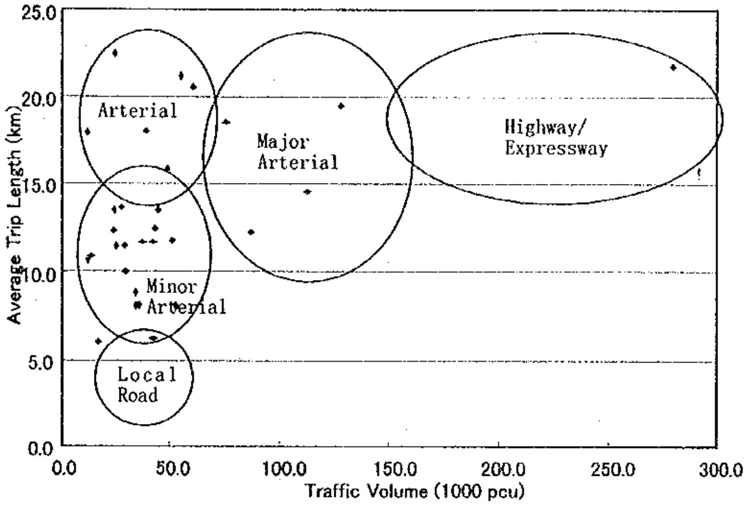
Chapter 3

Current Urban Transportation System and Travel Demand Characteristics

Chapter 3 Current Urban Transport System and Travel Demand Characteristics

3.1 Road Network System

The trunk road system of the Kuala Lumpur metropolitan area consists of two circumferential roads, Jln. Sultan Ismail and Jln. Tun Razak, and seven radial roads. Among seven radial roads, Karak Highway, Sungei Buloh Highway, Federal Highway (II) and Seremban Highway are fully access controlled expressways stretching to the north, north-west, west and south, respectively.



Source : SMURT-KL

Figure 3.1.1 Classification of Road Functions

The existing road network is classified into five categories by function as follows; 1) highway/expressway, 2) major arterial road, 3) arterial road, 4) minor arterial road and 5) local road as shown in Figure 3.1.1. The function is categorised by average trip length as well as traffic volume. The hierarchy of the existing road network is depicted in Figure 3.1.2 according to the road classification. It can be seen that the existing road network shows directional imbalance and lack of continuity.

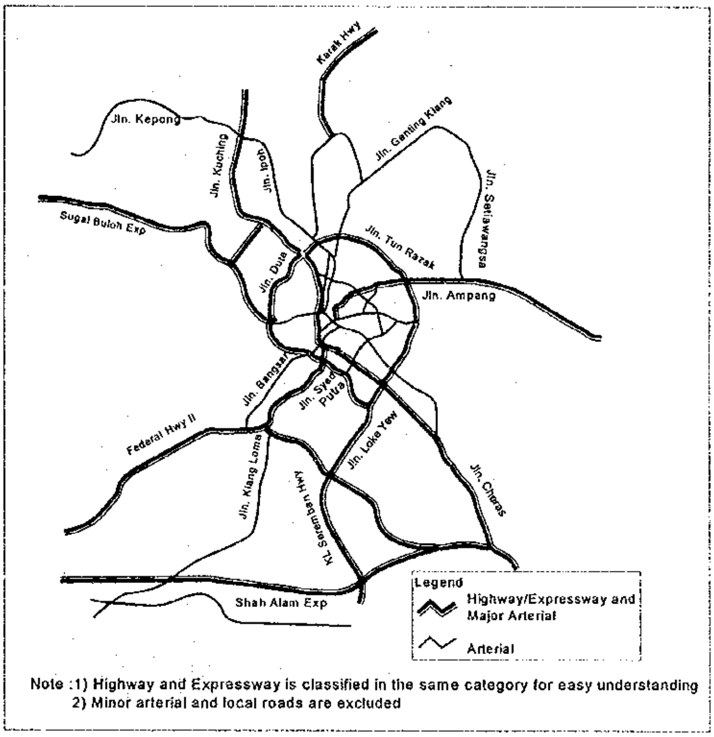


Figure 3.1.2 Hierarchy of Existing Road Network

3.2 Road Traffic Characteristics

(1) Traffic Volume

The existing traffic volume on the road network is illustrated in Figure 3.2.1. In the Central Planning Area (herein after referred to as CPA), it was observed that traffic volumes on the roads were on average as much as 150,000 Passenger Car Unit (herein after referred to as P.C.U.) per day. In the outskirts of the CPA, enormous traffic volumes were observed on two expressways, Federal Highway (II) and Seremban Highway, carrying more than 200,000 P.C.U. per day.

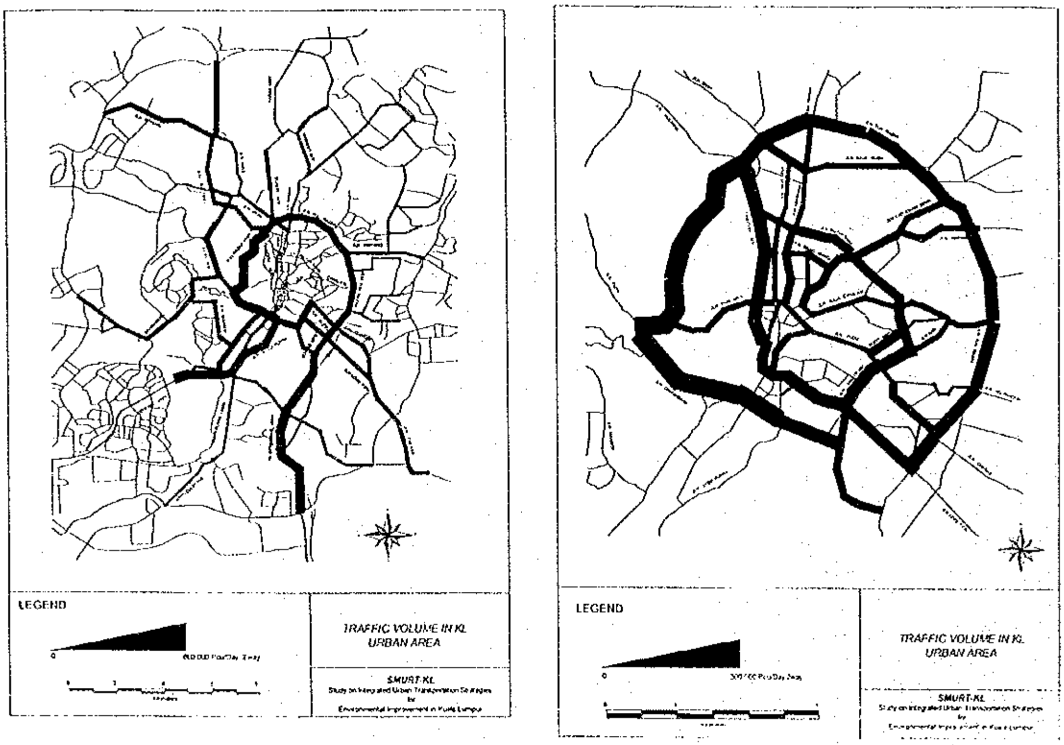
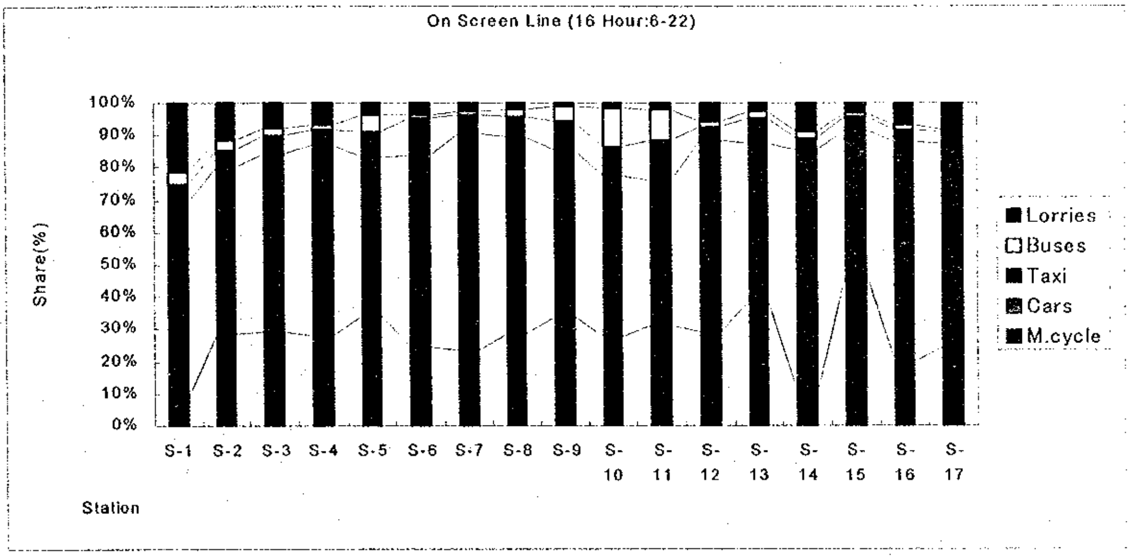
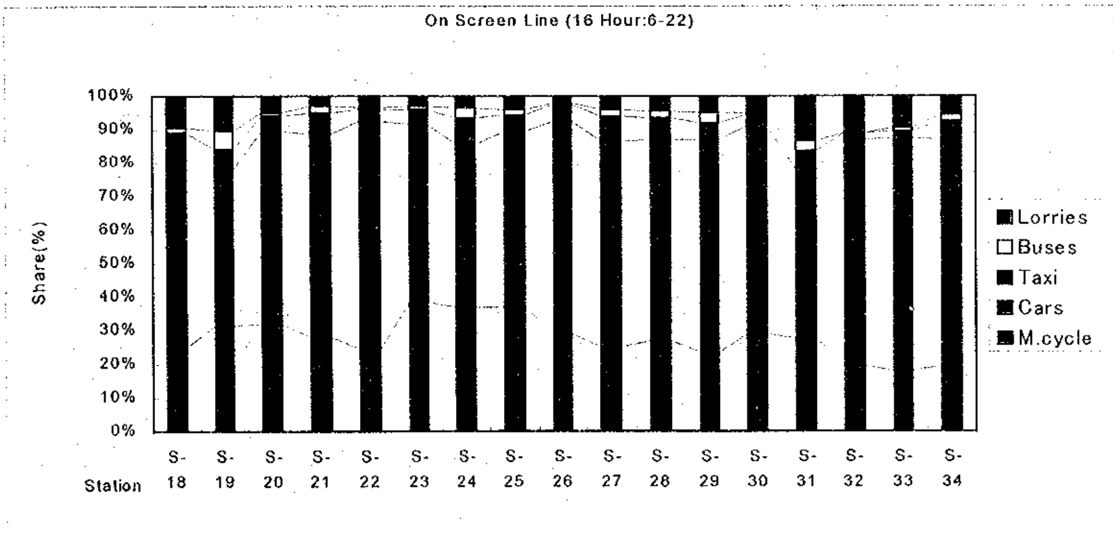


Figure 3.2.1
Traffic Volume in CPA and its Surrounding Area

(2) Vehicle Composition

Passenger cars dominate over other types of vehicles at all survey stations, accounting for 50 percent to 60 percent of the total number of vehicles in the Kuala Lumpur metropolitan area as shown in Figure 3.2.2. Motorcycles follow at 25 percent to 35 percent depending on the location. The compositions of lorries are small, ranging between 2 percent to 8 percent.





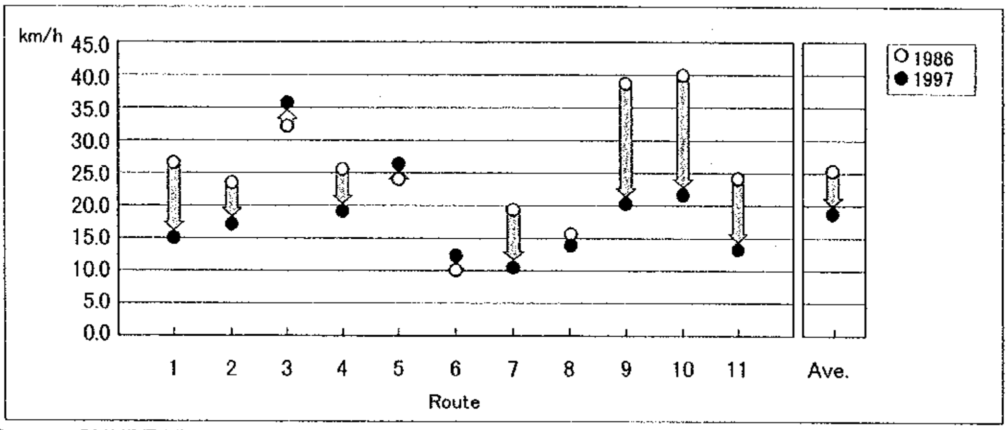
Source : SMURT-KL

Figure 3.2.2 Composition Ratios by Vehicle Type

(3) Level of Service of Road Network

1) Travel speed comparison over the past 10 years

Average travel speeds on major arterial roads have declined significantly by 4 km per hour to 18 km per hour over the past ten years. Figure 3.2.3 presents a comparison of average travel speed in 1986 and that in 1997. Although slight increases in average travel speeds have been recognised at some locations due to the construction of new parallel roads and other road improvements, the overall level of service of the road network has been lowered over the period.



Source: SMURT-KL

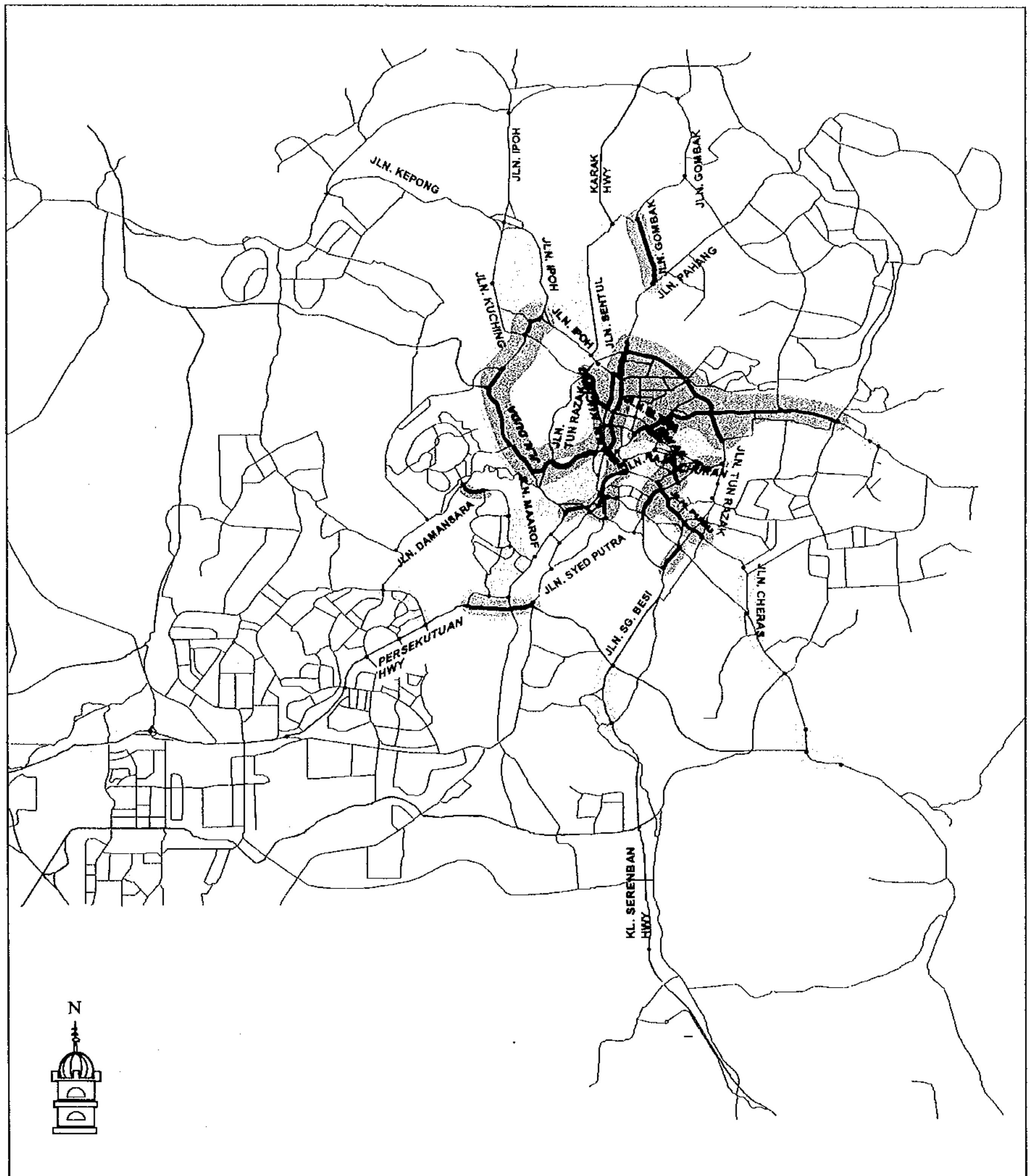
Note: Route Name

Route 1 - Inner Ring Road
Route 2 - Middle Ring Road
Route 3 - Jln. Ipoh, Jln. Kuching
Route 4 - Jln. Kepong, Jln. Ipoh
Route 5 - Karak Highway, Jln. Sentul
Route 6 - Jln. Gonbak, Jln. Pahang
Route 7 - Jln. Ampang
Route 8 - Jln. Cheras, Jln. Pudu
Route 9 - Seremban Highway
Route 10 - Federal Highway
Route 11 - Jln. Pantai
Ave. - represents the average.

Figure 3.2.3 Comparison of Travel Speed

2) Roads of low travel speed

Low travel speed sections were observed on almost all the roads within the CPA as well as radial roads plunging into the CPA from the south and south-east areas as depicted in Figure 3.2.4.



LEGEND

Under 10 km/h

10-20 km/h

2 0 2 4

KILOMETERS

Figure 3.2.4
Area with Low Travel Speed
(Under 20km/h)
(Morning Peak Hour)

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INTEGRATED URBAN TRANSPORT STRATEGIES
FOR
ENVIRONMENTAL IMPROVEMENT
IN
KUALA LUMPUR
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

3) Causes of low travel speed

The road sections with low travel speed are illustrated by cause of congestion (Figure 3.2.5). The following factors have been identified as significant causes for traffic congestion:

- Long cycle length of traffic signals;
- Many buses loading /unloading at/near bus stops;
- Spill back condition;
- Merging/diverting to/from minor roads;
- Influence of cars turning left/right;
- Narrow road sections at constitution site; and
- Interchanges/roundabout without traffic lights.

(4) Traffic Management System

1) Area traffic control

The Sydney Coordinated Adaptive Traffic System (SCATS) controls about one hundred intersections in Kuala Lumpur. Another three hundred intersections will be controlled by the system in the near future. Although the system has been installed, traffic at the major intersections in the morning and evening peak-periods are managed by traffic policeman because the traffic volumes exceed the limit that can be managed by the system. Since the manual traffic control tends to assign relatively longer cycle-time to directions of heavier traffic volume, overall waiting-time at intersections become longer.

2) Other traffic control measures

Heavy lorries are prohibited from entering the city centre during peak periods, thus serious problems caused by heavy lorries are avoided.

Bus and taxi priority lanes have been introduced recently at several sections on urban roads. The bus lanes, however, have not been successful at achieving smooth bus operation because private vehicles invade the lanes when the road is congested. Furthermore it lacks continuity as a network and does not form an effective network because it is difficult to introduce bus lanes continuously in the city centre due to the narrow road width.

The other traffic controls to manage traffic in the city centre include a one-way street system, right/left turn prohibition at intersections, reversible lanes and traffic controls near construction sites.

(5) Parking Facilities

The parking demand of commuters and the parking facility supply in office buildings are almost balanced in the CPA.

LEGEND

- Long cycle length of traffic signals
- Many buses loading/unloading at/near bus bus stop
- Spill back condition
- Merging/diverging to/from minor roads
- Influence of the cars turning to left/right
- Narrow road sections at construction site
- Interchanges/roundabout without traffic light

0 1 2 3 4 5 6

Kilometers

Figure 3.2.5

Main Causes of Traffic Congestion

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INTEGRATED URBAN TRANSPORT STRATEGIES FOR ENVIRONMENTAL IMPROVEMENT IN KUALA LUMPUR

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

3.3 Bus Transport Network

(1) Bus Transport

In the Kuala Lumpur metropolitan area, more than 1,000 bus fleets are operated a day. The total number of bus trips amount to around 15,000 trips per day. The streets which are heavily used for bus transport are Jln. Tuanku Abdul Rahman and Jln. Raja Laut. On the two streets more than two thousand buses are operated on a weekday.

(2) Bus Frequency

The observed frequencies of Intrakota buses in the morning peak period are generally similar to the scheduled frequencies on average. Most buses are operated at 15 to 20 minute interval in the peak period. Buses are, however, often bumper to bumper due to traffic congestion on the streets. It was observed that two or three buses would come in a short period, but the interval until the next bus appeared was considerably long, and it sometimes exceeded an hour.

3.4 Taxi Transport Network

(1) Situation of Taxi Transport

The total number of taxis registered in the Klang Valley region amounted to 11,275 in August, 1997. Compared with other large cities in Asian countries, the number of taxi per population is not small, although the role of taxi transport is limited in terms of its share compared to other modes of transport.

(2) Taxi Service

Previously taxi service in Kuala Lumpur was observed to be bad since some taxi drivers did not want to use the taximeter and asked passengers to pay extra charge. Taxi services, however, has been improved recently due to the instruction given by the agency concerned.

3.5 Rail Transport Network

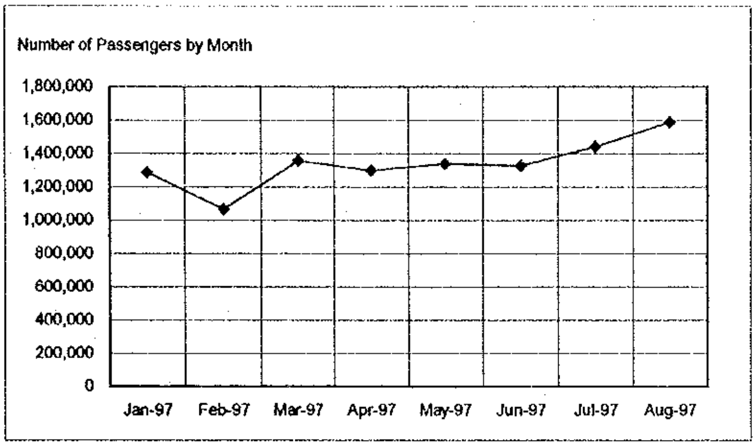
(1) Operations

1)KTMB

The KTMB completed its 153 km long double tracking and electrification project for commuter service in December 1995. The number of passengers transported by the KTM Kommuter was 870,000 per month in the first year of operation. The number of passengers has increased continuously and reached over 1.3 million per month in October 1997.

2) LRT

In Kuala Lumpur, the LRT System I and II have operated as of September 1998 with a total line length of about 40 km. The number of passenger volume of the LRT System I (Phase I Section:Sultan Ismail - Ampang) has been increasing constantly as shown in Figure 3.5.1. The LRT systems, however, have not attained sufficient patronage compared to the predicted passenger demand due to inconvenient access to the stations and expensive fare.



Source: STAR LRT

Figure 3.5.1 Monthly Number of Passengers of LRT System I Phase I

3.6 Characteristics of Person Trip Demand

(1) Change in Modal Composition

Compared with the modal composition in 1985, the share of the private mode of transport, consisting of motorcycles and cars, has significantly increased from 65.7 % to 80.3 % in 1997, as shown in Table 3.6.1.

In contrast, the modal share of public transport has decreased from 34.3 % to 19.7 %, more specifically, the share of stage bus/mini bus decreased remarkably from 24.3 % to 7.9 %.

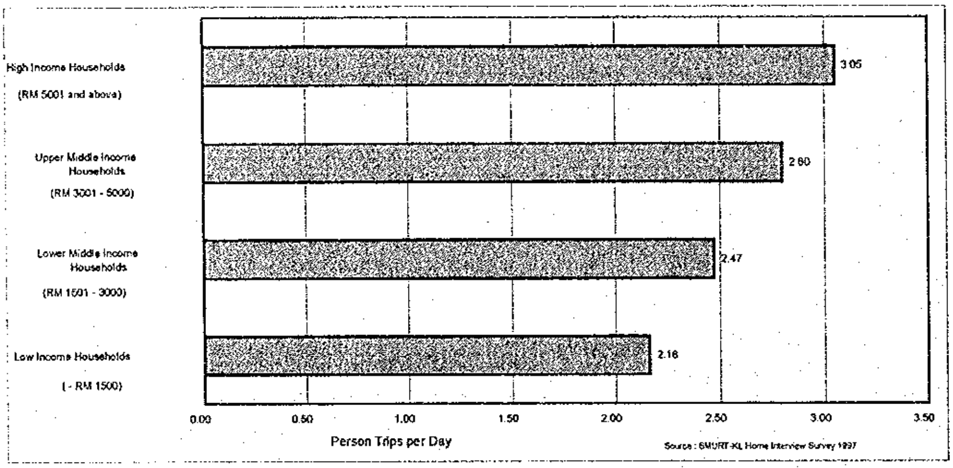
Table 3.6.1 Change in Modal Composition : 1985 and 1997

	Person Trip (.000)		Composition (%)	
	1985	1997	1985	1997
Private Mode	3,054.2	5,047.4	65.7	80.3
Motor Cycle	884.2	1,492.2	19.0	23.7
Car	2,170.0	3,555.2	46.7	56.6
Public Mode	1,595.8	1,235.8	34.3	19.7
Stage Bus/Mini Bus	1,129.9	493.9	24.3	7.9
Factory Bus/School Bus	465.9	638.7	10.0	10.2
Rail	0.0	103.2	0.0	1.6
Total	4,650.0	6,283.2	100.0	100.0

Source: 1) SMURT-KL Home Interview Survey, 1997
2) Klang Valley Transportation Study, JICA, 1987

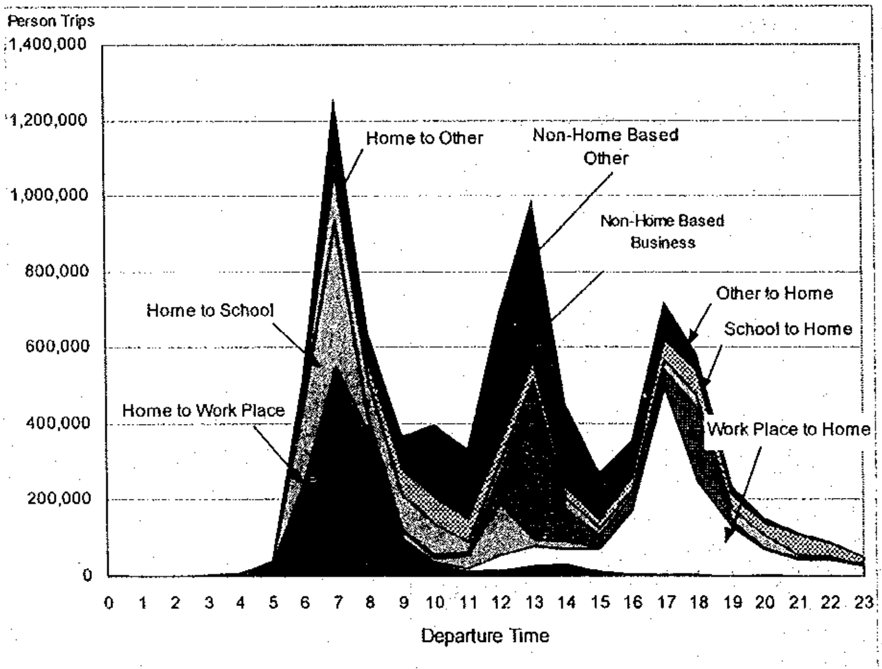
(2) Trip Production Rate

Trip production rates by household income group are illustrated in Figure 3.6.1. The trip production rate grows as household income increases. This is attributable to the higher car ownership of high income households.



Source : SMURT-KL Home Interview Survey

Figure 3.6.1 Trip Production Rate by Household Income Group



Source : SMURT-KL Home Interview Survey

Figure 3.6.2 Hourly Fluctuation of Person Trip Demand by Trip Purpose

(3) Hourly Fluctuation of Person Trip Demand

Three peak periods were observed starting at 7:00, 13:00, and 17:00, as depicted in Figure 3.6.2. It was observed that the morning peak hours are a relatively short.

3.7 Trip Characteristics by Zone

(1) Trip Production and Attraction by Zone

The largest zonal trip production was observed in CPA, followed by Petaling Jaya as depicted in Figure 3.7.1. Furthermore, zonal trip production by mode of transport is exhibited in Figure 3.7.2. The following characteristics can be pointed out by area and by mode:

- The modal share of cars is remarkably high in Damansara and Petaling Jaya, where relatively higher income households inhabit;
- The share of buses is high in the northern part of Kuala Lumpur, such as Batu Caves and its peripherals; and
- Bus and motorcycles are used intensively in the eastern and southern areas of the Kuala Lumpur metropolitan area, such as Ampang and Kajang.

(2) Trip Distribution

Person trip flows by all modes of transport are concentrated in CPA, whereas Petaling Jaya and Shah Alam are the secondary trip attraction centres in the Klang Valley region as illustrated in Figure 3.7.3.

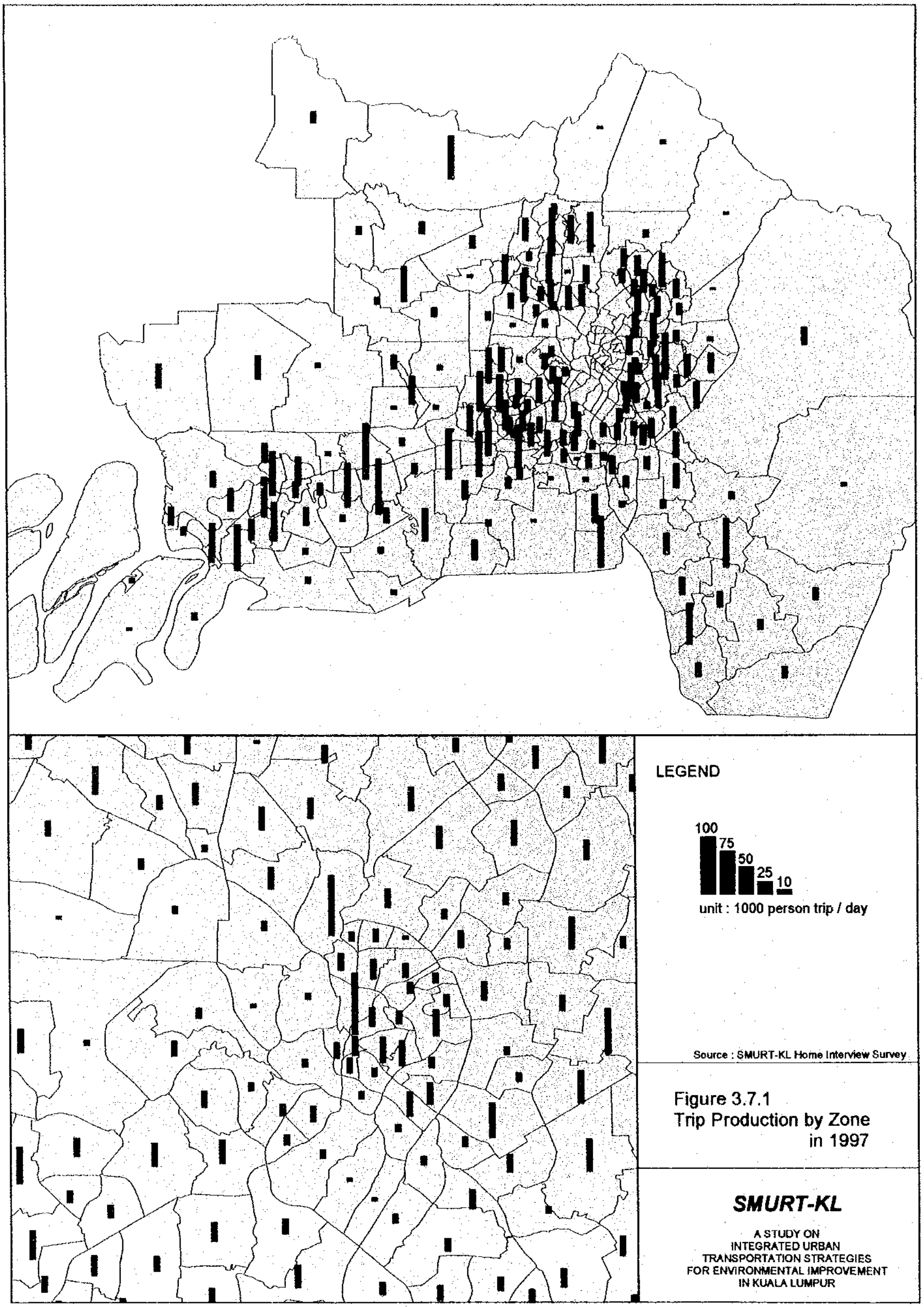


Figure 3.7.1
Trip Production by Zone
in 1997

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INTEGRATED URBAN
TRANSPORTATION STRATEGIES
FOR ENVIRONMENTAL IMPROVEMENT
IN KUALA LUMPUR

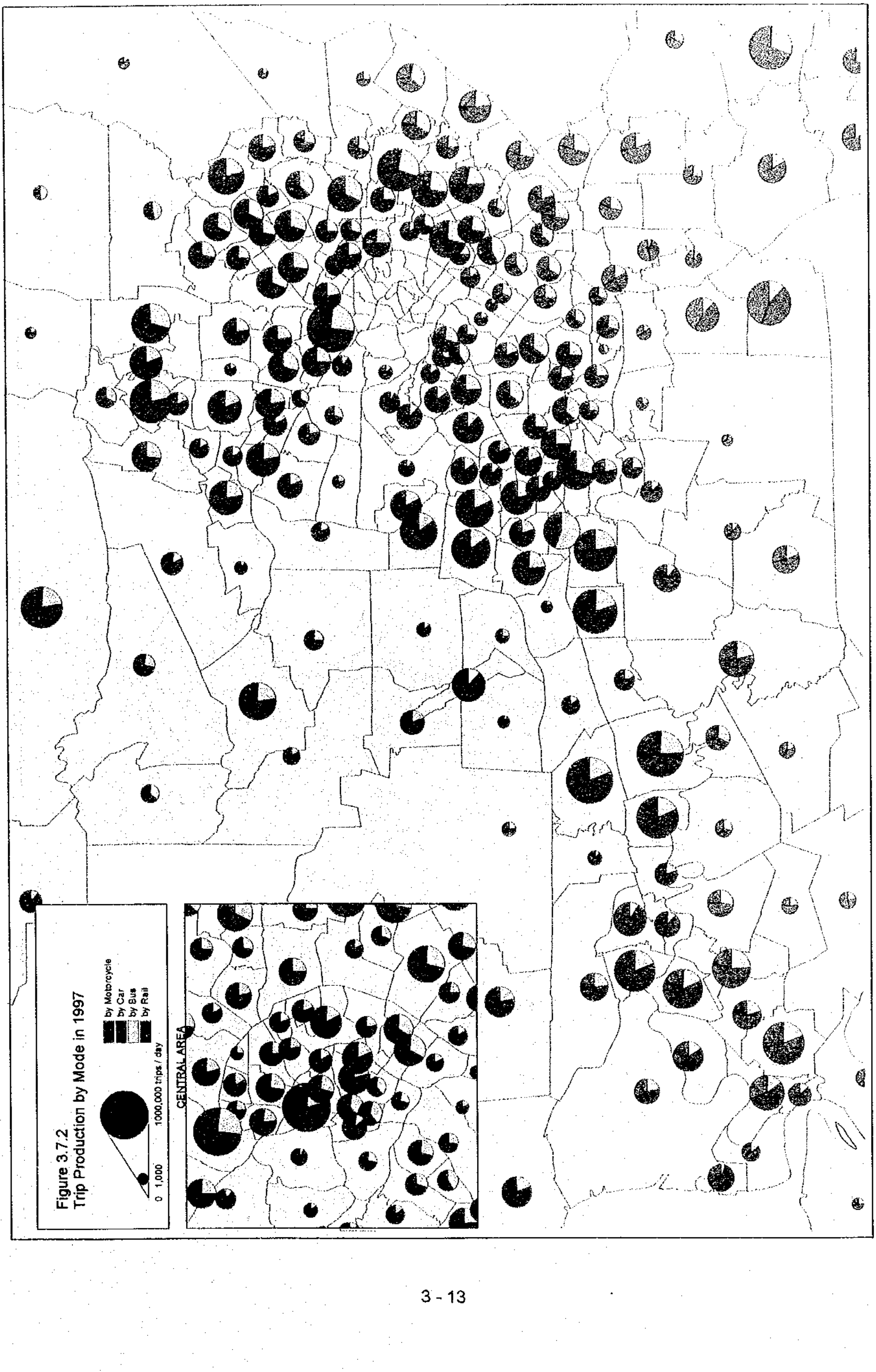
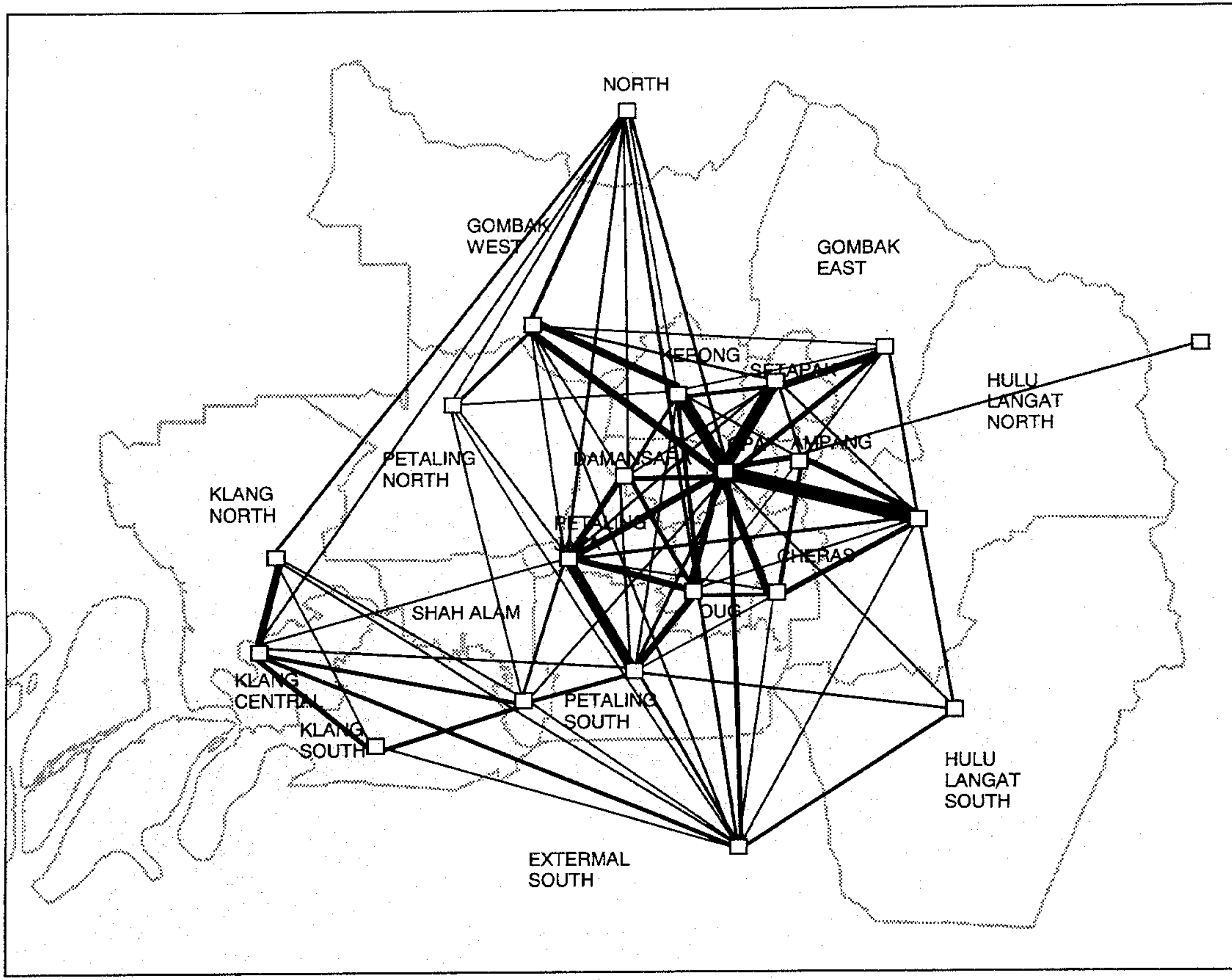


Figure 3.7.2
Trip Production by Mode in 1997

SMURT-KL
STUDY ON INTEGRATED URBAN TRANSPORTATION STRATEGIES FOR ENVIRONMENTAL IMPROVEMENT IN KUALA LUMPUR



Legend
(Person Trip per Day)

Scale 5000

20000

40000

60000

80000

100000

Note: Trips less than 5000 are omitted.

Figure 3.7.3

Person Trip Flows by All Modes of Transport

3.8 Urban Transportation Problems and Issues

(1) Problems and Issues on Road Transport

1) Traffic congestion

Traffic congestion appears mainly in the CPA and on the radial roads surrounding the CPA. Travel speeds on the major roads was observed to be less than 10 km per hour.

2) Lack of road capacity in CPA

The existing road network in the CPA is basically poor. Many arterial roads in the area have only four lanes for both directions. Thus, additional roads should be constructed to complement the existing arterial road network, and also to establish an efficient road network. It seems, however, very difficult to construct new roads or widen roads due to the fact that the area has been already built-up; land acquisition is difficult and also expensive.

Therefore, traffic management needs to be practical in the short term to alleviate traffic congestion, although continuous efforts should be made for the construction new roads and improvement of the existing roads.

3) Excessive traffic demand on the Federal Highway (II)

The Federal Highway (II) connects Klang – Shah Alam – Kuala Lumpur, which constitute a development corridor in the Klang Valley region. Tremendous traffic flows are observed along the corridor with the traffic volumes exceeding 200,000 vehicles per day.

Although the Shah Alam Highway, which was opened recently, aimed to disperse the heavy traffic burden from the Federal Highway (II), sufficient traffic dispersion has not been taken. Thus, some improvement measures are necessary.

4) Insufficient north-south links in Damasara area

Damansara area is one of the exclusive residential districts in Kuala Lumpur. Arterial roads connect mainly to the City centre. Therefore, vehicular traffic tends to concentrate on specific roads, because of an insufficient north-south arterial road network.

5) Heavy lorry traffic

Serious problems caused by heavy lorries have not been identified due to the truck ban during peak periods in the urbanised area at present. However, negative impacts, such as deterioration of environment, was found at some areas near construction sites. It is necessary to control the heavy lorry traffic through stricter traffic regulation.

6) Traffic accidents

The traffic accident rate is high, particularly in terms of rear collision and angular collision accidents. The traffic accident rates involving pedestrians and motorcycles are also high. These high accident rates can be partly attributed to insufficient knowledge of traffic safety among the citizens.

7) Insufficient traffic control and management facilities

The amount of traffic control facilities such as traffic lights and traffic signboards are insufficient in the Study area in general. Lack of traffic signs sometimes causes traffic congestion as well as traffic accidents.

8) Upgrading traffic control system

The current traffic control system should be upgraded in order to monitor the degree of traffic congestion in detail by queue length. In addition, road facilities for traffic safety should be improved or developed intensively.

9) Enhancement of traffic safety education

Traffic spill-back at intersections, which is one of the causes for traffic congestion, is caused by thoughtless entrance into intersections. An enhancement of traffic safety education is deemed indispensable in dealing with this matter.

(2) Problems and Issues of Rail-Based Transport

1) Limited service area

KTM Komuter, LRT System (I) and System (II) have commenced their services but the coverage of the rail-based transport system is limited. Although the planned section of the LRT System (II) will start operation and the PRT (KL-Monorail) project, work on which works is currently suspended, will eventually be completed, there will be several areas which will not be covered by the services.

2) Low frequency of KTMB rail service

Both LRT systems are operated at a reasonable frequency of 3 to 5 minutes during the peak period, and 7 to 15 minutes during the off-peak period. Frequency of KTM Komuter is, however, still low despite efforts to install additional trains.

3) Expensive fare

Compared with the fare for bus transport, the fare level of LRT is considerably expensive, especially for the low and lower middle income group.

4) Insufficient feeder services

In the initial stage bus feeder services were provided by the bus companies, Intrakota and Park May. Currently LRT companies provide feeder bus services in their territory to collect the passengers and to carry them to the stations. However, feeder services for KTM Komuter have not been improved yet.

5) Inconvenient access roads to the stations

Access roads to the railway and LRT stations are not well planned for pedestrians. Sidewalks are generally narrow and some sections are damaged.

(3) Problems and Issues on Bus Transport

1) Insufficient coverage of bus service area

Obviously bus operation is subject to availability of road space; large sized buses cannot operate on narrow streets. Lack of arterial streets limits the supply of large bus services, in particular, in suburban areas and newly developed areas.

2) Duplication of bus routes

In Kuala Lumpur almost all bus routes run in a radial direction from/to CBD and some of them have similar route structure. Some buses serve almost identical routes with little difference near the destination in the suburbs. This results in excessive number of similar bus routes operated in the central area.

3) Low frequency of bus services

Bus operation of Intrakota are scheduled with a frequency range of 15 minutes to one hour. A frequency of 30 minutes to one hour is too long in the context of urban transportation service.

4) Overcrowed buses

Most buses carry more bus passengers than their capacity during peak hours. The observed average occupancy of stage buses is some 50 passengers in the morning peak period.

5) Longer travel time than private modes

Severe traffic congestion prevails on many road sections in Kuala Lumpur and its surrounding area. The average speed for an inbound bus to the city centre during the morning peak period were observed to be as low as 7 to 15 km per hour. Compared with private passenger cars, the average speeds of buses are about 20 to 40 percent lower due to the additional time for passengers boarding and alighting.

6) Poor bus terminal facility

The existing bus terminal facilities are not well designed for the existing level of demand. In particular, the Puduraya bus terminal is always over-crowded with bus passengers, and it is dark and dirty inside the terminal.

7) Inadequate location of inter-city bus terminals

Bus terminals located at the City centre are one of the causes for traffic congestion, and environmental issues. Some measures, including the relocation of terminals, should be considered in order to improve the current situation.

8) Ineffectiveness of bus priority lanes

Although smooth bus operation was anticipated with the introduction of bus and taxi priority lanes, little significant effects was observed.

When roads are congested on Jln. Cheras, many private cars plunge into the bus priority lane and buses are dragged into the traffic congestion. Since the lane is not physically separated from the ordinary lanes, bus operation can be easily disturbed by cars in the absence of traffic policemen.

The bus lane on Jln. Syed Putra is not provided for at the most congested section; thus the effect of the lane is minimal.

On Jln. Raja Laut and Jln. Tuanku Abdul Rahman, sometimes a platoon of buses are held up for some hundred meters on the single lane reserved for buses, and this resulted in a low bus operating speed.

(4) Issues on Taxi Transport

Taxi services play a role as an intermediate transport mode between private passenger cars and mass transit systems. They are an important mode of transport for business trips in the CBD and their role will be more significant when public transport become more popular in the future. Current laws and regulations with regard to the taxi service, such as licensing control and the metered charging system, should be maintained.

(5) Issues on Integration of Public Transport

Enhancement of the public transport system is indispensable in order to alleviate traffic congestion problems. It is necessary to establish an integrated urban transport system, consisting of rail-based transport systems and bus transport. In this regard inter-modal facilities should be developed and improved.

Chapter 4

Urban Transportation Policy and Strategies

Chapter 4 Urban Transportation Policies and Strategies

4.1 Urban Transportation Policies

(1) Objectives of Urban Transportation System Development

Three major objectives have been identified through the analyses of the present urban transportation problems and issues in the Kuala Lumpur metropolitan area.

- Efficiency to sustain economic growth and to minimise negative externality,
- Equity in mobility among all the members in the society,
- Betterment of the Environment.

1) Efficiency

Efficient urban transport system should be developed to enforce urban functions and to sustain economic growth in the Kuala Lumpur metropolitan area. Efficiency in transportation can be achieved by balancing transportation demand and transportation infrastructure capacity. There are two ways to balance the demand and the capacity; one is to increase transportation capacity to meet the demand, whereas the other to decrease excessive demand by managing transportation demand.

It is of great significance to achieve efficiency by decreasing negative externality such as economic losses of travel time due to traffic congestion.

2) Equity

Minimum level of transportation services should be provided for all the members of the society to secure civil minimum. There are two types of "Transportation Poor"; one is the economically poor who cannot afford to pay expensive transportation cost, and the other, the physically handicapped citizens who have difficulties in their mobility. Affordable and sufficient level of service of transportation system should be provided for those people by the enhancement of public transport and normalisation of transportation system.

At the same time homogeneous transportation services should be prepared among the areas in the metropolitan area to achieve spatial equity between areas. Several areas will not be covered by the existing and planned KTMB and LRT services, thus the areas left put by the rail-based transport services should be covered by almost the same level of services.

3) Environmental Betterment

Air pollution and noises caused by automobiles should be minimised through promotion of public transport and control of traffic demand in congested area. At the same time reduction of exhaust gas and noises should be achieved by the gradual advance in automobile technology guided by environmental standards.

(2) Urban Transportation Policies

To achieve the three objectives of the urban transportation system development, the objectives are translated into the following four major urban transportation policies.

1) Alleviation of vehicular traffic congestion

- To increase road capacity through development and improvement of road network
- To make most use of the existing capacity through traffic control and provision of transportation information
- To decrease excessive traffic demand through transportation demand management

2) Promotion of public transport usage

- To improve the level of service of public transport
- To decrease cost of public transport

3) Mitigation of atmospheric pollution and noise

- To decrease air pollutants and noise by enhancement of regulation
- To decrease exhaust emission through advances in vehicle technology

4) Normalisation of transportation system

- To prepare transportation facilities considering amenity
- To provide transportation facilities for the handicapped

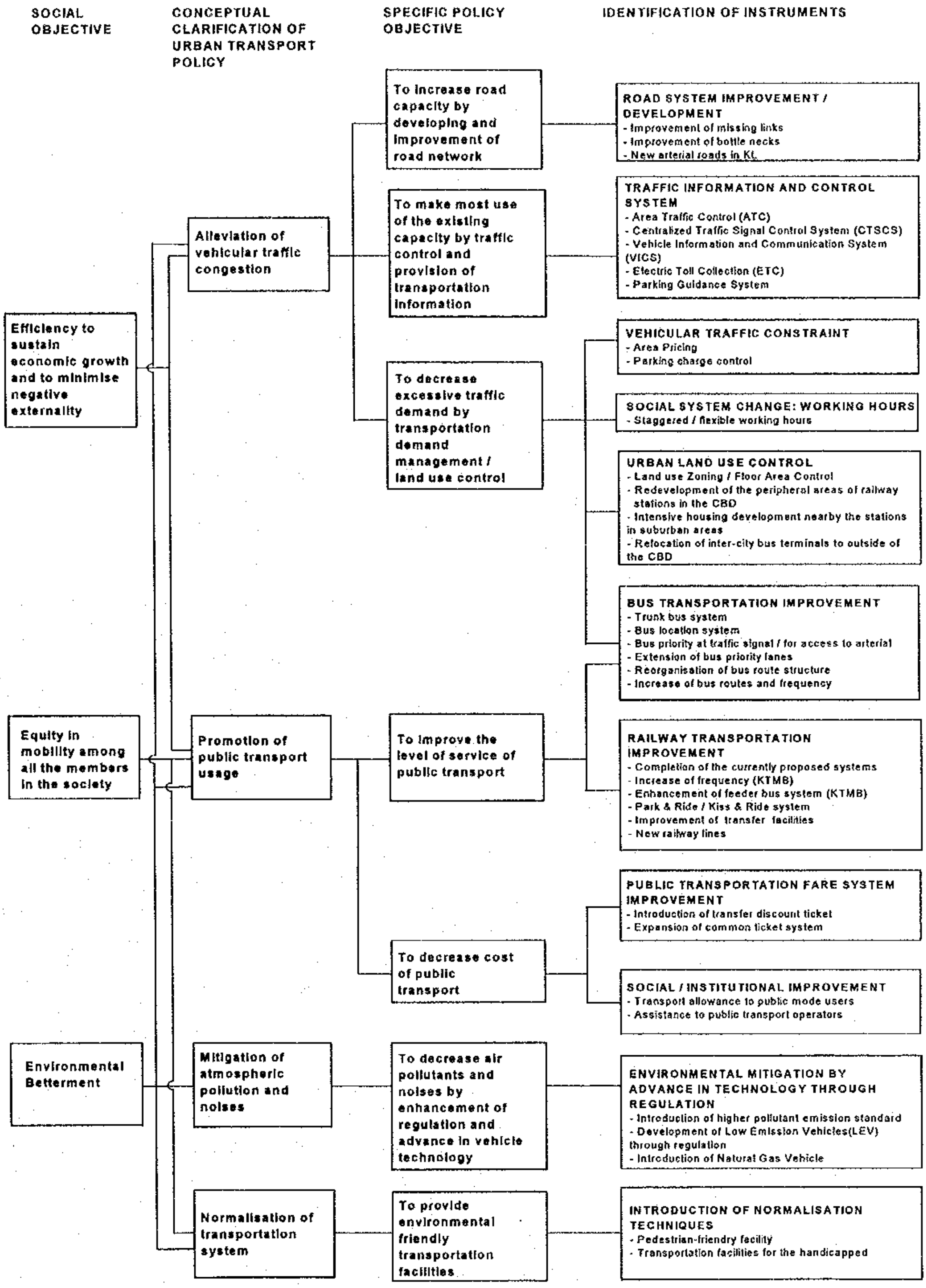


Figure 4.1.1 Objectives of Urban Transportation System Development and Policy Measures

(3) Policy Measures

1) Road System Development / Improvement

Traffic demand in the metropolitan area will continue to increase, and the demand in 2020 was estimated to be more than twice of the existing demand. The capacity of the road network, therefore, should be expanded either by new road construction or by improvement of the existing roads in order to cope with the increasing road traffic.

The existing road network consists of seven radial roads and two circumferential roads in the central area. However, the road network is not well formulated as discussed in Section 3.1. Considering the current situation, a principal for road system development is described as follows;

- Fundamental circumferential roads and radial roads should be composed of high-standard motorways and major arterial roads. In addition, arterial and minor arterial roads, which complement the fundamental road network, should be constructed. By formulating the road network with each class of road properly, the road system functions efficiently and effectively as a whole. This includes addition of missing links as well as improvement of bottlenecks.
- It is necessary to secure road supply to meet the traffic demand in the Kuala Lumpur metropolitan area, in particular, the gap between the traffic demand and the capacities of the roads connecting to the CPA should be minimised.
- Road development should not aim merely to cope with traffic congestion issues but also to guide a desirable urban structure.

2) Traffic Information and Control System

Improvement of the traffic control system would bring about smoother traffic flows and more efficient use of the existing transport infrastructure. It is recommended that traffic control techniques be introduced first because they do not require huge capital investments and land acquisition. Traffic information system is another measure to make most use of the existing road network capacity by providing road users with traffic information on congestion on roads, travel time, and route guidance.

a. Reversible lanes

Reversible lanes have been introduced to date on some roads in Kuala Lumpur, and they aim to at deal with the private passenger cars. However, more extensive introduction of the reversible lanes in CBD is recommended to install the exclusive bus lanes on four lane streets as well as to secure the existing road capacity.

b. Improvement in signal phase

It is necessary to change the signal phase from the existing system of one-phase-one-direction to one-phase-two-direction system so as to increase intersection capacity (Refer to Figure 4.1.2.).

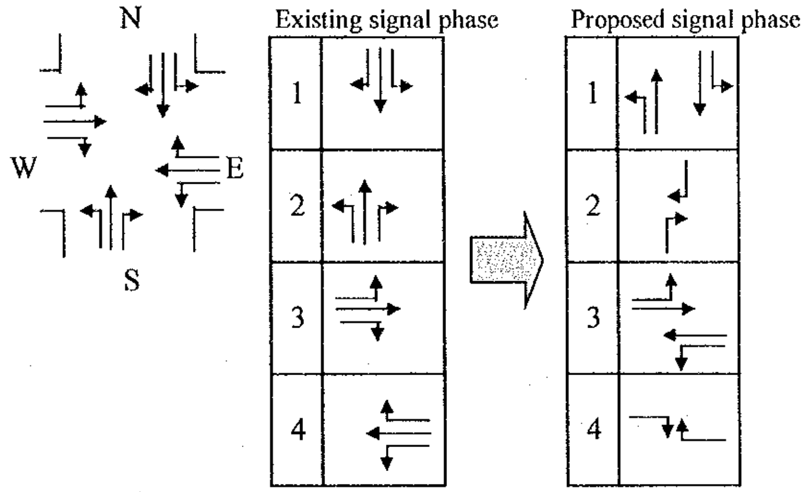


Figure 4.1.2 Proposed Signal Phase

c. Co-ordinated signal control

To secure smooth traffic flows, co-ordinated signal control should be introduced in conjunction with the extensive reversible lane development.

d. Conversion of roundabouts into signalised intersections

It is also recommended that the existing roundabouts should be converted into signalised intersections to increase traffic capacity.

e. Traffic Information System

Traffic information system provides drivers with various information, such as traffic congestion, travel time, and route guidance. Thus drivers are able to choose the optimal route to the destination. The information system also makes better use of the existing road network.

3) Traffic Demand Management

Transportation demand management (TDM) has been recognised as an effective measure to deal with traffic congestion in many cities. Various types of TDM techniques, such as vehicular traffic constraint and parking control, have been in practice in the world.

a. Vehicular traffic restraint scheme

New urban developments such as KLCC and Star City among others, will attract more vehicular traffic in the CBD. As it is substantially difficult to increase the capacity of CPA road network in the short term, it is necessary to employ vehicular traffic restraint scheme in a designated area to reduce traffic attracted in the CBD. Among several car restraint schemes, the area pricing scheme is selected as the most suitable scheme for the Kuala Lumpur metropolitan area (Please refer to Chapter 6 on justification of selection of area pricing scheme). The following measures should be implemented simultaneously in conjunction with the scheme.

- Prior to the introduction of the area pricing scheme, adequate public transport services should be prepared to absorb travel demand diverted from private modes of transport. In this context, the scheme should be implemented only after completion of the planned rail-based systems and establishment of a satisfactory level of bus services (refer to the recommended Trunk Bus System).

- Appropriate bus services should be provided, including trunk bus system in order to cope with inbound trips to the CPA.

- A toll rate policy should be incorporated with the area pricing scheme.

b. Parking policy

Parking policy can be also employed to control excessive traffic demand. It is recommended that vehicle trip demand should be controlled not by restraining parking facility supply but by controlling parking charges or by removing companies' allowance for parking charge.

4) Social System Change: Staggered / Flexible Working Hours

Another measure to reduce excessive traffic demand can be achieved by flattening the demand in the peak periods since excessive demands are merely observed in the morning and afternoon peak periods.

Government agencies have introduced staggered working hour system recently. It is considered effective because the duration of the peak period bound to the CPA is relatively short. Therefore, it is recommended that staggered / flexible working hours be introduced to the private sector as well.

5) Urban Land Use Control and Relocation of Facilities from CBD

Urban land use control, such as land use zoning and floor area control, is another important measure to decrease excessive traffic demand, although it needs longer time to take the effects.

The large-scale urban developments, which are in progress in the CPA, will certainly cause an explosion of vehicle traffic as shown in Table 4.1.1.

Table 4.1.1 Urban Development and Vehicle Trip Attraction in CPA

Unit : Vehicles / day

Status	Office	Hotel	Residential	Others	Total
Under Construction	46,962	5,769	7,179	36,879	96,789
Development Order	15,548	12,575	2,199	7,600	37,922
Approved	3,958	3,498	3,613	4,868	15,936
Total	66,468	21,843	12,990	49,347	150,647

Source: SMURT-KL Estimate

Other large-scale urban developments are planned in the surrounding area of the CPA as well. It is envisaged that it will become necessary to restrain excessive urban development to control vehicle traffic production by adopting the following measures.

a. Structure Plan and Local Plans

A proper urban structure plan for the Kuala Lumpur metropolitan area and local plans which indicate land use zoning and floor area control should be established to prevent the excessive urban development.

b. High density commercial and residential development in the area around the stations

Scattered residential land use pattern in the metropolitan area is not suitable for the public transport system in terms of transport efficiency, particularly for rail-based transport systems. Consequently land use should be guided in a public transport advantageous pattern, that is, the areas around the stations should be developed with high-rise apartments or condominiums in suburban areas and high-density commercial and office complex in the CBD. By locating residence and offices within walking distance from the stations, it would be possible to promote usage of public transportation.

c. Relocation of inter-city bus terminals and wholesale market to the outside of the CPA

Facilities, which attract considerable amount of traffic demand, should be relocated to the outside of the CPA in order to decrease traffic flows plunging into the CPA.

d. Conversion of the Federal Government offices into residential use

According to the MSC development plan, all the Federal Government offices plan to relocate to Putra Jaya from Kuala Lumpur in the coming years. Since the progress of suburbanisation has brought about scattered residential area developments, the subsequent longer commuting distance has caused heavier vehicular traffic burden on the road network. Provision of residential areas close to the working places can be regarded as one measure to lessen the traffic demand in terms of vehicular distance. In this view, it is desirable to convert the existing government offices to residential use to increase residential space near the heart of the City.

6) Bus and Taxi Transportation Improvement

The service level of bus and taxi transportation should be improved in order to promote public transportation usage. The followings are the recommended measures to improve the performance of bus and taxi transportation.

a. Trunk bus system

A new bus service with high speed, punctual operation and satisfactory level of frequency should be introduced because the current bus services are not competitive against private cars. A trunk bus system is one of the competitive bus transport services with exclusive bus lanes. The system should cover the areas where no rail-based transport service is planned in order to achieve spatial equity among areas within the metropolis.

b. Commuter express bus and CBD circular bus

It is recommended that new types of bus service should be introduced; namely, a commuter express bus and a CBD circular bus. The commuter express bus provides speedy operation with limited stops, while the CBD circular bus serves people moving around in the CBD.

c. Taxi service

Taxi services do not play a significant role in terms of passenger volume, but they are expected to have two important roles in the future. One is as a supplemental mode of transport for access trips to/from stations and bus terminals. The other is as an alternative mode of transport for the non-home based trips such as business and private matters, especially for the public transport users who have shifted from private modes of transport.

7) Rail Transportation Improvement

Although financial difficulties are foreseen, development of rail-based transport system should be a key issue in the public transportation system in the Kuala Lumpur metropolitan area. The following measures are considered necessary to promote utilisation of the rail-based transport.

a. Completion of the planned rail-based transport system development

It seems difficult to develop the planned projects under the current deteriorated economic circumstances in Malaysia. However, since the bus transport system does not have enough capacity to cope with future traffic demand, the planned rail-based transport system development should be completed at the earliest possible date. Otherwise the rail-based systems can not form an efficient network, and will become less attractive for the passengers.

b. Transfer facility development between rail-based transport systems

For the development of rail-based systems, the most crucial matter is that the whole system works efficiently as if it were one organic network. Therefore, transfer impedance should be minimised by providing smooth and convenient transfer facilities.

c. Enhancement of feeder bus service

To attract passengers to the rail-based transport systems, enhancement of the feeder bus services to/from the stations of rail-based systems is indispensable together with "park & ride" facility developments, because insufficient patronage would be expected if the rail-based systems relied on residents within only walking distance from the stations.

8) Public Transportation Fare System Improvement

One obstacle for using the LRT system is the expensive fare, especially for low and lower middle income groups. Reduction of public transport cost would lead to an increase in the number of LRT passengers.

a. Introduction of transfer discount ticket

Since the rail-based transport systems have been developed independently by different operators, passengers must pay the fare for each system and the total cost is expensive. Thus it is recommended that transfer discount ticket between different operators be introduced.

b. Expansion of common ticket

In Malaysia a common ticket, "Touch'N Go", has already been realized. The common ticket is convenient for users and it is recommended that the system be expanded to all modes of transport to encourage public transport usage.

9) Social / Institutional System Improvement

Reduction of public transportation costs through the improvement of the social system would also increase passenger demand for public transportation. The following measures are recommended in this field.

a. Transport allowance for public transport users

It is recommended that companies provide their employees who commute by public mode of transport with transportation allowances. To promote transportation allowance, the government should give incentives to companies in the form of preferential tax treatment, that is, tax exemption for the public transportation cost of employees.

b. Financial assistance for public transport operators

Public transport operators have faced serious financial problems. Since the public transportation system is indispensable for the metropolitan area to achieve efficiency and to secure equity, assistance from the public sector would be justified. And this assistance could lower the fare level of public transport indirectly.

10) Environmental Mitigation through Advances in Vehicle Technology through Regulation

Stricter pollutant emission standard should be introduced gradually to promote advances in vehicle technology for the reduction of exhaust emission. Expected development in vehicle technology includes Low Emission Vehicle (LEV) and Natural Gas Vehicle (NGV).

11) Normalisation of Transportation Facilities

a. Pedestrian-friendly facilities in the CPA

It is important to provide safe and convenient pedestrian facilities extensively for the aged, women and children. Furthermore, comfort and fun should be considered carefully in developing the pedestrian facility environment. The following measures are desirable:

- Provision of traffic lights for pedestrian at intersections to secure safety;

- Introduction of scramble intersections which allow pedestrians to cross a road in any direction; and
- Formation of a pedestrian network.

b. Transportation facility for the handicapped

Transportation facilities for the handicapped, such as barrier free walkway, and elevators at stations of the rail-based transportation system, should be developed.

4.2 Strategy for Urban Transportation System Development

In the previous section, based on the identification of objectives for the urban transportation system development in the Kuala Lumpur metropolitan area, various types of policy measures to accomplish the objectives were proposed.

In this section the transportation demand and the measures to cope with it will be examined from both sides of demand control and increase in supply. Since the relationship between transportation demand and capacity is best illustrated by those at the CPA boundary, the effects of transportation demand management techniques, the limitation of transportation infrastructure facilities, and further actions to be taken will be explored first.

A strategy for urban transportation system development will then be formulated by arranging the policy measures in a time scale.

(1) Perspective of Traffic Demand Growth and Urban Transportation System Development

Prediction of traffic demand crossing the CPA boundary and the corresponding road capacity are illustrated in Figure 4.2.1. The effect and necessity of traffic restraint scheme is discussed below;

- Average daily vehicular traffic crossing the CPA boundary, observed, was approximately 961,000 p.c.u. per day in 1997;
- The current road capacity of CPA boundary in terms of LOS (Level of Service) C condition is calculated to be 837,000 p.c.u., thus, the existing vehicular traffic demand slightly exceeds the capacity;
- If no traffic restraint measure is taken, vehicular traffic crossing the CPA boundary will reach 1.715 million p.c.u. in 2020, which is almost double the current road capacity;
- Approximately 13% of the total vehicular trips can be decreased by the area pricing scheme in 2000;
- About 12% of the total vehicle trips will be reduced due to the MSC project through the relocation of the Federal Government and related functions; and
- Even if the area pricing scheme and the MSC project were implemented in a proper way, trip production after 2010 is estimated to exceed the capacity by a wide margin. Therefore, it is necessary to reduce further increase of trip attraction in the CPA by measures such as urban development control. At the same time, it will also be necessary to increase the road capacity by introducing information technology as well as new arterial road construction.

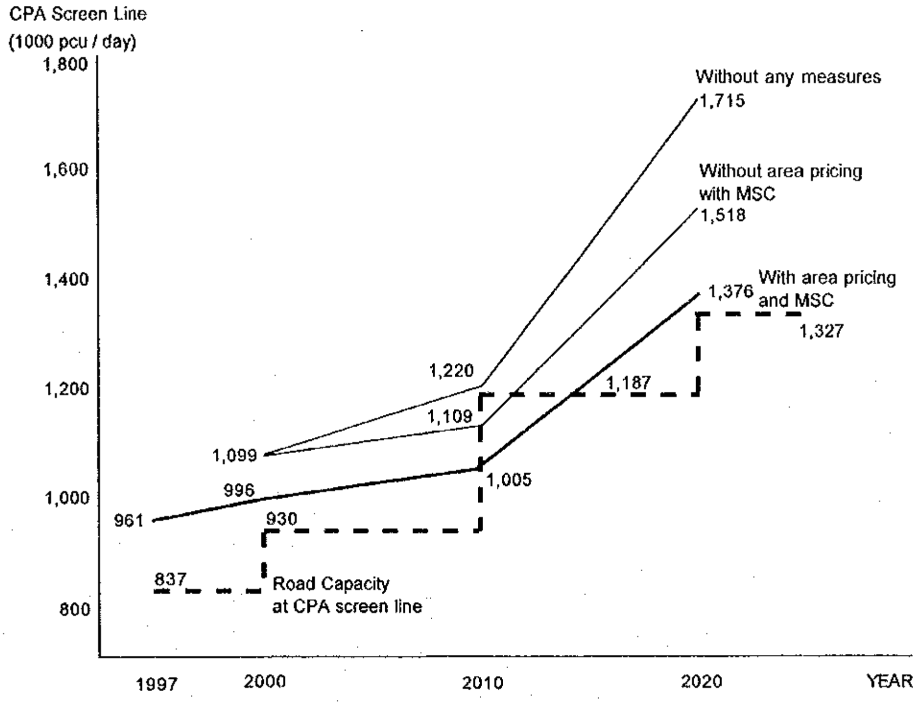


Figure 4.2.1 Traffic Volume Crossing the CPA Boundary

(2) Basic Concept to Formulate the Strategy for Urban Transportation System Development

Based on the understanding of the relationship between the predicted traffic demand and the possible measures applicable in the metropolis, the basic concept to formulate a strategy for the urban transportation system development in the Kuala Lumpur metropolitan area is described as below (Refer to Figure 4.2.2);

- In a short-term implementation programme, the transport demand management programme is the focal measure for maximum utilisation of the existing resources because large-scale infrastructure development is difficult to implement in a short period.
- In a mid-term implementation programme, the on-going and the planned road and rail-based transport system development projects, some of which are being completed step by step, are the measures to cope with the future increase in traffic demand in the metropolitan area.
- Over a longer term, the implementation programme should put focus on information technology, which not merely realises a highly efficient utilisation of transport facilities but also aims at raising the social living standard, taking into account the limitation of the further transport facility development.

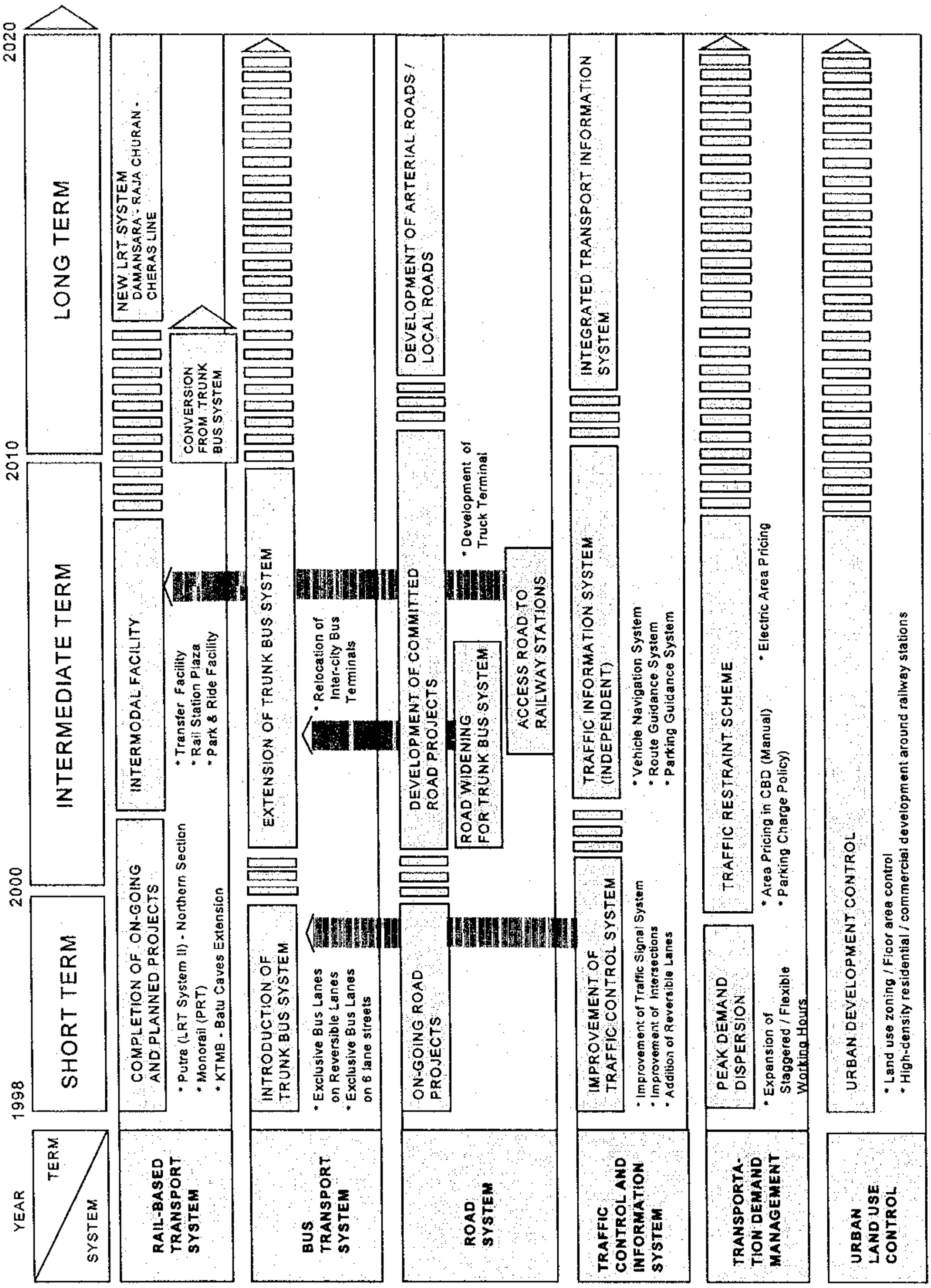


Figure 4.2.2 Schematic Staged Implementation Programme

1) Transport Demand Management Stage

- Traffic restraint measures, which consist mainly of staggered working hours for involving the private sector and an area pricing scheme to the CPA, ought to be implemented. The time frame is considered as being approximately between the year 2000 and the time when the MSC project is completed and the Federal Government offices have relocated to Putra Jaya.

- At the same time, measures to make most use of the existing road capacity, such as improvement of traffic control system, should be implemented to alleviate traffic congestion in the CPA.

- In conjunction with the area pricing scheme, the reversible lanes and the trunk bus system should be introduced to raise the level of service of both the road transport and the bus service.

2) Facility development stage

It is conceived that most of the on-going and currently planned road and rail-based transport system development projects will be completed approximately by the year 2000. Although some of them will be delayed due to the current economic downturn, these facilities will be opened to the public at latest by 2010. Since the increase of transportation capacity is considerably large, the increase of future traffic demand will largely be managed by these facility developments.

3) Information technology stage

In the long term, beyond the year 2010, emphasis should be given on the efficient utilisation of the transport facilities than transportation infrastructure development. In this context, information technology, which has the potential to change life-styles, should be used not merely to manage future car usage but also to create a traffic congestion free and comfortable society.

Chapter 5

Traffic Demand Forecast

Chapter 5 Traffic Demand Forecast

5.1 Objective of the Analysis and Simulation Cases

(1) Objective

The objective of the simulation is to test quantitatively the concepts and principles of the transportation system development.

Several combinations of infrastructure development and transportation demand management schemes are taken into consideration for evaluating the impacts of the various policies and strategies on transportation system development.

(2) Simulation Case

Future transportation demand has been predicted for 30 cases as listed in Table 5.1.1. They include simulation runs with and without improved public transportation system (trunk bus system and/or LRT system), highway network development and traffic restraint scheme (area pricing).

Table 5.1.1 Simulation Cases

Year	No	Simulation Case	Highway Network	Public Transport Network		Area Pricing
				Rail	Trunk Bus	
2000	1	BASE00	Highway Network 2000	Railway Network 2000	4 routes	Not applied
	2	WO00	Highway Network 2000	Railway Network 2000	none	
	3	WOHWY00	Highway Network 2000	Railway Network 2000	4 routes	
	4	WOTBS00	Highway Network 2000	Railway Network 2000	none	
	5	LRTA00	Highway Network 2000	Railway Network 2000 + LRT(A) Network	none	
	6	LRTB00	Highway Network 2000	Railway Network 2000 + LRT(B) Network	none	
	7	APATB00	Highway Network 2000	Railway Network 2000	4 routes	Applied
2010	8	BASE10	Highway Network 2010	Railway Network 2000	4 routes	Not applied
	9	WO10	Highway Network 2000	Railway Network 2000	none	
	10	WOHWY10	Highway Network 2000	Railway Network 2000	4 routes	
	11	WOTBS10	Highway Network 2010	Railway Network 2000	4 routes	
	12	LRTA10	Highway Network 2010	Railway Network 2000 + LRT(A) Network	none	
	13	LRTB10	Highway Network 2010	Railway Network 2000 + LRT(B) Network	none	

Table 5.1.1 Simulation Cases (continued)

Year	No	Simulation Case	Highway Network	Public Transport Network		Area Pricing
				Rail	Trunk Bus	
2010	14	APATB10	Highway Network 2010	Railway Network 2000	4 routes	Applied
	15	APALA10	Highway Network 2010	Railway Network 2000 + LRT(A) Network	none	
	16	APALB10	Highway Network 2010	LRT(B) Network	none	
	17	APAFN10	Highway Network 2010	Railway Network + Damansara-Cheras Line	3 routes	
2020	18	BASE20	Highway Network 2020	Railway Network 2000	4 routes	Not applied
	19	WO20	Highway Network 2000	Railway Network 2000	none	
	20	WOHWY20	Highway Network 2000	Railway Network 2000	4 routes	
	21	WOTBS20	Highway Network 2020	Railway Network 2000	4 routes	
	22	LRTA20	Highway Network 2020	Railway Network 2000 + LRT(A) Network	none	
	23	LRTB20	Highway Network 2020	Railway Network 2000 + LRT(B) Network	none	
	24	APATB20	Highway Network 2020	Railway Network 2000	4 routes	Applied
	25	APALA20	Highway Network 2020	Railway Network 2000 + LRT(A) Network	none	
	26	APALB20	Highway Network 2020	Railway Network 2000 + LRT(B) Network	none	
	27	APAFN20	Highway Network 2020	Railway Network + Damansara-Cheras Line	3 routes	
2000	28	WORW00	Highway Network 2000	None	4 routes	Not Applied
2010	29	WORW10	Highway Network 2010	None	4 routes	
2020	30	WORW20	Highway Network 2020	None	4 routes	

Source : SMURT-KL

Note : 28, 29, and 30 are imaginary cases which exclude all railways in the network to analyze importance of railways in public transportation.

5.2 Future Trip Production : 2000 - 2020

Trip production in the Kuala Lumpur metropolitan area will gradually increase at an average annual growth rate of 2.73 percent in the period from 1997 to 2020, while population in the metropolitan area will increase at 1.2 percent per annum, and job opportunities at 2.0 percent per annum. Since job opportunity increases more rapidly than population, NHBB (non home-based business) trips and NHBO (non home-based others) trips will increase above the average growth rate of the total person trip production.

In contrast, HBS (home-based school) trips will increase more slowly, due to the change in the age structure (see Tables 5.2.1 and 5.2.2).

Table 5.2.1 Trip Production Growth in Kuala Lumpur Metropolitan Area

(Unit : 1000 person trips)

Trip Purpose	1997	2000	2010	2020	Average Annual Growth Rate 1997-2020
HBW	2,158	2,461	2,994	3,491	2.11%
HBS	1,290	1,498	1,796	1,954	1.82%
HBO	1,196	1,514	1,734	1,896	2.02%
NHBB	797	1,073	1,787	2,444	4.99%
NHBO	871	1,183	1,582	1,940	3.54%
Total	6,311	7,729	9,893	11,725	2.73%

Source : SMURT-KL Estimate

Table 5.2.2 Population and Job Opportunities in Kuala Lumpur Metropolitan Area

(Unit : 1000 persons)

	1997	2000	2010	2020	Average Annual Growth Rate 1997 –2020
Population	2,522	2,694	3,048	3,355	1.2 %
Job Opportunities	1,120	1,224	1,503	1,766	2.0 %

Source : SMURT-KL Estimate

According to continuing sub-urbanisation, trip production will increase more rapidly in suburban areas as shown in Figure 5.2.1. On the other hand the primacy of the CBD in the Kuala Lumpur metropolitan area will be strengthened, due to the on-going large-scale urban development projects. These urban development projects will create an additional 200 ha office space by the year 2000, of which KL Sentral and KLCC account for 54 percent (112 ha). These new urban centres will emerge outside the existing CBD, and the trip production and attraction pattern will consequently be changed.

5.3 Future Trip Distribution : 2000 - 2020

The CPA (Central Planning Area) indicates strong connections with the surrounding areas in 1997, in particular, with the Ampang, Wangsa Maju, and Kepong areas. In 2020 the connection between the CPA and the other zones will be strengthened and trip demand between those zones will increase significantly as depicted in Figure 5.3.2. In addition, origin - destination pairs with more than 30,000 trips will be spread out over the metropolitan area. Increase in trip demand volume, coupled with longer trip lengths, will be a heavy burden on the transportation network in the future.

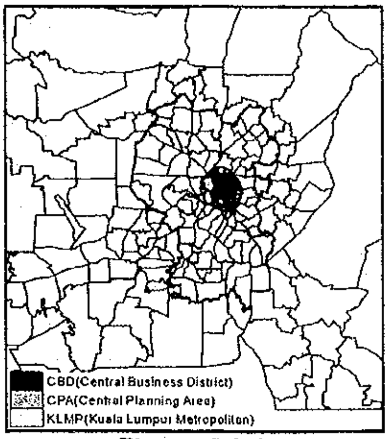
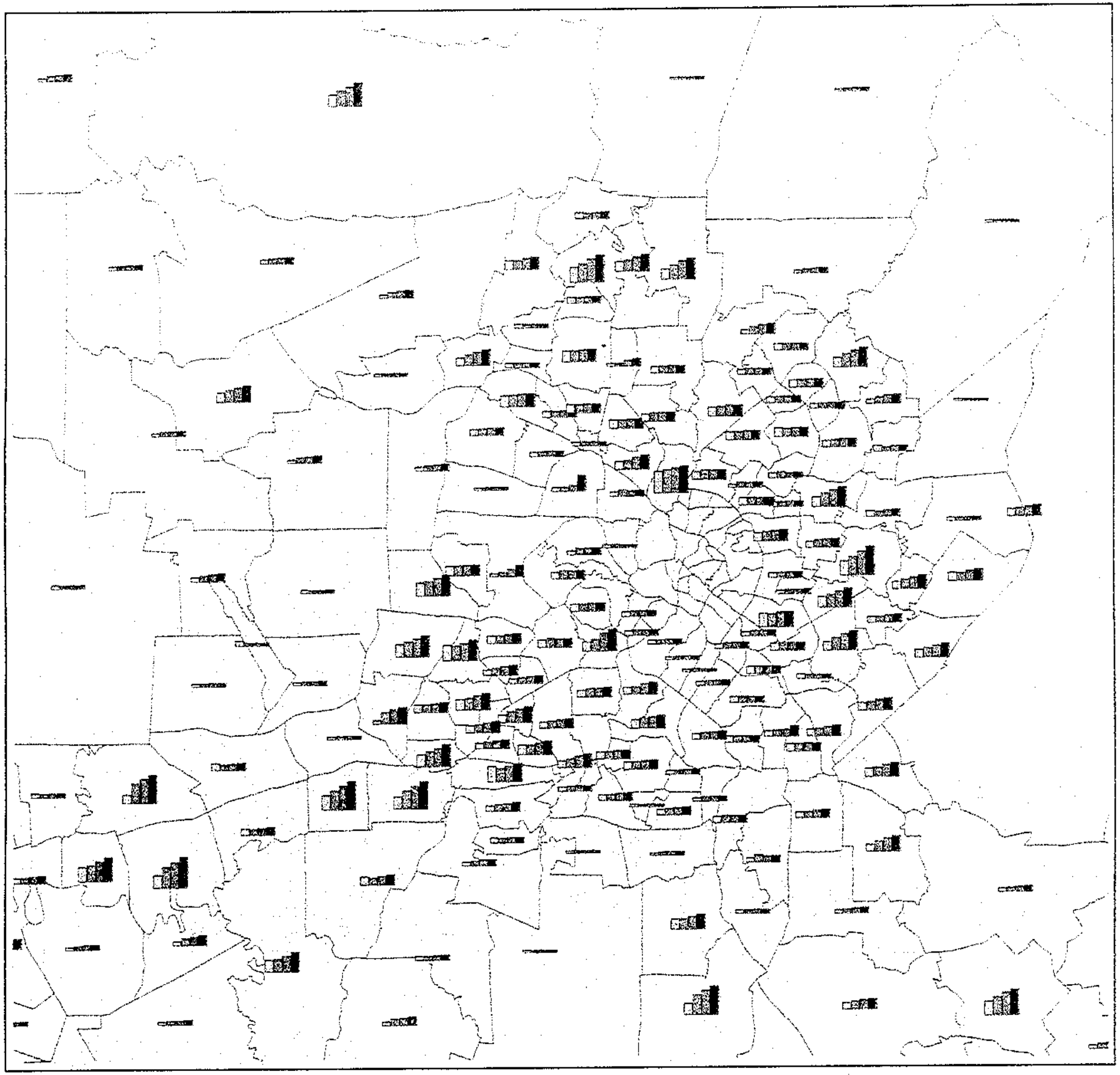
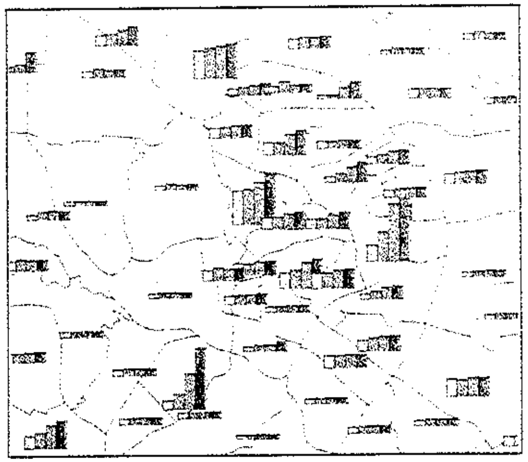


Figure 5.3.1

Definition of CPA





LEGEND

Total Trip Production

- 1997
- 2000
- 2010
- 2020

300 250 200 150 100 50

unit: 1,000 person trips

Figure 5.2.1

Future Trip Production (All Purposes)

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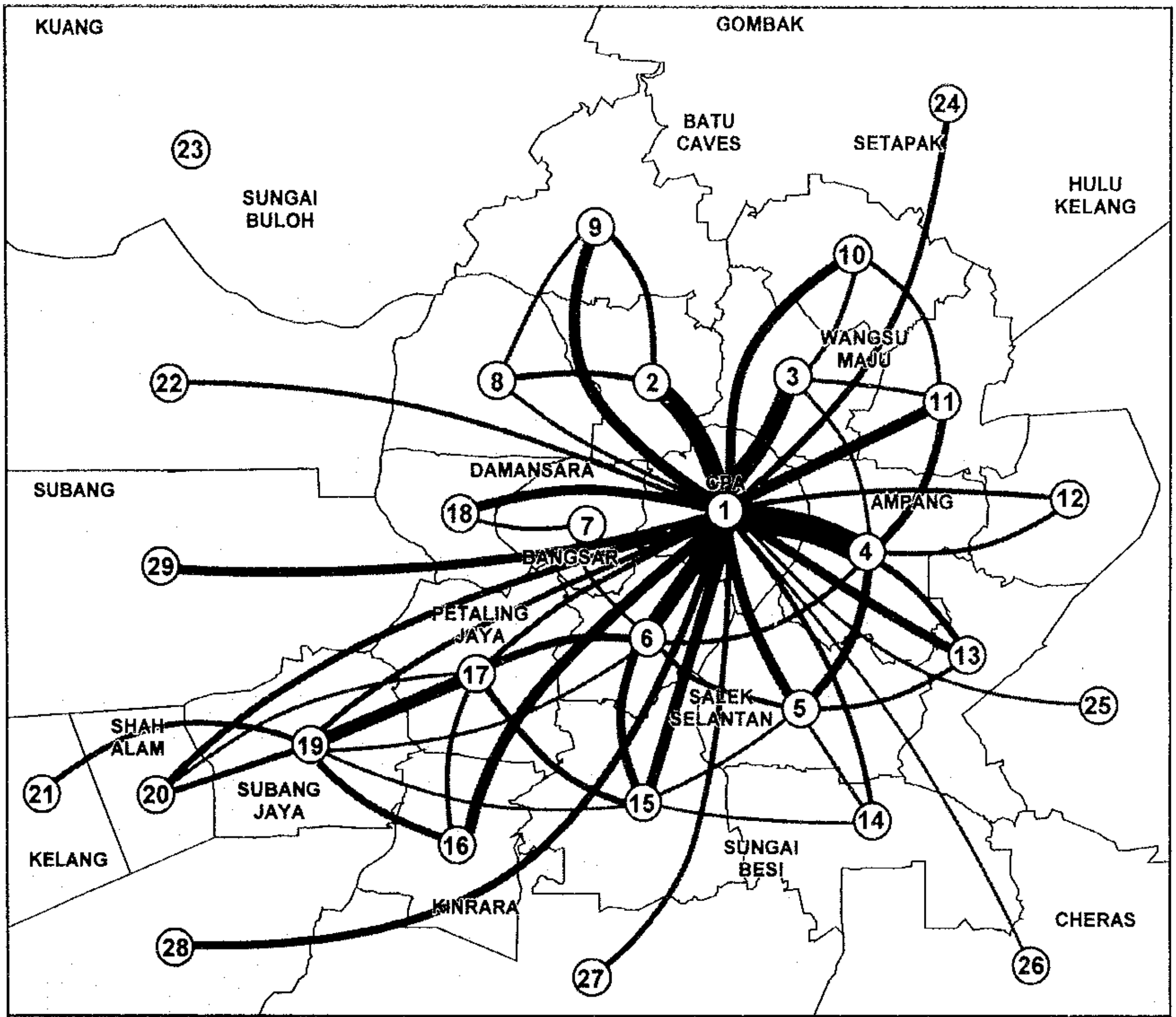
FOR ENVIRONMENTAL IMPROVEMENT
IN KUALA LUMPUR



LEGEND

- 50,000
- 100,000
- 150,000
- 200,000
- 250,000 trips / day

Note:
Less than 30,000 trips are omitted.

Figure 5.3.2
Person Trip Demand in 2020 (All Purposes): Metropolitan Area

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FOR ENVIRONMENTAL IMPROVEMENT
IN KUALA LUMPUR

5.4 Modal Share in 2000 –2020

1) Base Case

The share of the public mode of transport in the Kuala Lumpur metropolitan area is estimated at 24.0 percent in 2000, 23.6 percent in 2010, and 25.6 percent in 2020 under the BASE case (as shown in Table 5.4.1), in which both highway and public transportation network development is assumed to have been completed according to the schedule. The drop in public transport share between 2000 and 2010 is attributable to the excessive expressway development planned in this period.

Table 5.4.1 Modal Shares in The Kuala Lumpur Metropolitan Area

(Unit 1000 person trips)

Year	Case	Motor-cycle	Car	Conventional Bus	Trunk Bus + Rail	Private Mode of Transport	Public Mode of Transport	Total
1997	HIS	1,162	2,876	943	28	4,038	971	5,009
		(23.2%)	(57.4%)	(18.8%)	(0.6%)	(80.6%)	(19.4%)	(100.0%)
2000	WO	1,464	3,520	1,075	486	4,984	1,561	6,545
		(22.4%)	(53.8%)	(16.4%)	(7.4%)	(76.1%)	(23.9%)	(100.0%)
	BASE	1,461	3,514	1,084	487	4,975	1,570	6,545
		(22.3%)	(53.7%)	(16.6%)	(7.4%)	(76.0%)	(24.0%)	(100.0%)
	MP	1,467	3,490	1,094	494	4,957	1,587	6,545
		(22.4%)	(53.3%)	(16.7%)	(7.5%)	(75.7%)	(24.2%)	(100.0%)
2010	WO	1,391	4,722	1,346	622	6,113	1,968	8,084
		(17.2%)	(58.4%)	(16.7%)	(7.7%)	(75.7%)	(24.4%)	(100.0%)
	BASE	1,411	4,770	1,312	592	6,181	1,904	8,084
		(17.5%)	(59.0%)	(16.2%)	(7.3%)	(76.5%)	(23.6%)	(100.0%)
	MP	1,411	4,622	1,408	643	6,033	2,052	8,084
		(17.5%)	(57.2%)	(17.4%)	(8.0%)	(74.6%)	(25.4%)	(100.0%)
2020	WO	1,307	5,986	1,674	883	7,292	2.556	9,852
		(13.3%)	(60.8%)	(17.0%)	(9.0%)	(74.0%)	(26.0%)	(100.0%)
	BASE	1,316	6,013	1,632	891	7,329	2,523	9,852
		(13.4%)	(61.0%)	(16.6%)	(9.0%)	(74.4%)	(25.6%)	(100.0%)
	MP	1,316	5,686	1,837	1,013	7,002	2,850	9,852
		(13.4%)	(57.7%)	(18.6%)	(10.3%)	(71.1%)	(28.9%)	(100.0%)

Source : SMURT-KL Estimate

WO: Without area pricing, trunk bus system, and new highways.

Base: With trunk bus system and highway development but without area pricing scheme.

MP: SMURT-KL Master Plan Case (including area pricing scheme, highway development, trunk bus system, Damansara-Cheras LRT development in 2020).

Kuala Lumpur metropolitan area: the City of Kuala Lumpur and its conurbation area.

On the other hand, the share of public transportation in CBD is estimated at 19.1 percent in 2000, 19.3 percent in 2010, and 20.7 percent in 2020 under the Base case.

Table 5.4.2 Modal Shares in CBD

(Unit 1000 person trips)

Year	Case	Motor-cycle	Car	Conventional Bus	Trunk Bus + Rail	Private Mode of Transport	Public Mode of Transport	Total
1997	HIS	218	674	162	14	892	177	1,068
		(20.4%)	(63.1%)	(15.2%)	(1.3%)	(83.5%)	(16.6%)	(100.0%)
2000	WO	305	834	148	114	1,139	262	1,401
		(21.8%)	(59.5%)	(10.6%)	(8.1%)	(81.3%)	(18.7%)	(100.0%)
	BASE	303	830	151	117	1,133	268	1,401
		(21.6%)	(59.2%)	(10.8%)	(8.4%)	(80.9%)	(19.1%)	(100.0%)
	MP	310	806	161	124	1,116	285	1,401
		(22.1%)	(57.5%)	(11.5%)	(8.9%)	(79.7%)	(20.3%)	(100.0%)
2010	WO	269	901	171	130	1,170	300	1,470
		(18.3%)	(61.3%)	(11.6%)	(8.8%)	(79.6%)	(20.4%)	(100.0%)
	BASE	275	913	162	122	1,188	284	1,472
		(18.7%)	(62.0%)	(11.0%)	(8.3%)	(80.7%)	(19.3%)	(100.0%)
	MP	275	765	257	175	1,040	432	1,472
		(18.7%)	(52.0%)	(17.5%)	(11.9%)	(70.7%)	(29.3%)	(100.0%)
2020	WO	235	1,078	193	163	1,313	356	1,669
		(14.1%)	(64.6%)	(11.6%)	(9.8%)	(78.7%)	(21.3%)	(100.0%)
	BASE	238	1,086	181	165	1,324	346	1,671
		(14.2%)	(65.0%)	(10.8%)	(9.9%)	(79.2%)	(20.7%)	(100.0%)
	MP	238	759	385	288	997	673	1,671
		(14.2%)	(45.4%)	(23.0%)	(17.2%)	(59.7%)	(40.3%)	(100.0%)

Source : SMURT-KL Estimate

WO: Without area pricing, trunk bus system, and new highways.

Base: With trunk bus system and highway development but without area pricing scheme.

MP: SMURT-KL Master Plan Case (including area pricing scheme, highway development, trunk bus system, Damansara-Cheras LRT development in 2020).

2) Area Pricing Case

When a traffic restraint scheme, such as area pricing is applied and the total number of car trips in the CBD is maintained at the level of the year 1997, the share of public transport would slightly increase to 24.2 percent in 2000, 25.4 percent in 2010, and 28.9 percent in 2020 in the metropolitan area as shown in Figure 5.4.1.

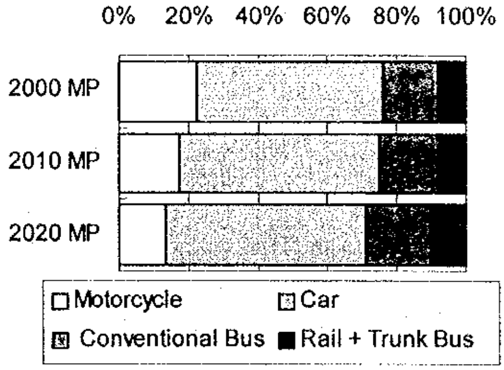

Figure 5.4.1 Modal Share in KL Metropolitan Area (with Area Pricing)

3) Modal Share in the CBD under the Area Pricing Scheme

In the CBD, the share of public transport is 19.1 percent in 2000, 19.3 percent in 2010, and 20.7 percent in 2020 under the BASE case, which include highway development and public transport system development mainly by the trunk bus system. If a traffic restraint scheme is introduced in the CBD, the share of public transport in the CBD-related trips increases sharply to 20.3 percent in 2000, 29.3 percent in 2010, and 40.3 percent in 2020 (see Figures 5.4.2 and 5.4.3).

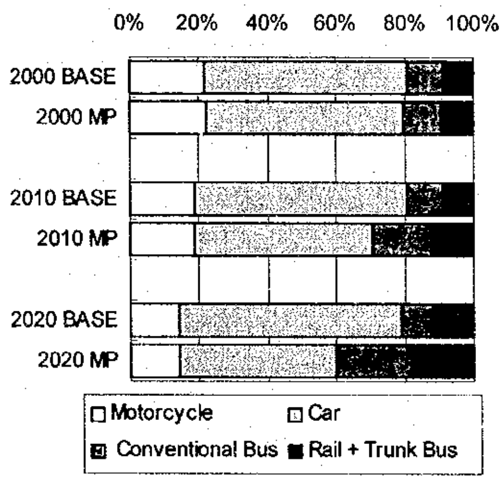

Figure 5.4.2 Modal Share in CBD

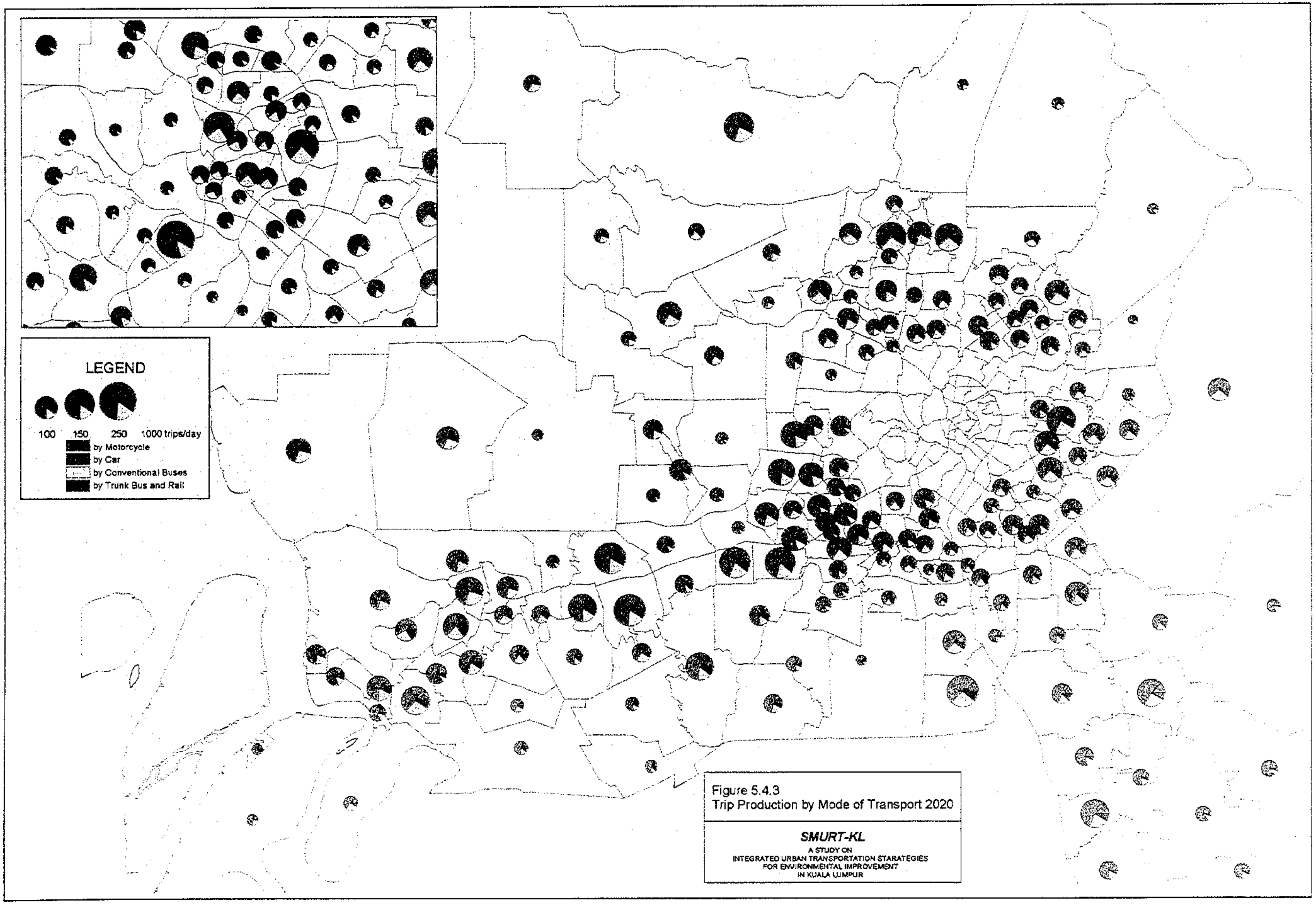

Figure 5.4.3
Trip Production by Mode of Transport 2020

5.5 Future Traffic Demand on the Highway Network

Figure 5.5.1 and Table 5.5.1 show the predicted highway traffic volume for the year 2020 under the BASE case (both highway development and trunk bus system development).

In the year 2000, eleven highway projects, including new construction and improvements are to be completed. Among them, the eastern part of the Middle Ring Road II, with a traffic volume of 100,000 p.c.u. per day, will be effective in alleviating the congestion in the inner city area. On the contrary, the Ampang Elevated Highway and the North East Highway will carry less traffic due to high toll rates.

In the year 2010, more road space will be provided outside the CPA mostly by expressway projects, but little road space will be augmented within the CPA. Furthermore, the many new expressway development projects such as Wangsa – Keramat, and KL Transit, start from or end at the Middle Ring Road (I). This would result in further worsened traffic congestion within the CPA in the year 2010.

In the year 2020, traffic will be well distributed over the planned highway network. However it should be noted again that limited arterial roads will be added to the road network in the CBD, thus traffic demand in the CBD should be reduced by both traffic restraint measures and enhancement of the public transport system.

5.6 Future Passenger Demand on the Public Transport Network

1) Alternatives for the future public transport network

Alternatives for the future public transport network were established based on an understanding of the following items:

- Existing public transport passenger demand,
- Existing railway services and feeder bus services,
- Existing bus operation,
- Rail-based transport network development plan.

First of all, the areas left out by the rail-based transort services were extracted, and the corridors which needed enhanced public transport system were identified. These corridors include a) Kepong, b) Damansara, c) Puchong, d) Cheras, e) Ampang, and f) Genting Klang/ Gombak.

If the person trip demand in the CBD made by private cars is maintained at the year 1997 level by employing the traffic restraint scheme, person trips related to the CBD by public mode of transport will increase by 148,000 in 2010 and by 327,000 trips in 2020, compared to cases without the traffic restraint scheme. Thereby, in the year 2020, the modal share of public transport in CBD would increase to 40 percent from 17 percent in 1997. Under such a car use restraint scheme, the passenger demand on the railway as well as on the trunk bus system are predicted in Table 5.6.1.

The most significant impact of the area pricing scheme on passenger demand can be seen in the number of passengers on the PRT (Monorail) North Line. Among the seven corridors, the Cheras corridor has the highest average number of passengers in 2020, followed by Damansara, Ampang and Kepong. However, the predicted demands will not meet the financially required passenger demand for LRT operations.

Table 5.5.1 Average Daily Traffic Volumes of Planned Highways

Unit: 1000 pcu per day

YEAR	NAME	2000	2010	2020
1997	EAST-WEST LINK	86.4	104.6	156.3
1997	IRR	80.6	72.9	88.4
1997	KLANG BYPASS	73.0	104.0	131.5
1997	KL-SEREMBAN EXPRESSWAY	74.1	89.2	140.0
1997	MRR I	53.3	40.3	53.5
1997	NEW KLANG VALLEY EXPRESSWAY	84.3	109.3	145.6
1997	NORTH-SOUTH EXPRESSWAY	31.0	51.4	72.6
1997	N-S EXPRESSWAY CENTRAL LINK	15.5	25.4	59.1
1997	SHAH ALAM PROJECT A	59.1	99.2	156.0
2000	AMPANG ELEVATED HIGHWAY	12.7	14.8	33.0
2000	CHERAS-KAJANG HIGHWAY	29.7	34.9	51.6
2000	DAMANSARA-PUCHON PACKAGE 1	27.4	32.0	43.9
2000	JLN LAPANGAN TERBANG EXTENSION	16.9	47.0	59.2
2000	JLN SULTAN ISMAIL EXTENTION	41.0	43.7	56.0
2000	KARAK HIGHWAY	16.7	28.5	43.8
2000	KL NORTH-EAST HIGHWAY	20.4	35.5	56.8
2000	MRR II	83.7	95.5	113.7
2000	SHAH ALAM PROJECT B	22.1	42.2	111.0
2000	SUNGAI BESI HIGHWAY	62.5	87.5	124.3
2010	ASAM JAWA-TAMAN RIMBA-TEMPLER	-	17.9	41.0
2010	KAJANG BYPASS	-	1.5	4.3
2010	KAJANG TRAFFIC DISPERSAL RING ROAD	-	27.0	42.5
2010	KAJANG-SEREMBAN EXPRESSWAY	-	15.6	31.3
2010	KILA DEDICATED HIGHWAY	-	36.8	55.2
2010	KL ELEVATED EXPRESSWAY	-	35.3	54.1
2010	KL TRANSIT ROUTE	-	77.4	88.4
2010	KL W TRAFFIC DISPERSAL SCHM	-	2.8	65.2
2010	KL-RAWANG EXPRESSWAY	-	79.8	117.5
2010	NEW PANTAI HIGHWAY	-	25.6	64.6
2010	PANDAN CORRIDOR	-	51.4	59.4
2010	SHAH ALAM-RAWANG EXPRESSWAY	-	48.6	125.9
2010	WANGSA-KERAMAT EXPRESSWAY	-	32.4	68.4
2010	WEST COAST EXPRESSWAY	-	46.1	84.1
2020	OUTER RING ROAD	-	-	61.4

2020	UNDERGROUND EXPRESSWAY	-	-	36.7
2020	Arterial Road 01	-	-	68.4
2010	Arterial Road 02	-	30.9	52.6

Source: SMURT-KL Estimate

Note: Average traffic volume = Vehicle - kilometres / Length of road section

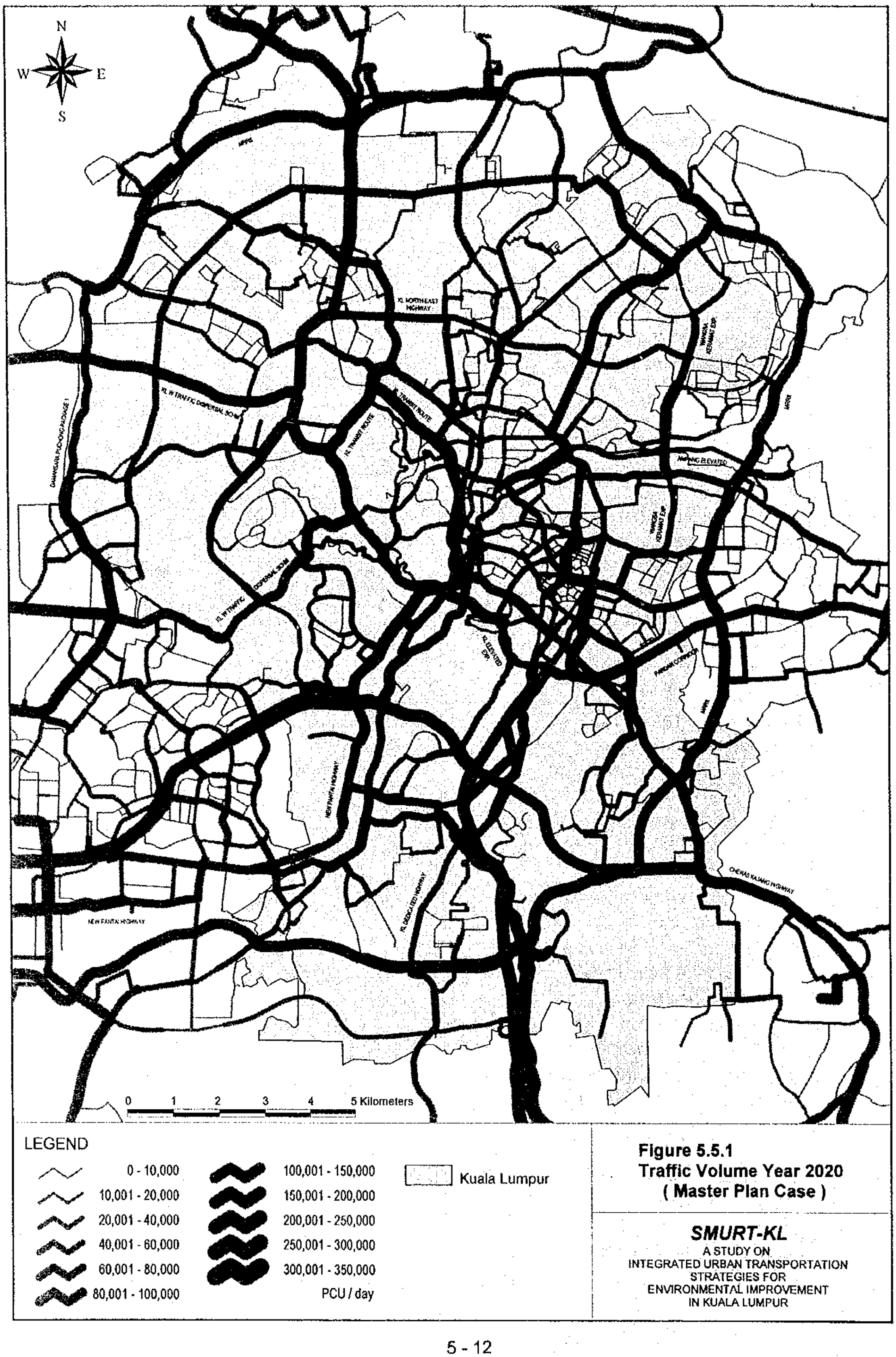

Figure 5.5.1
Traffic Volume Year 2020
(Master Plan Case)

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Table 5.6.1 Number of Passengers by Railway and Trunk Bus Line (Area Pricing Case)

Unit : persons per day

	Distance (Km)	2000	2010	2020
KTM Klang-Sentul	48.0	163,500	226,200	364,500
KTM Rawang-Seremban	105.0	115,800	164,200	260,100
KTM Batu Caves	7.6	15,200	28,200	38,300
STAR Phase (1)	12.0	107,700	153,000	242,800
STAR Phase (2)	15.0	24,200	34,600	49,900
PUTRA Phase (1)	14.1	64,000	76,400	125,000
PUTRA Phase (2)	14.9	42,700	55,400	90,800
Monorail North	8.0	60,800	91,200	153,500
Trunk Bus Ampang	10.1	34,200	47,600	75,200
Trunk Bus Cheras	13.7	59,600	74,300	107,100
Trunk Bus Damansara	11.9	54,300	65,700	100,000
Trunk Bus Genting Kelang	9.4	42,100	47,200	68,400
Trunk Bus Gombak	3.5	5,800	6,600	9,000
Trunk Bus Kepong	14.0	42,500	53,400	74,500
Trunk Bus Puchong	14.2	29,900	37,100	59,000

Source : SMURT-KL Estimate

To explore the possibility of conversion from trunk bus system into LRT, three alternatives of public transport network as shown in Table 5.6.2 were examined.

Table 5.6.2 Alternatives for LRT Network

Network	Description
(1) LRT Network (A)	The planned LRT lines, Kepong line and Cheras line, as well as PRT south section are included and the corresponding lines are eliminated. Other trunk bus routes, Ampang, Genting Klang, are converted into LRT.
(2) LRT Network (B)	Compared to the LRT Network (A), LRT Cheras line and LRT Damansara line are cross-linked via Jalan Raja Chulan.
(3) Combination of LRT and Trunk Bus	Only one LRT line Damansara – Raja Chulan – Cheras line is included, and other lines are operated as truck bus systems.

Table 5.6.3 Average Number of Passengers (With Area Pricing Scheme)

Unit : persons per day

Line	Distance (Km)	(1) LRT (A)	(2) LRT (B)	(3) Combination
LRT Ampang / Trunk Bus	10.1	60,400	53,200	44,200 *
LRT Cheras (A)	13.7	51,500	-	-
LRT Raja Chulan-Cheras (B)	17.3	-	96,000	110,000
LRT Damansara	11.9	69,600	101,100	110,600
LRT Genting Klang	14.0	68,500	67,900	55,700 *
Monorail South/ Trunk Bus Puchong	14.2	41,100	34,800	32,700 *
LRT Kepong / Trunk Bus	14.0	34,500	34,400	68,700 *

Source : SMURT-KL Estimate
Note: * indicates the trunk bus operation rather than LRT on the corridors.

According to the forecast results, a combination of LRT Raja Chulan – Cheras and LRT Damansara in LRT Network (B) will carry the largest number of passengers because the LRT network (B) passes through the Golden Triangle area. Since the other lines have less passenger demand and competitiveness against the existing and on-going railway/LRT system, a trunk bus system would be more suitable for these corridors.