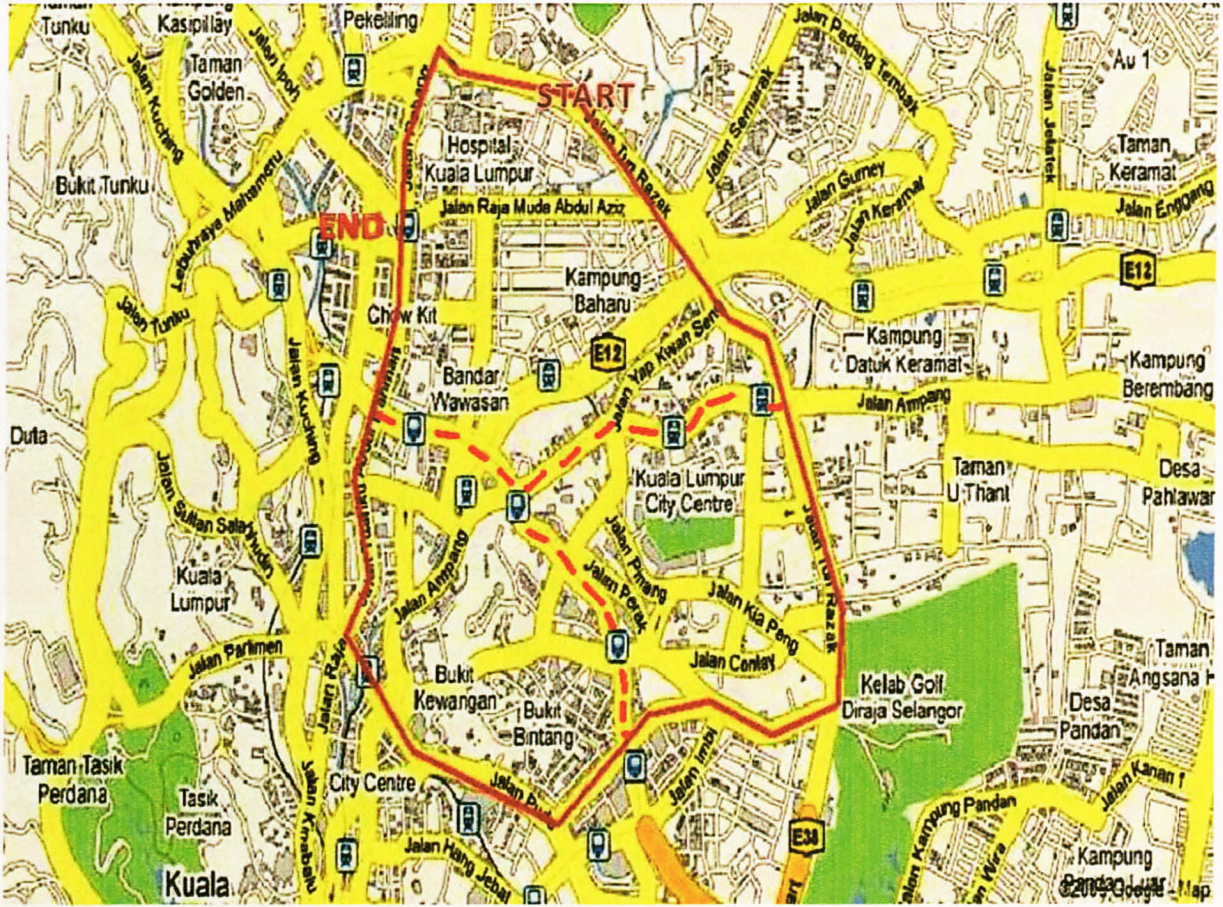


Figure 2: BRT bus route model in the KL city inbound

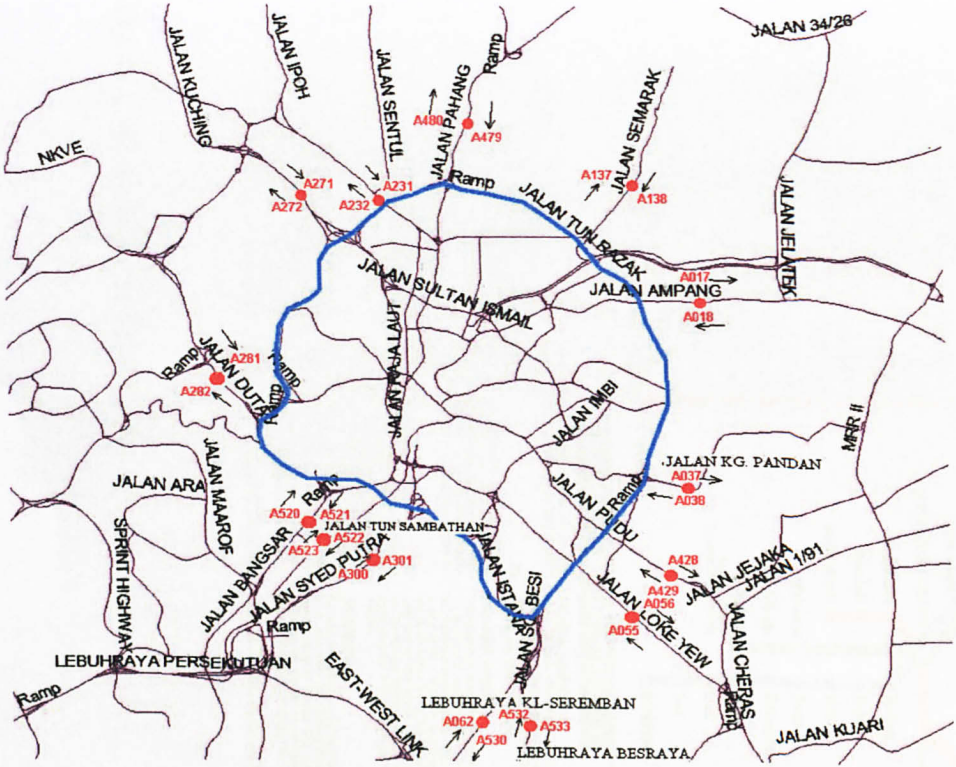
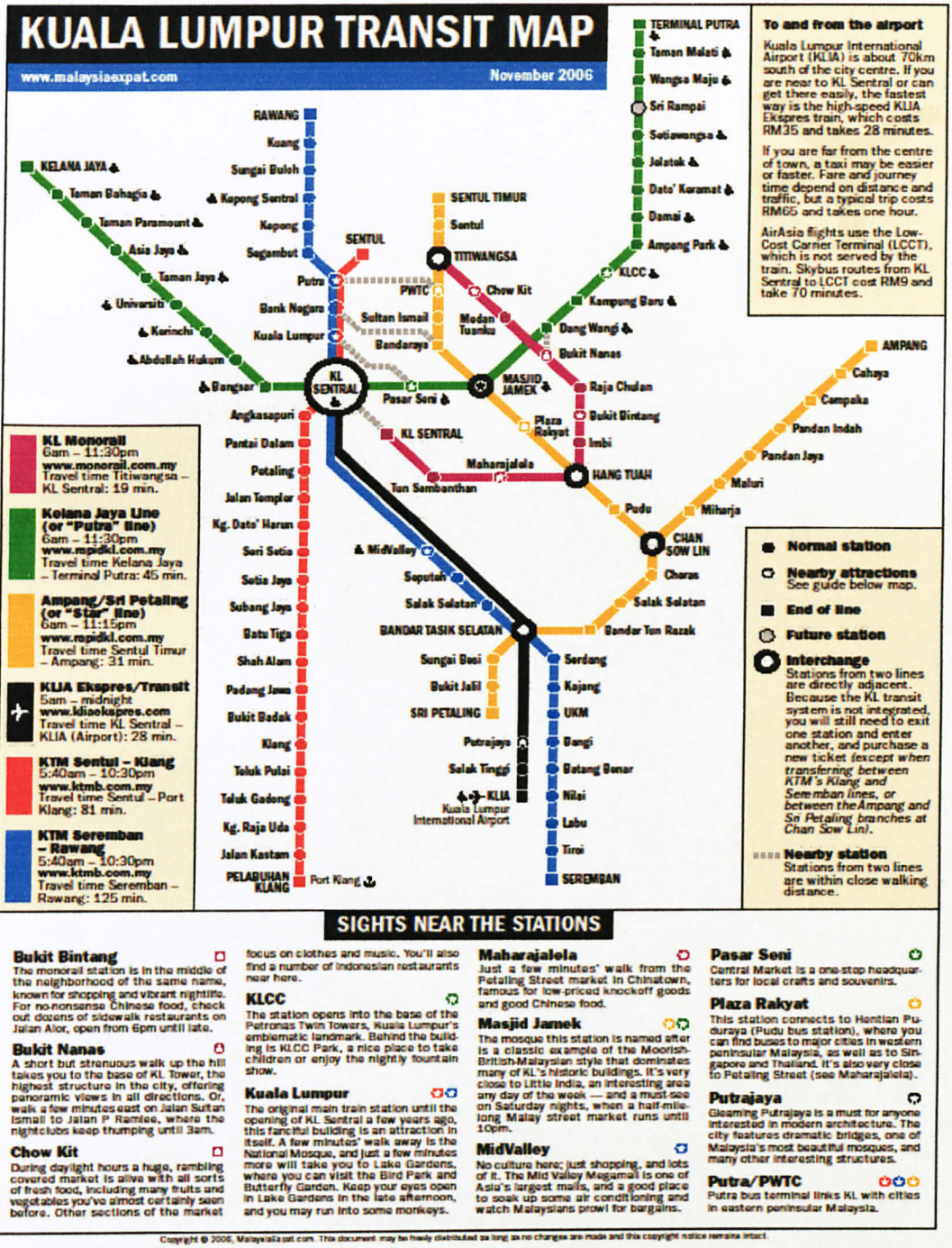


Figure2: MRR1 – inbound into Kuala Lumpur



SIGHTS NEAR THE STATIONS

Bukit Bintang
The monorail station is in the middle of the neighborhood of the same name, known for shopping and vibrant nightlife. For no-nonsense Chinese food, check out dozens of sidewalk restaurants on Jalan Alor, open from 6pm until late.

Bukit Nanas
A short but strenuous walk up the hill takes you to the base of KL Tower, the highest structure in the city, offering panoramic views in all directions. Or, walk a few minutes east on Jalan Sultan Ismail to Jalan P Ramlee, where the nightclubs keep thumping until 3am.

Chow Kit
During daylight hours a huge, rambling covered market is alive with all sorts of fresh food, including many fruits and vegetables you've almost certainly seen before. Other sections of the market focus on clothes and music. You'll also find a number of Indonesian restaurants near here.

KLCC
The station opens into the base of the Petronas Twin Towers, Kuala Lumpur's emblematic landmark. Behind the building is KLCC Park, a nice place to take children or enjoy the nightly fountain show.

Kuala Lumpur
The original main train station until the opening of KL Sentral a few years ago, this fanciful building is an attraction in itself. A few minutes' walk away is the National Mosque, and just a few minutes more will take you to Lake Gardens, where you can visit the Bird Park and Butterfly Garden. Keep your eyes open in Lake Gardens in the late afternoon, and you may run into some monkeys.

Maharajalela
Just a few minutes' walk from the Petaling Street market in Chinatown, famous for low-priced knockoff goods and good Chinese food.

Masjid Jamek
The mosque this station is named after is a classic example of the Moorish-British-Malaysian style that dominates many of KL's historic buildings. It's very close to Little India, an interesting area any day of the week — and a must-see on Saturday nights, when a half-mile-long Malay street market runs until 10pm.

MidValley
No culture here; just shopping, and lots of it. The Mid Valley Megamall is one of Asia's largest malls, and a good place to soak up some air conditioning and watch Malaysians prowl for bargains.

Pasar Seni
Central Market is a one-stop headquarters for local crafts and souvenirs.

Plaza Rakyat
This station connects to Hentian Pudu raya (Pudu bus station), where you can find buses to major cities in western peninsular Malaysia, as well as to Singapore and Thailand. It's also very close to Petaling Street (see Maharajalela).

Putrajaya
Gleaming Putrajaya is a must for anyone interested in modern architecture. The city features dramatic bridges, one of Malaysia's most beautiful mosques, and many other interesting structures.

Putra/PWTC
Putra bus terminal links KL with cities in eastern peninsular Malaysia.

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Figure 4: Kuala Lumpur Transit map