8.2 Public Transport Development Plan

8.2.1 Railway, Bus and Taxi Transport Development Plan

(1) Background

1) Deterioration of Public Transport

As described in Chapter 3, the share of public bus transport in the modes of motorised transport has dropped sharply from 17.6 percent in 1985 to 7.9 percent in 1997. The declining patronage has brought about financial difficulties for the bus operators. As a consequence, bus operators have ceased their operation on unprofitable routes or reduced the frequency on these routes. The Deterioration in the level of bus services has resulted in further decline of bus passenger demand.

2) Motorisation

On the contrary, as the real income increased over the last decade, cars and motorcycles have become more affordable for many people today. Since people were tired of poor public transport services and were seeking more convenient and reliable modes of transport, in the end, many people shifted to private modes. Thus at present as many as 80 percent of trips made by motorised modes of transport depends on private modes such as cars and motorcycles. This rapid motorisation has caused traffic congestion in the metropolitan area, in particular, serious traffic congestion is observed in the morning and afternoon peak periods in the CBD.

3) Areas Left behind from Rail-based Transport

If the motorisation continues to advance, the traffic congestion will worsen. One expects that when the on-going rail-based transport projects such as the remaining part of the LRT System (2) and the PRT commence the operation and connects with the already operating KTM Kommuter and LRT System (1), rail-transport will carry many passengers and alleviate the current traffic congestion. However the area covered by rail-based transport is limited and some areas are left out from the services as shown in Figure 8.2.1. These areas are Gombak, Wangsa Maju, Ampang, Cheras, Puchong, Damansara, and Kepong, and they should be supported by bus transport services.

4) Financial Difficulty of Rail-based Transport

In addition, to date all the rail-based transport operators have suffered from shortage of revenue due to the lower passenger demand than predicted. Shortage in passenger demand has been attributed to expensive fare and inconvenient access/egress. This shows that only the development of public transport facility does not contribute to an increase in public transport demand.

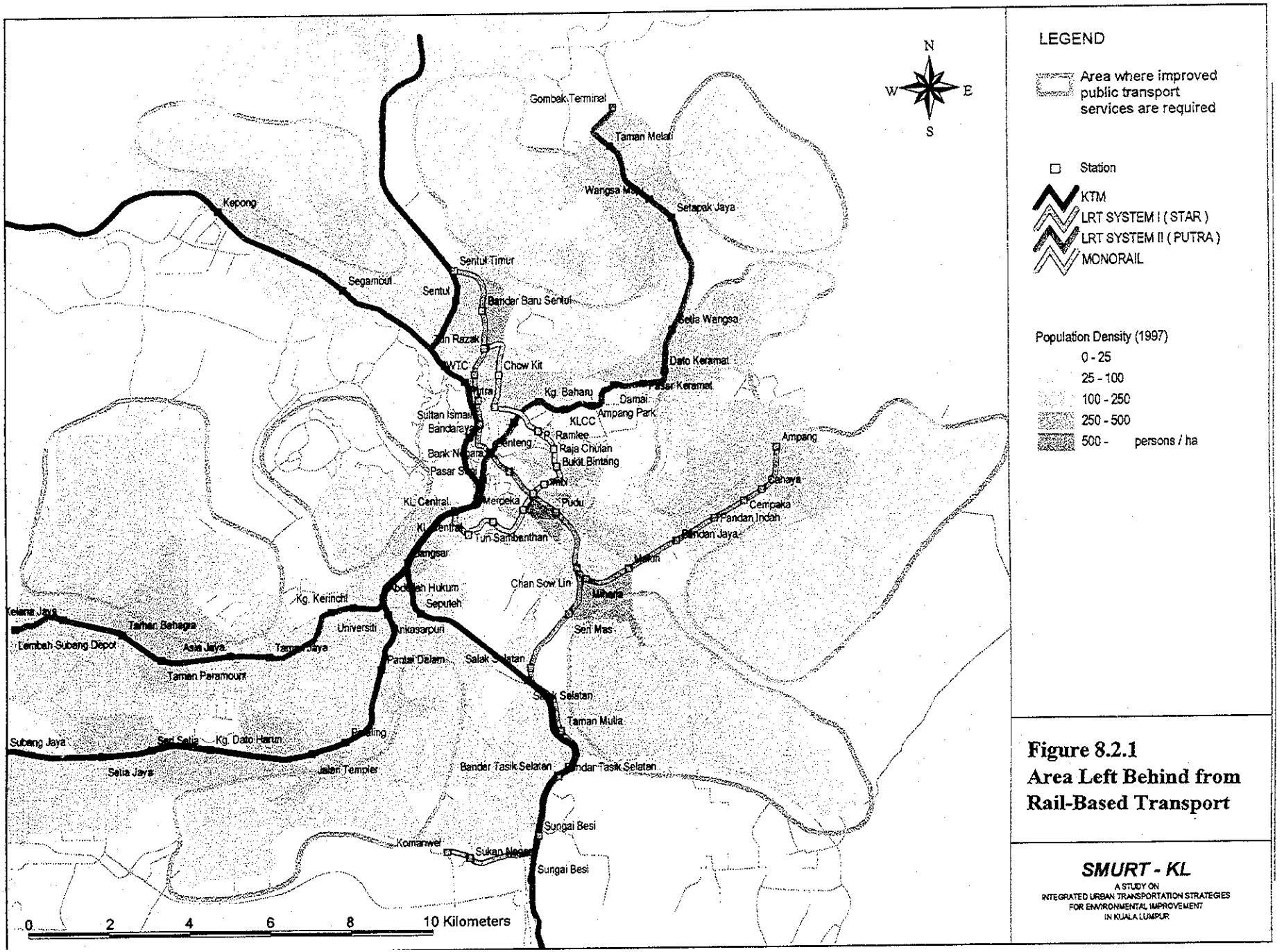

Figure 8.2.1
Area Left Behind from Rail-Based Transport

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(2) Role of Public Transport

1) Supplemental Bus Services to Rail Transport

Public transport system should be strengthen by providing bus services to supplement the rail-based transport. Several corridors have been identified which should be supported by enhanced bus services. These corridors can be largely categorised into two types. One are corridors with sufficient existing bus passenger demand, and the other are those without sufficient demand.

For the corridors with sufficient existing passenger demand, it is important to maintain or increase bus transport patronage by providing better bus services. Poor level of bus services might result in a further decrease in the number of bus passengers. This includes the Ampang, Cheras, Gombak and Kepong corridors.

On the other hand, on the corridors without sufficient bus passenger demand, people will need to depend on private mode of transport for their travel needs. It will not be to attract those people to public modes of transport, and a higher level of bus service such as commuter express bus service will have to be required. This includes the Damansara corridor.

2) Provision of Alternative Mode of Transport for Car Users

One of the primary objective for improving public transport is to alleviate traffic congestion by reducing car usage. It will not only improving public transport but also employing traffic demand management such as area pricing. Details on traffic demand management will be discussed in Chapter 9. In order to introduce the area pricing scheme to alleviate traffic congestion in the CBD, alternative modes of transport such as rail-based, bus, and taxi transport, will be required. If other modes of transport are not available, the current car users will not be able to switch to public transport. Consequently, area pricing will only impose additional cost on car users and strong public opposition to the area pricing scheme can be expected. Thus enhancement of public transport is a prerequisite for introducing the area pricing scheme in the CBD.

Traffic congestion is observed in the morning and afternoon peak periods in the CBD. The major components of the traffic are composed of commuting trips from home to work place in the morning and the opposite flow in the afternoon. Among those working in the CBD, workers of certain occupational groups do not go out for their business during the daytime. On the other hand, administrative and managerial workers, and sales workers indicate a higher trip rate of 1.42 and 1.45 trips per day, and clerical and service workers make just 0.27 and 0.17 trips from/to their working place per day on average. If a satisfactory level of public transport service is provided at a reasonable cost, some of them would switch their mode of transport to public transport.

(3) Strategies for Public Transport System Development

Taking the current situation and the expected role of public transport into consideration, a staged public transport system development plan is proposed, as follows;

1) Short-Term Public Transport Development Plan (Year 2000)

In the short term, bus transport should continue to play a significant role in supplementing rail-based transport system because the rail-based transport system does not cover the whole metropolitan area and the current fare level is not affordable to the low and lower middle income groups. Therefore, emphasis should be placed on improvements which can be implemented immediately and at moderate costs. This includes the development of a trunk bus system on six lane streets, such as Jln. Syed Putra, Jln. Ipoh and a part of Jln. Pudu. All that It requires is the construction of bus stops on the median with marginal road widening at bus stops. This development should be coupled with the introduction of exclusive bus lanes supported by reversible flow lanes in the CPA.

It is desirable to introduce exclusive bus lanes on the roads which are currently managed by a private highway operator such as Jln. Pahang, and on roads to be improved or developed under privatisation schemes such as Jln. Damansara and Jln. Cheras. However it requires the Government to negotiate with the concessionaire companies regarding the condition of concessions since they would lose toll revenue to some extent. If the companies do not agree with the scheme, another way would be to add one lane in each direction along the existing carriageway, and ask that the lane next to the median be used, as an exclusive bus lane. In the latter case, as it cannot be achieved in the short term, and the plan should be for the intermediate term.

Other improvements include re-arrangement of bus routes by cross-linking the existing routes, and introduction of new bus services. Public transport development plan for the year 2000 is shown in Figure 8.2.3.

2) Intermediate-Term Public Transport Development Plan (Year 2010)

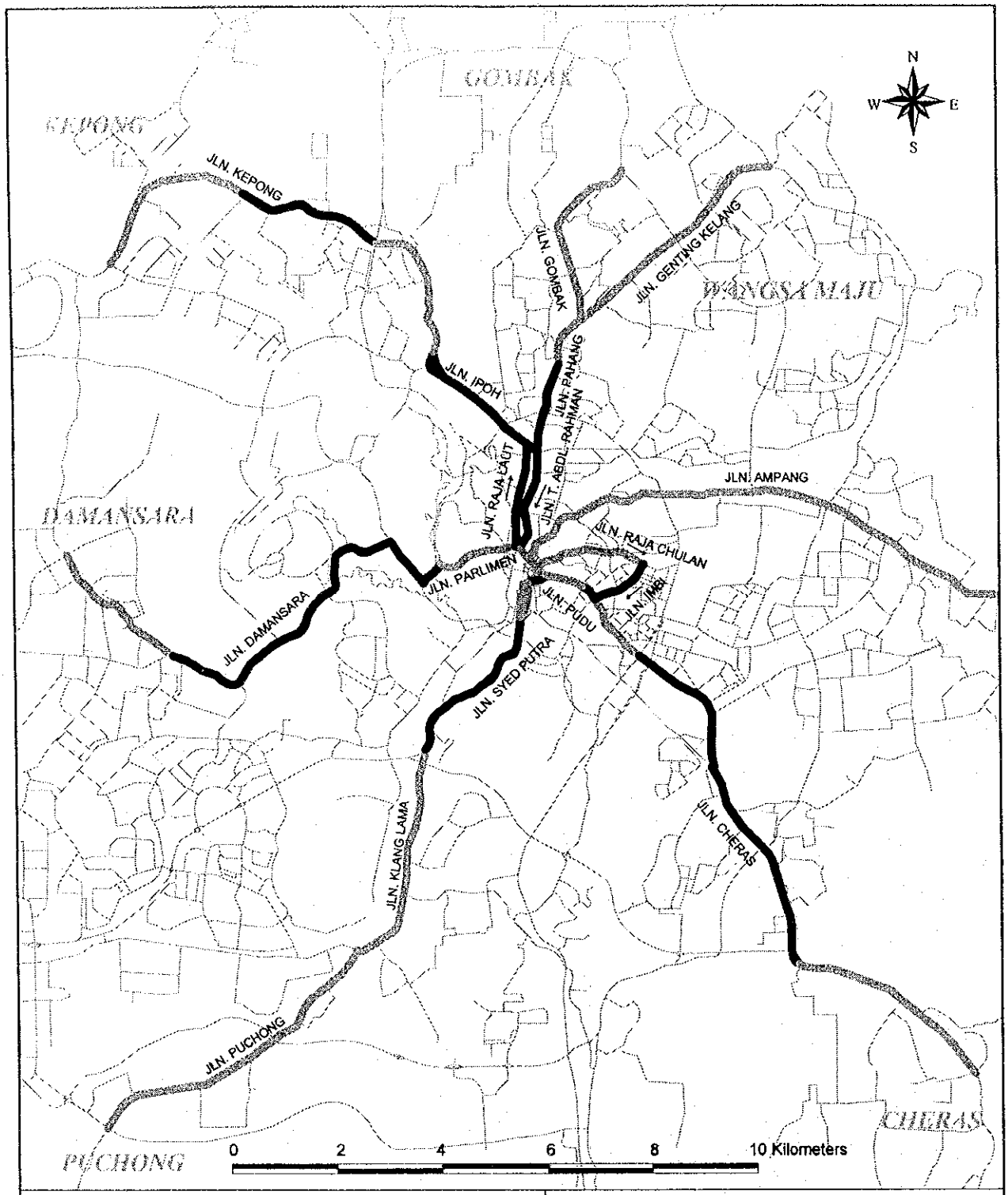
In the intermediate term up to the year 2010, facilities for the enhancement of the public transport should be constructed. This includes the extension of the trunk bus system where road widening works are required, and the relocation of inter-city bus terminals. Public transport development plan for the year 2010 is shown in Figure 8.2.4.

3) Long-Term Public Transport System Development Plan (Year 2020)

In the year 2020, person trip demand will continue to increase and trip attraction to the CBD area will be further increased. On the other hand, the increased road network capacity in the CBD will be marginal under the road network development plan. Thus, in order to maintain the current level of service on roadways, about 40

percent of person trips should be made by public modes of transport. Therefore, public transport system will have a significant role in providing people with the means of transport and also must have sufficient capacity to meet the increasing travel demand.

As discussed in Chapter 7, several trunk bus lines, such as the Damasara - Cheras line via Jln. Raja Chulan, have a potential passenger demand for conversion into LRT lines as shown in Figure 8.2.5. The other trunk bus lines, coupled with the rail-based transport, should be maintained to serve the public transport passenger demand. A proposed staged public transport development plan is summarised in Table 8.2.1. The predicted passenger demand under a traffic demand restraint scheme is illustrated in Figure 8.2.6.



LEGEND

1 or 2 lanes (for one direction)

3 and more (for one direction)

Figure 8.2.2
Existing Road Condition on Planned Trunk Bus System

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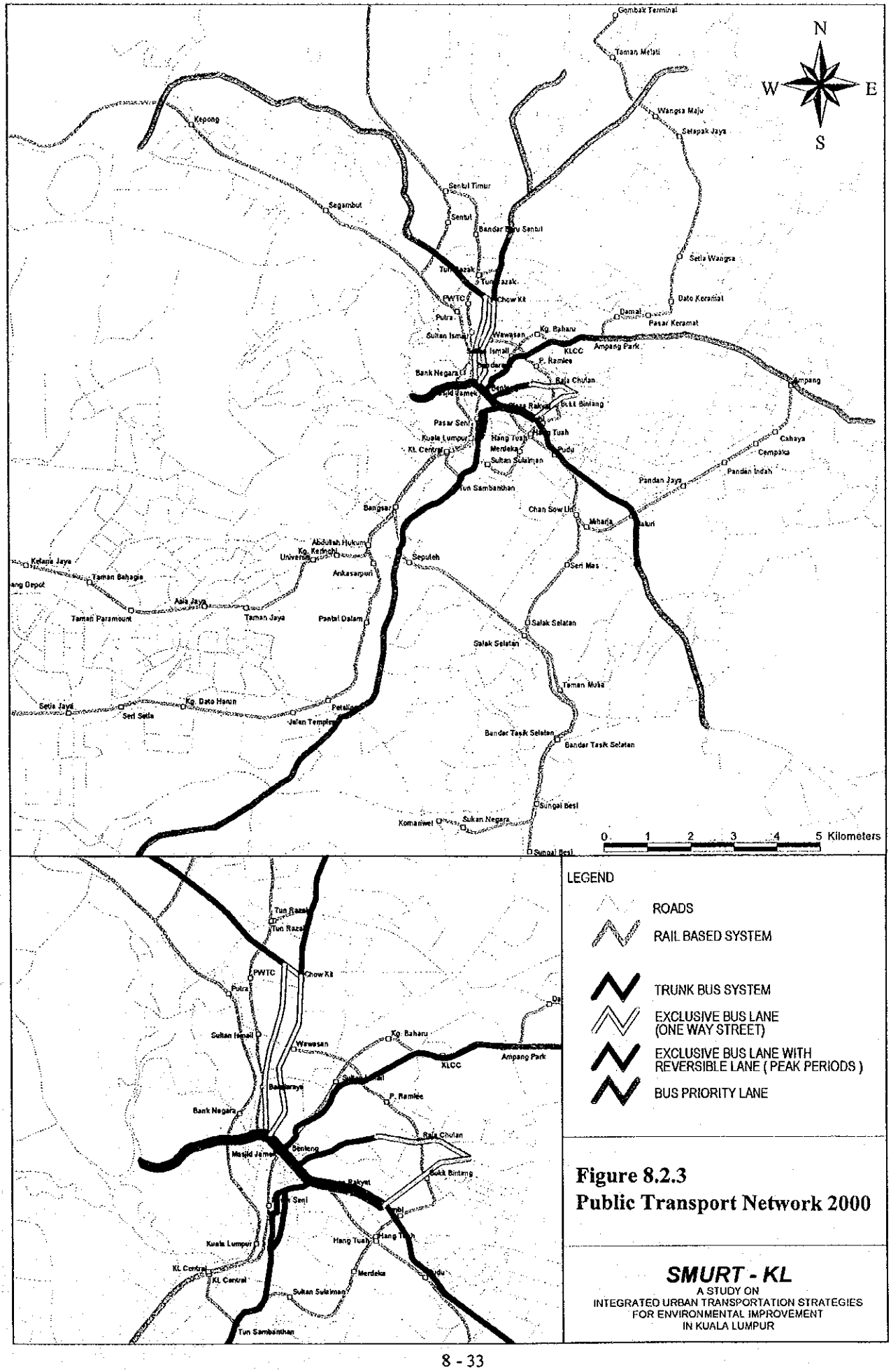

Figure 8.2.3
Public Transport Network 2000

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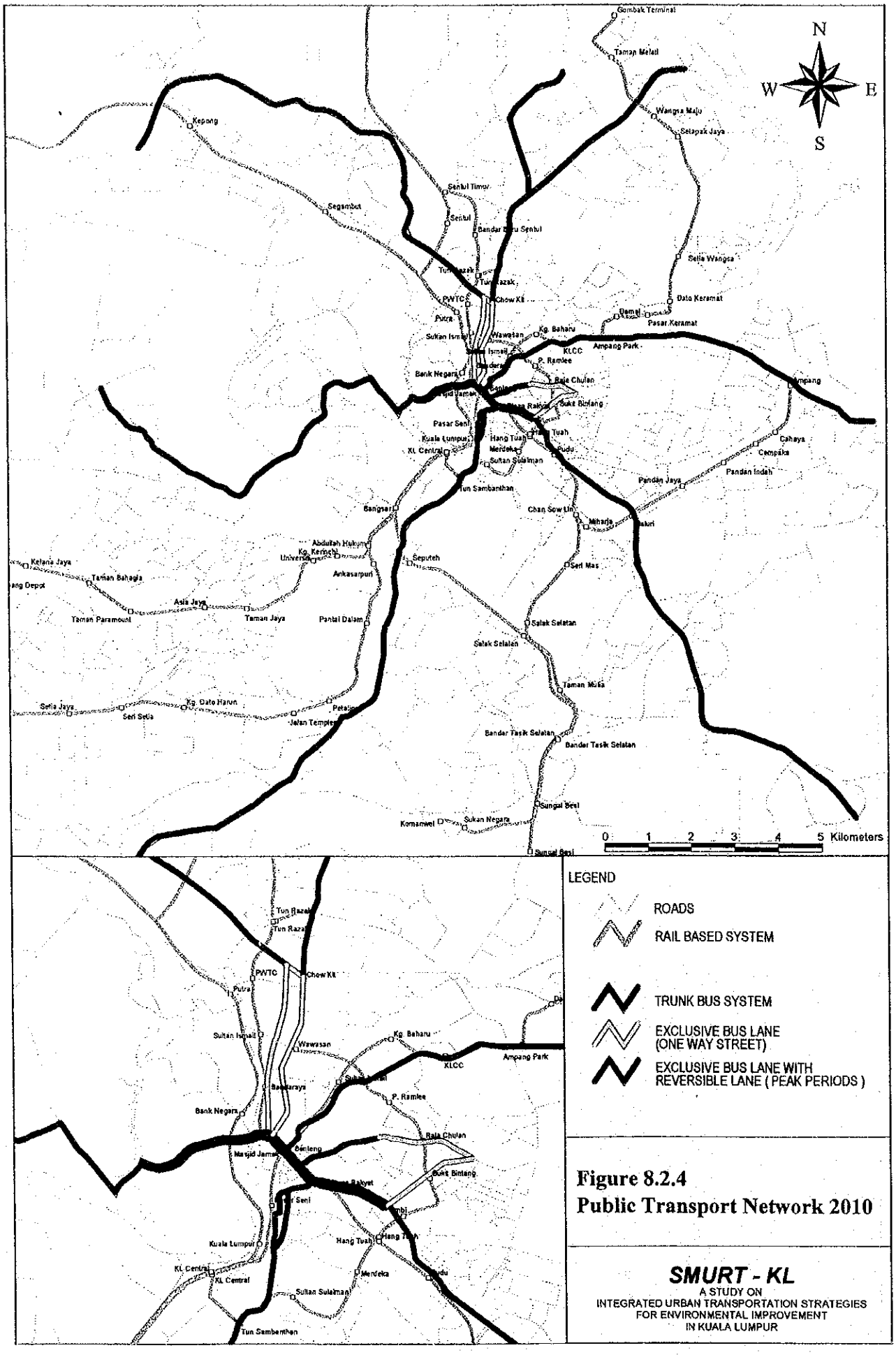

Figure 8.2.4
Public Transport Network 2010

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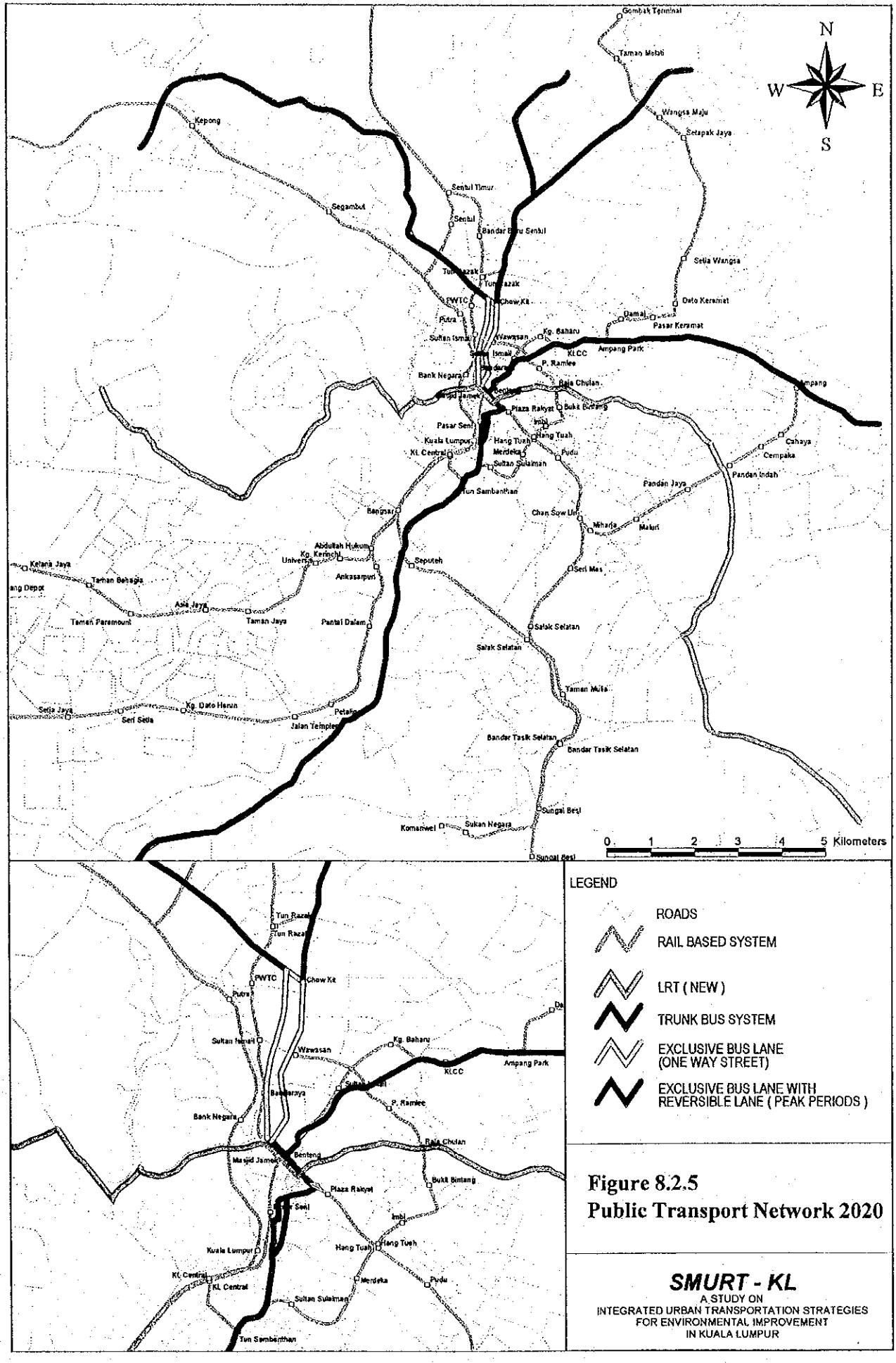

Figure 8.2.5
Public Transport Network 2020

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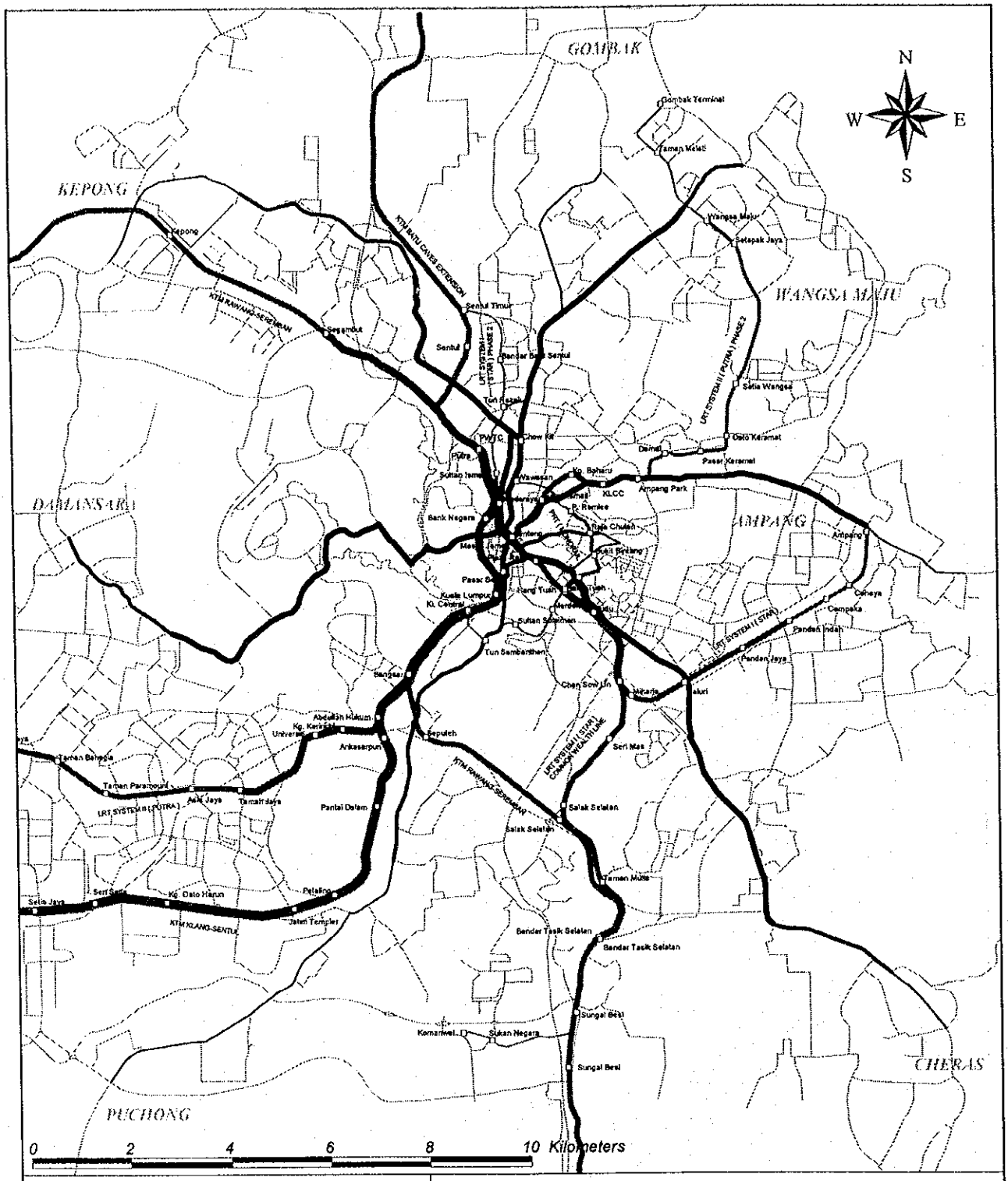

LEGEND

0 - 10000	60001 - 80000
10001 - 20000	80001 - 100000
20001 - 40000	100001 - 150000
40001 - 60000	150001 - 200000
	passengers / day
Trunk Bus	
Railway	

Figure 8.2.6
Predicted Passenger Demand on Public Transport Network 2000

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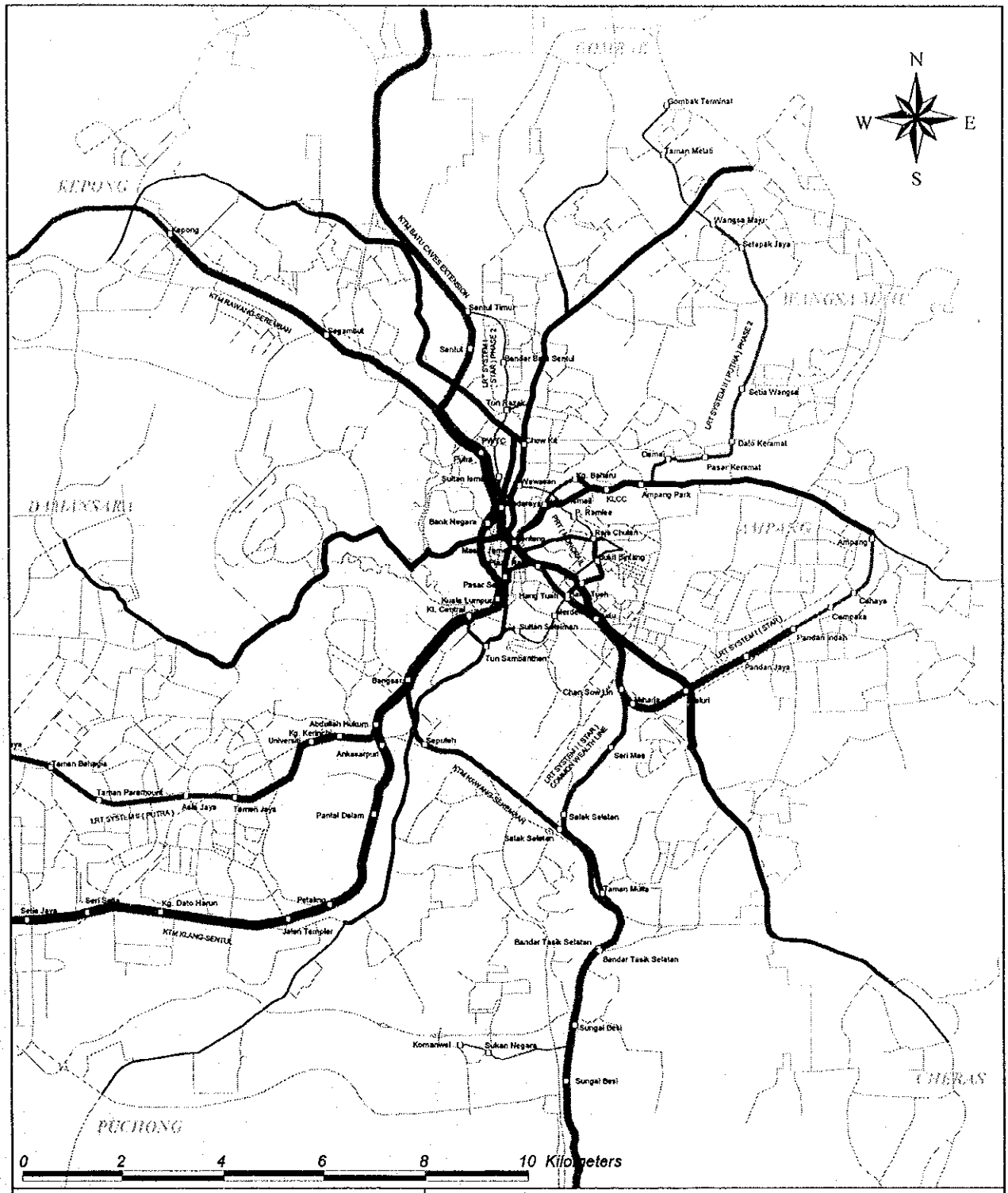

Figure 8.2.7

Predicted Passenger Demand on Public Transport Network 2010

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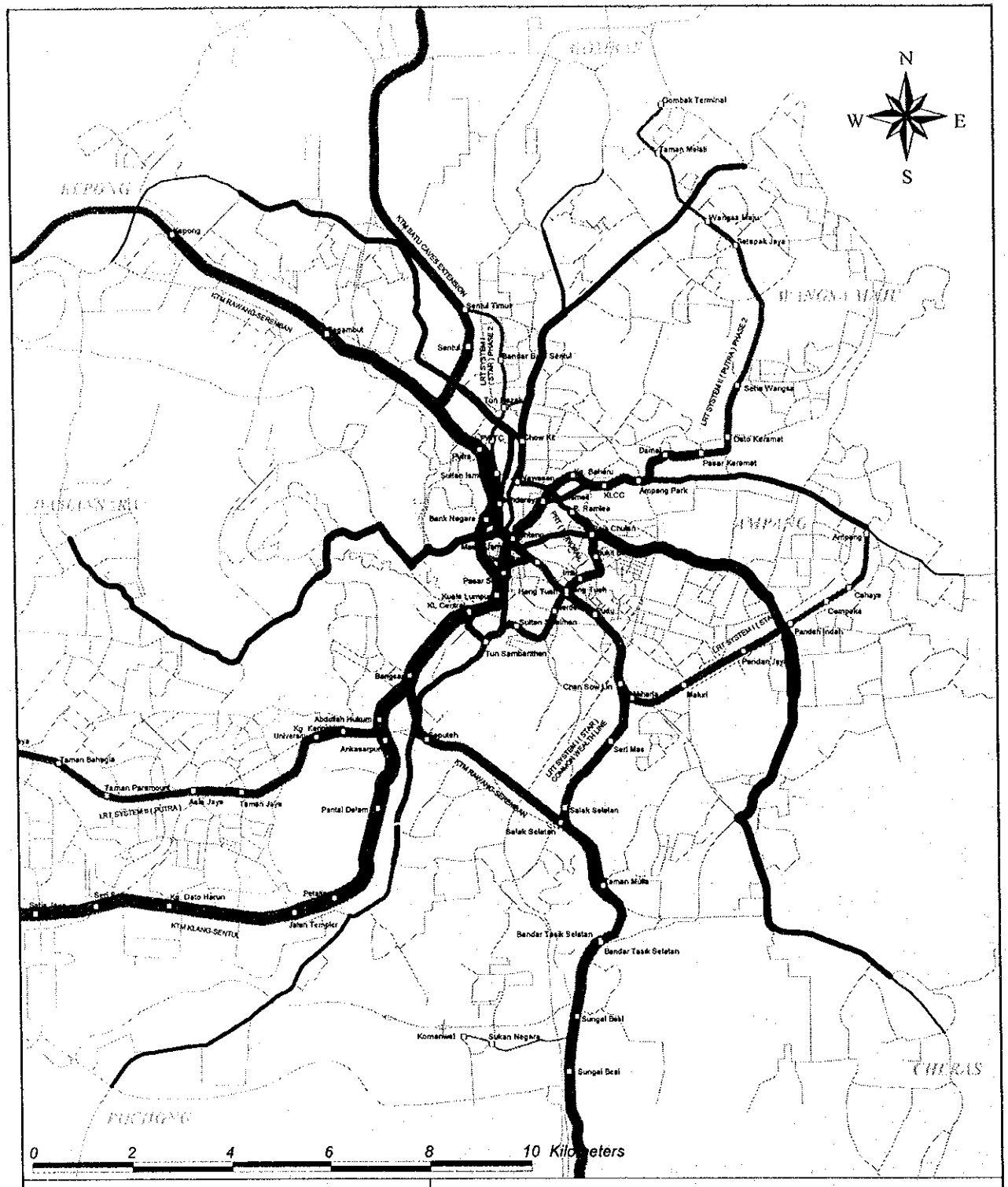

LEGEND

0 - 10000	60001 - 80000
10001 - 20000	80001 - 100000
20001 - 40000	100001 - 150000
40001 - 60000	150001 - 200000
	passengers / day
Trunk Bus, New LRT	
Railway	

Figure 8.2.8

Predicted Passenger Demand on Public Transport Network 2020

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Table 8.2.1 Strategies for Public Transport System Development

Period	Bus	Rail
Short term (Year 2000)	• Develop trunk bus system on the six-lane streets • Develop bus exclusive lane coupled with reversible lanes • Extend bus priority lanes • Improve the level of bus service in terms of frequency and punctuality by re-organising bus route • Introduce new type of bus services, Express Bus Services for commuters and CBD Circular Bus Services	• Complete on-going rail-based transport project, in particular, PRT, as soon as possible • Provide efficient feeder bus services for KTM Komuter
Intermediate term (Year 2010)	• Extend trunk bus system by road widening at several road sections • Relocate inter-city bus terminals • Introduce Bus Location System	• Develop inter-modal facility • Improve access roads to railway stations
Long term (Year 2020)	• Supplement rail-based transport	• Convert trunk bus system into LRT when passenger demand increase • Achievement of high density development in the surrounding area of the stations

(4) Components of Public Transport Enhancement

1) Improvement of Bus Operation

a) Commuter Express Bus Service

It is recommended that a new type of bus service be introduced, i.e. commuter express bus operation, to provide a better level of service for workers. Express buses stop at a limited number of bus stops.

b) CBD Circular Bus

At present, a triangle area surrounded by Jln. Tun Perak, Jln. Cheng Lock, and Sungai Klang is used as an intra-city bus terminal. As many as 10,800 buses depart or arrive from/to this area, compared with other major bus stations such as Chow Kit(3100 buses), Jln. Sultan Mohamad and Klang Bus station (2200 buses), and Lot 10(1500 buses).

This concentration of buses is one of the main causes of traffic congestion in the CBD. In other words, high concentration of buses in the CBD make bus operations difficult. Consequently re-organisation of the bus routes is necessary for both the convenience of the bus passengers and efficient bus operation.

Another drawback of the current bus route structure is the duplication of bus routes and irregular service. Thus consolidation of the bus routes is essential to achieve more efficient bus services in the metropolitan area.

If CBD circular bus services are provided and transfer difficulties are minimised in terms of cost and time through special arrangement, all the buses would not have to enter the triangle area. Two CBD circular bus services are proposed as depicted in Figures 8.2.7 and 8.2.8 to connect the major destinations in the CBD, namely City Centre North, City Centre South, Chow Kit and Golden Triangle.

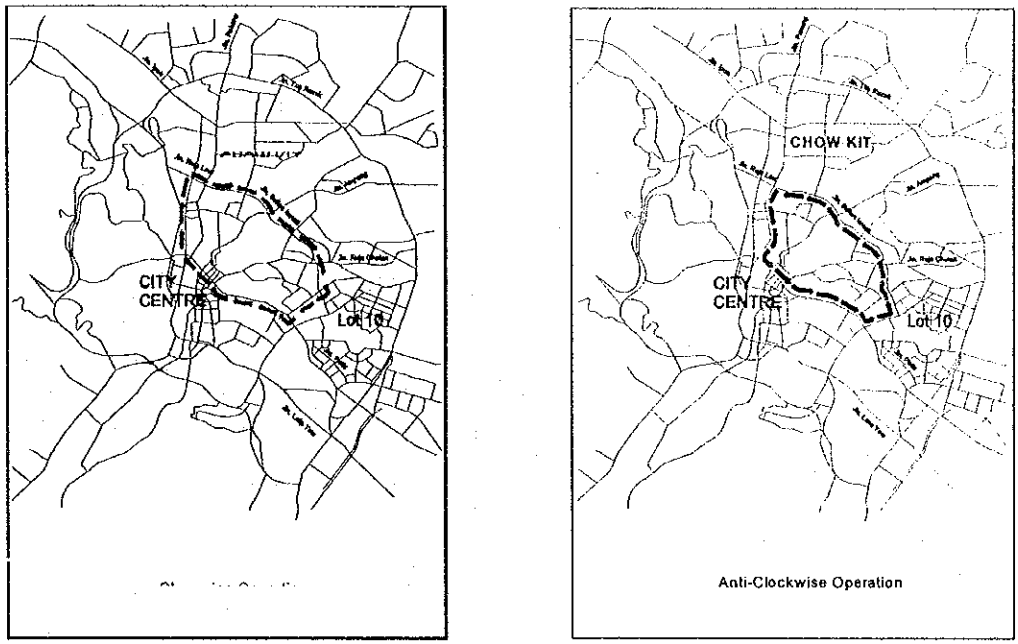


Figure 8.2.7 CBD Circular Bus (A)

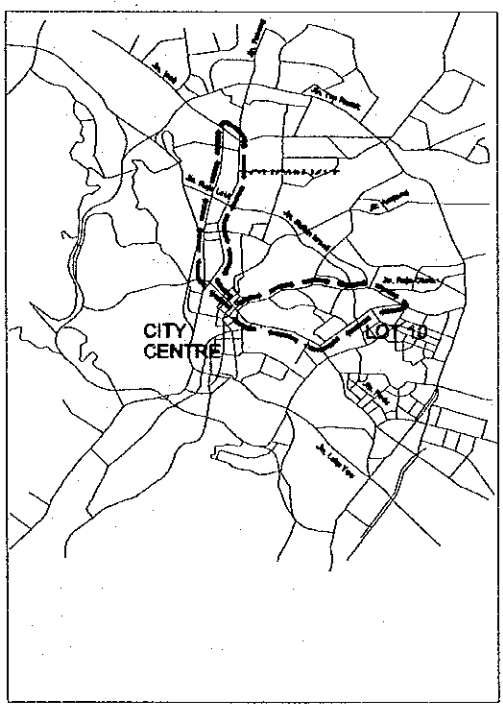


Figure 8.2.8 CBD Circular Bus Service (B)

2) Bus Transport Preferential Facility

At present, bus and taxi priority lanes are located on several streets, but the length of each bus and taxi priority lane is short and it lacks continuity. Therefore, the effectiveness of the bus priority lanes for smooth bus operation is limited. Furthermore bus operation on priority lanes is often disturbed by private passenger cars when the road is congested, and there are also conflicts with traffic accessing office buildings and shopping centres along the street.

To deal with this problem the middle part of roadway is more appropriate as the bus priority lane, although it will conflict with the left-turn traffic at intersections. Moreover, a one lane reduction out of two lanes per direction on four-lane twoway streets would result in not 50 percent reduction of the road capacity but 60 to 75 percent reduction, according to traffic characteristics and land use along streets. As a result it will cause traffic congestion and car users will not support a bus priority scheme.

Based on the understanding of the reduction of road capacity, it is recommended that in principle a bus exclusive lane be located on six lane streets or multiple lane one-way streets. However, after reviewing the characteristics of the existing road network in the study area, most radial streets in the CPA are four-lane streets and it seems difficult to accommodate a bus exclusive lane. Therefore it is recommended that reversible lanes be introduced on radial streets in the CPA with one lane assigned as a bus priority lane. Exclusive bus lanes and bus priority lanes are classified into four categories.

Type of Bus Transport Preferential Lane	Description
Exclusive bus lane coupled with reversible flow lane in CPA	Exclusive bus lanes on four-lane streets will be introduced, coupled with reversible flow lanes in the morning and afternoon peak periods. (Details on reversible flow lanes will be described in Chapter 9.)
Exclusive bus lane in the middle of roadway (Trunk Bus System)	Exclusive bus lane in the middle of six-lane streets is used for trunk bus system.
Exclusive bus lane on the multiple-lane oneway street	Exclusive bus lane on the multiple lane oneway street e.g. Jln. Laut, Jln. Tuanku Abdul Rahman
Bus priority lane	Priority is given to buses on the bus priority lane, but cars are allowed to pass the lane when buses do not run on the street. The bus priority lane will be applied on the four-lane streets, where exclusive bus lanes is difficult to be placed.

3) Trunk Bus System

a) Characteristics of Trunk Bus System

A trunk bus system has a railway-like characteristics and provides shuttle service between the origin and the destination of a route. Examples of trunk bus system operated in Nagoya city, Japan, is shown in Figure 8.2.9. Buses run through exclusive bus lanes in the middle of roadway, which are separated from the lanes for other vehicles. Since the middle of roadway is used, conflicts between buses and access traffic to building along the streets are avoided. To provide a better service with such an operation, it is necessary to construct facilities for segregating bus operation from other traffic flows such as grade separation at intersections and construction of bus stops in the middle of roadway. The layout of bus stops for trunk bus systems at signalised intersection, as well as on the roads, are illustrated in Figure 8.2.10. Buses on the trunk bus system are allowed to stop for embarking/disembarking passengers only at designated bus stops and bus terminals. The interval of bus stops should be around 1.0 km to 1.5 km, which is longer than that for conventional bus operation.

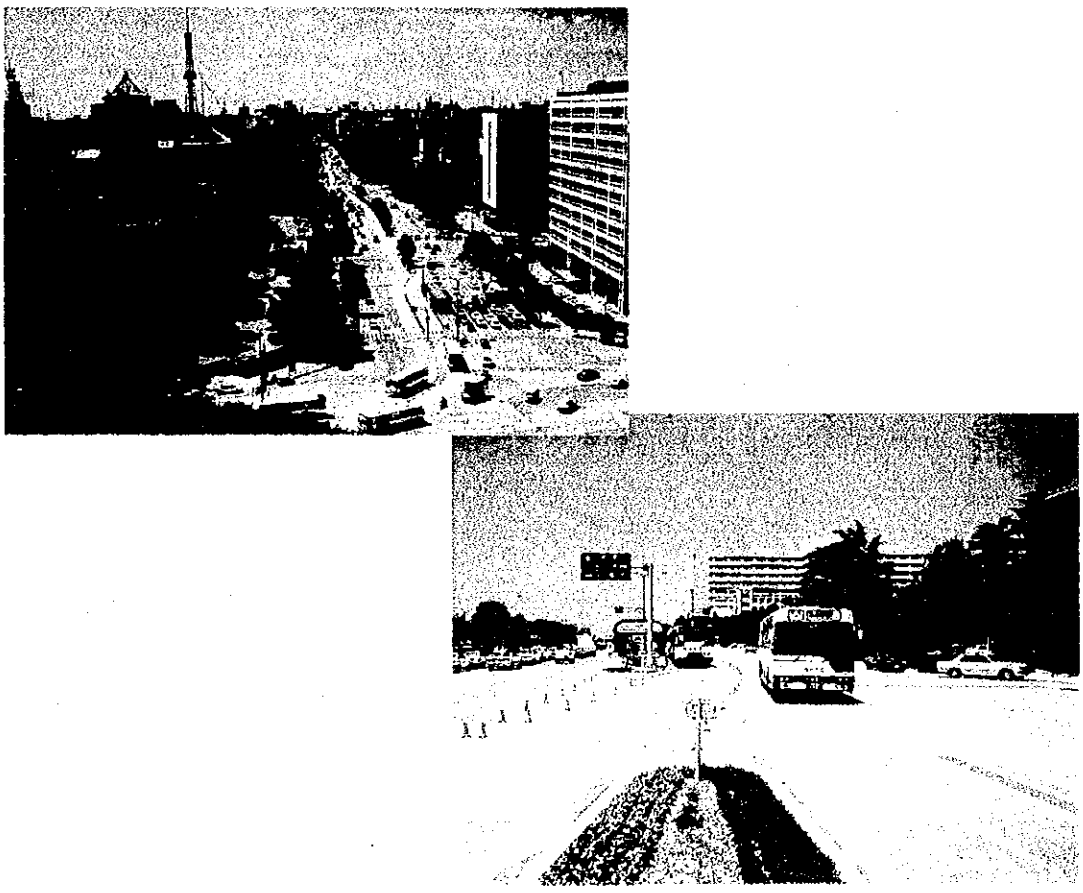


Figure 8.2.9 Trunk Bus Operation in Nagoya City

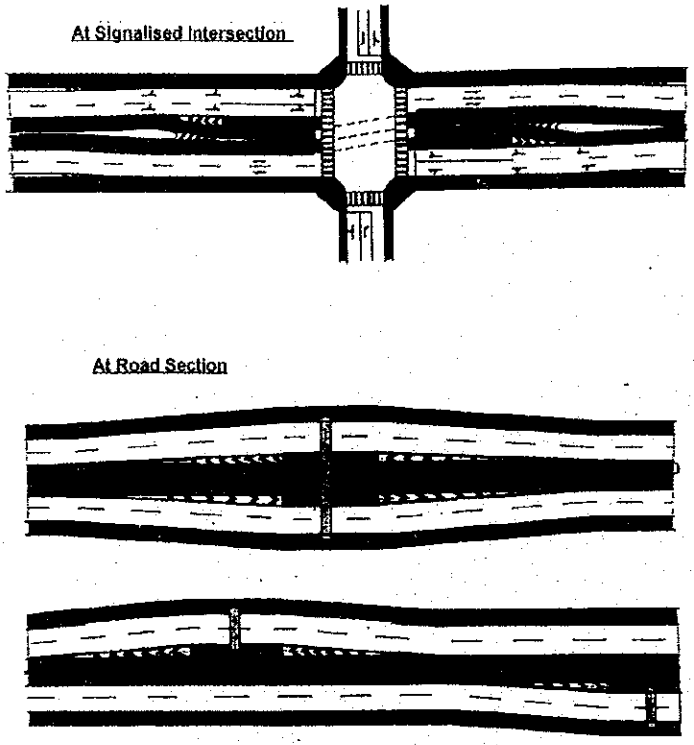


Figure 8.2.10 Layout of Bus Stops for Trunk Bus System

b) Institutional Set-up for Trunk Bus System

The proposed routes of the trunk bus system will serve not merely the city of Kuala Lumpur but the Kuala Lumpur metropolitan area, which include several municipalities in the State of Selangor. Consequently a new agency is required to deal with metropolitan wide transportation administration, and the agency should be responsible for the development and maintenance of the trunk bus system.

Buses on the trunk bus system could be operated by either the existing bus operators or new operators. The relevant agency will be able to collect charges from the bus operators for using the trunk bus system and the collected charge can be allocated for the relevant expenditure. The charges can be justified as buses can operate smoothly as a result and bus companies can save on bus operation costs.

4) Relocation of Inter-City Bus Terminals

At present, four inter-city bus terminals are utilised for bus passengers going out of the City. Among the four terminals, the Puduraya terminal is the largest bus terminal. The number of buses departing from the terminals are listed in Table 8.2.2.

However, buses arriving at/departing from this terminal caused traffic congestion on Jln. Pudu. Since the urbanised area has already extended, the final destination of the inter-city bus passengers are distributed throughout the metropolitan area. Thus the inter-city bus terminal does not have to be located in the heart of the city. Plaza Rakyat, which is to be developed next to the Puduraya bus terminal as an alternate inter-city bus terminal will cause the same problem as the existing bus terminal.

Table 8.2.2 Number of Buses Departed from Four Inter-City Bus Terminals

(as of October 1998)

Bus Terminal	Direction	Number of Buses Departed (bus trips / day)	Percent Composition
Puduraya	North	358	
	South	525	
	East	84	
	Subtotal	967	46 %
Putra	East	51	2 %
Pekeliling	East	146	7 %
Klang	West	926	44 %
Total		2,090	100 %

Source: Ground Checking at Bus Terminals in October, 1998

The criteria for selecting a location for inter-city bus terminals are;

- Along circumferential roads such as Middle Ring Road (I)/(II) or other circumferential expressways for efficient distribution of passengers to the various final destinations within the metropolitan area
- Good connection with rail-based transport systems
- Outside the CBD to avoid traffic congestion

Based on the criteria above, two inter-city bus terminals are recommended; one is the development of Sentul bus terminal, and the other is the Bandar Tasik Selatan terminal, as illustrated in Figure 8.2.11.

a) North Inter-City Bus Terminal : Development of the Sentul Bus Terminal

At present, north-bound and east-bound bus trips account for 358 trips and 281 trips respectively. The new north inter-city bus terminal should be established for buses bound for the north and east. The desirable location for the north inter-city bus terminal is near the Sentul station of KTM or the Sentul Timur station of LRT System(I) and the planned KL North-East Highway, which can be regarded as being a part of the circumferential road outside of the Middle Ring Road (I). The proposed terminal should be, therefore, developed after the construction of the KL North-East Highway. This bus terminal will be connected with the LRT System (I) and/or the KTM Komuter Sentul Line, so that bus passengers can go to their home or the other final destinations easily.

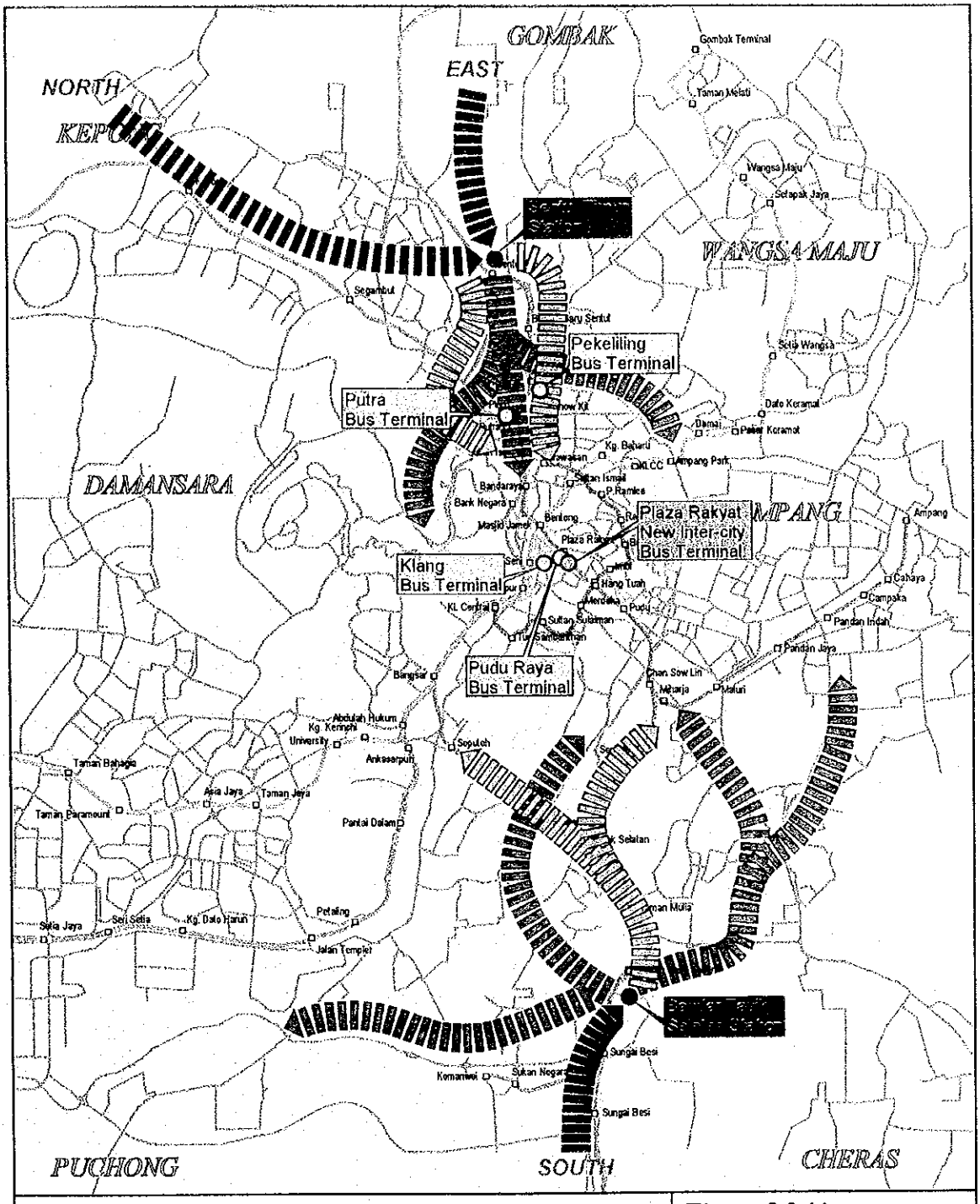
b) South Inter-City Bus Terminal : Bandar Tasik Selatan

Currently 525 buses operate toward the southern direction and all the buses depart from the Puduraya terminal. The terminal for the buses to the south should be relocated to Bandar Tasik Selatan, which is located about 7 kilometres south from the CBD and which is to be an integrated station for the KTM Kommuter, the LRT System(I) and the ERL. This station is located along Jln. Sungai Besi and also has an easy access to the Middle Ring Road (II).

4) Taxi Transport

Currently taxis are not heavily used for business trips; more than 80 percent of business trips are made by cars. Since many people use cars for commuting, subsequent non-home based trips such as trips for business meetings from offices are also made by cars. However this does not mean that taxis are not a significant mode of public transport. When people shift from cars to public transport, taxis provide a more flexible transport service than rail-base transport and buses.

In addition, taxis can also provide feeder services for rail-based transport and trunk bus system to promote public modes of transport.



LEGEND

- KTM
- LRT(STAR)
- LRT(PUTRA)
- Monorail(PRT)
- Station
- Road
- Existing Bus Terminal
- On-going Terminal Development
- New Bus Terminal
- Inter-city Bus
- Distribution (Rail)
- Distribution(Road)

Figure 8.2.11
Relocation of Inter-city Bus Terminals

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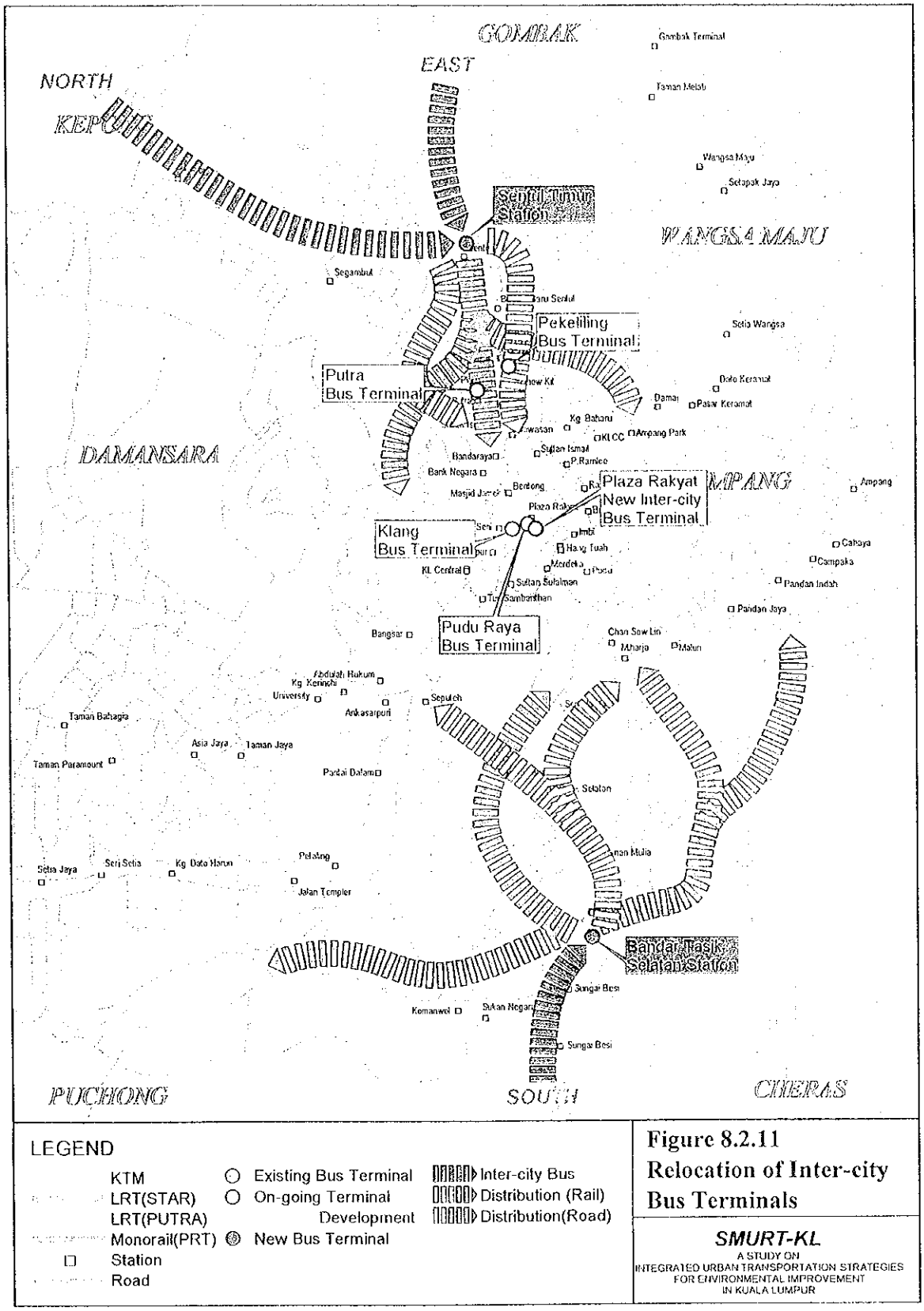

LEGEND

KTM	○ Existing Bus Terminal	Inter-city Bus
LRT(STAR)	○ On-going Terminal Development	Distribution (Rail)
LRT(PUTRA)		Distribution(Road)
Monorail(PRT)	◎ New Bus Terminal	
□ Station		
Road		

Figure 8.2.11
Relocation of Inter-city Bus Terminals

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8.2.2 Inter-modal Facility Plan

(1) Necessity of Inter-modal Facility

According to the traffic demand forecast, a very high vehicle traffic growth is forecasted in the Study Area even after the completion of the rail-base system with the additional proposed line for Cheras. This is mainly due to the increase in car ownership as household incomes grow. The average household is expected to own more than one car and this shows that everyone, except children, will have the capability to eventually possess a car in the Study Area.

On the other hand, the road facility cannot afford to cater for such large amount of traffic even if the new planned road network is established in the future. This implies that public transport has to play an important role in absorbing vehicle trips. The rail-based systems are composed of different systems such as the KTMB, LRT System I, LRT System II and PRT (monorail), and users have to transfer to another rail-based system when they cannot get to final destination by one line. This transferring is very inconvenient for the users and this will, without doubt, discourage them from using the rail-based system.

In addition, public transportation system, including rail-based and bus systems have to be integrated into one, since the two systems need to complement each other.

From this point of view, the current and planned rail-based system might encounter some problems in terms of inter-modal facilities in promoting the utilisation of public transport. It is necessary to improve the current and future planned public transport facilities to enhance their smooth utilisation.

(2) Transferring Among Rail-base System

Intensive development, including rail-based stations, can be observed at the KL Central development project in Brickfield. KTMB, PRT, LRT system II and Express Rail Link (ERL) will come together at this project site. Users can change transportation here according to their destinations without transferring many times here and there. This is one of the ideal examples of inter-modal facility.

On the other hand, there are some problems transferring at other rail-based stations. The details are shown below (see Figure 8.2.12):-

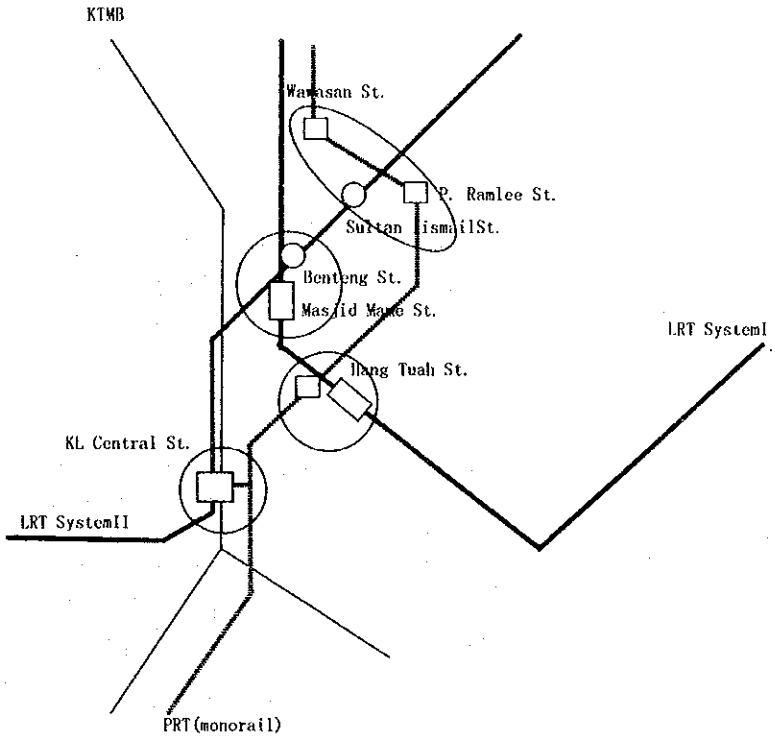


Figure 8.2.12 Rail Network and Transferring

1) Sultan Ismail, P. Ramlee and Wawasan Stations

Based on the current plan, LRT system I and PRT (monorail) cross each other on Jln. Sultan Ismail and the station arrangement is as shown below.

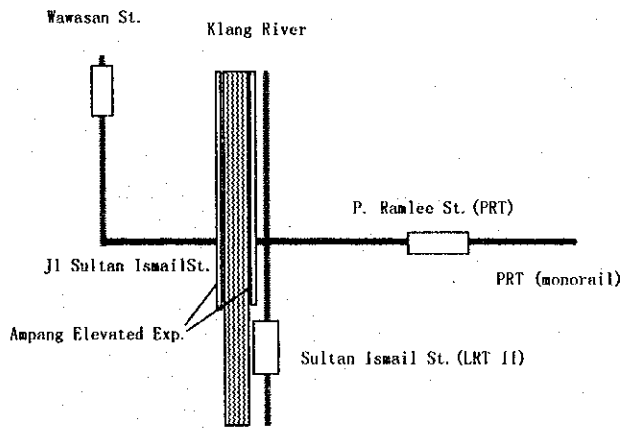


Figure 8.2.13 LRT and Monorail Station

These projects are now under construction though there have been some deferments due to the current economic slow down. The three stations are placed at distant locations and this is obviously an inconvenience for the users transfering between the PRT (monorail) and LRT stations. In the rail-based system, PRT has a very important role in connecting one line with another, and is to run in the most densely-built areas in KL. Although it seems difficult to modify the currently planned layout of the stations at present, the first priority should be on the modification of the location of the P. Ramlee station closer to the Sultan Ismail Station. As a marginal improvement, pedestrian facility development to connect the three stations is proposed to smoothen transfers. The detailed plan is mentioned in Chapter 9, Traffic Control and Management Plan.

2) Masjid Jamek and Benteng Stations

The Masjid Jamek (LRT system I) and Benteng (LRT system II) stations are located adjacent to each other along Jln. Tun Perak. The Masjid Jamek station has been in operation while the Benteng station is expected to open for service within a month. These stations were planned as a pair from the beginning and an underground gangway is to connect both stations. However, the provision of such facilities as moving-walk-belts and escalators is preferable to further improve the ease in transferring.

3) Hang Tuah Stations

The Hang Tuah stations located on Jln. Sultan Ismail near Pudu Prison connects the LRT system I and PRT. The station for the LRT is open for service already but the one for PRT is currently under construction. At present, no special facilities are planned for transfers between the two stations. Provision of escalators with roofs, which enable smooth transfers and protect the users from rain is desirable.

(3) Station Plaza

1) Reinforcement of Feeder Bus Service

Another key issue with inter-modal facilities is the smooth transfer between the rail-based station and bus transport. The users of rail-based systems are usually users of the bus transport too. One of the current weak points of the rail-based system is the poor feeder bus system, which originate from inconvenient transferring facilities near the stations. In terms of the KTMB Klang Line, for instance, many rail stations are located in extremely narrow areas where buses cannot turn around. It is of great importance to establish an extensive feeder bus system to reinforce the rail transport because of the long distance from the residential areas to the rail stations. In cases like this, provision of a station plaza at major rail stations is key to increasing the patronage of rail transport.

Please refer to embodied plan for rail station plaza in Chapter 10, Development Plan of Model Area.

The rail station plaza should be provided at the following rail stations:

i) Ampang Station (LRT system I)

The current rail station plaza is small and needs to be extended.

ii) Masjid Jamek Station (LRT system I &II)

Since China Town has a huge bus transport demand, a station plaza should be provided and it can also cater to the Benteng station of LRT system II (refer to Chapter 10 Development Plan of Model Area)

iii) From Gombak Terminal to Dato Keramat (LRT system II)

The share of public transport is comparatively high in is area due to its residential characteristics. Rail transport cannot collect patronage without a feeder bus system. In this case, rail station facilities should be provided to promote feeder bus services.

iv) From Lembah Subang to Bangsar (LRT system II)

The areas alongside this section have comparatively high car trip share. A number of vehicle traffic is generated from these areas. One of the key issues is how to divert the car users to public transport. For this, the provision of a rail station plaza is a necessity.

v) From Setia Jaya to Petaling (KTMB)

This section has the same characteristics as the above. A rail station plaza should be provided.

vi) From KG. Pasir to Lamban Panta (PRT)

According to the initial plan of the PRT, linear-city development alongside the section was laid out by the investors. However, this area development plan has been suspended due to financial problems in conjunction with the current economic woes. The provision of rail station plazas is one of the measures for collecting patrons.

vii) Northern part of KTMB line

The interval between rail stations in this section is long which implies that the access distance is longer as well. Most of the passengers come to this

line mainly by feeder bus services. The provision of a rail station plaza is indispensable in collecting patrons.

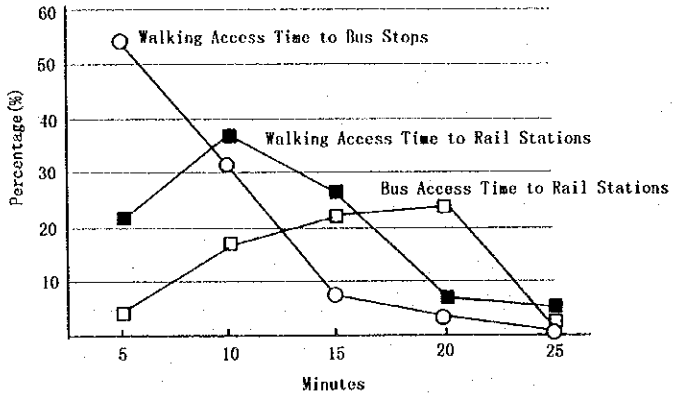


Figure 8.2.14 Access Time Distribution

2) Implementation

In implementing these station plazas, there are several ways of constructing these facilities. Considering the current BOT system, the best way would be for them to be constructed by rail companies.

However, rail-base business will not be lucrative during the initial stage. In order to expertise the provision of rail station plaza, the necessary costs should be shared by the private rail company and the government.

3) Park and Ride

As mentioned in Chapter 6, Urban Transportation Policies and Strategies, usage of park and ride depends heavily on the characteristics of the rail stations. In this case, facilities for park and ride should be provided at rail stations with less frequent feeder bus operation. For kiss and ride, no parking lot is required at the station plazas.

Park and ride facilities are deemed necessary at the following railway sections:

i) From Gombak Terminal to Dato Keramat (LRT system II)

Although it is uncertain that who will take care of the feeder bus service in this railway section, it can be seen that the feeder bus services are not efficient due to the lack of well-arranged local roads. Some of the rail users might prefer a park and ride system.

ii) Northern part of KTMB line

This section has the same characteristics as the section from Gombak Terminal to Dato Keramat, and does not have enough minor arterial and local roads for feeder

buses to operate. In addition, the distance between stations are quite long, resulting in a need for park and ride facilities.

(4) Pedestrian Facility for Public Transport

Another key issue in promoting public transport is to provide comfortable walkways for long walking distances. This will help to increase the utilisation of public transportation and reduce short vehicle trips. In addition, rail stations cover around 80% of the CPA, where the most densely built area is located. Additional emphasis has to be placed on the creation of pedestrian-friendly environment in the CPA. This will help in the formulation of a better quality of life in the future.

(5) Fare System Planning

1) Current Fare System

The need to transfer transport modes is one of the most disliked characteristics of public transport service compared to private cars, in terms of its travel time and cost. To ease this burden on the passengers, various technical considerations were examined mainly for travel time related matters and convenience for passengers as mentioned above.

In this section, strategies to ease the passengers' burden are discussed, focusing on the public transport fare structure, which is another important factor in transfers.

The current public transport fare systems by company are summarised in Table 8.2.3. Generally speaking, a season ticket system is not popular in Malaysia except for the KTM Komuter. Although Park May has started the Smart card system for fare collection, bus companies are not active in promoting the season ticket system.

Table 8.2.3 Current Public Transport Fare Systems

Operators	Fare System	Season Ticket	Remarks
KTM Komuter	Distance Based	Weekly Pass: 16% discount Monthly Pass: 24% discount Six-month Pass: 27% discount Yearly Pass: 30% discount	
STAR LRT	Distance Based	None	Pre-paid Card Last-ride bonus
Intrakota Komposit	Flat	None	
Park May	Distance Based	None	Smart Card
STAR Link	Flat	None	

Source: SMURT-KL

Modal integration to supply efficient public transport service in terms of the fare system is divided into two strategies. They are: 1) a common ticket system, and 2) a transfer discount system. The common ticket system minimizes the passengers' burden in having to pay individual fares separately for various modes. The transfer

discount system is reduces travel costs for passengers who use more than two public transport modes to reach a destination.

However, public transport businesses should recognise the effect of the season ticket. If the discount rate is reasonable, passengers will consider using public transport, as the discount would be a reduction in travel cost. In addition, the public transport companies could also predict the number of regular passengers, which would generate regular revenue for railway operation.

Related to the common ticket system for public transport, it should be mentioned that the Smart card system called Touch 'N Go Card will be realized in Malaysia. Park May began accepting the card since May 1997 and a new PUTRA LRT will also accept the card from September 1998. The KTM Komuter passengers will also benefit from the card starting 1999, if everything goes as scheduled.

The Touch 'N Go card is a pre-paid card. Passengers can buy the card at the service provider's outlet, and use the card with the relevant public transport operators. A Common Clearing House issues the cards, and handles transactions and settlement of the revenue and cost. However, it is not the same as the so-called common fare system, which is now in operation in Europe, because fare systems in Malaysia are not common among operators.

In big European cities, such as Paris, London, Frankfurt, Hamburg and so on, the common fare system is popular. But, it should be noted again that the common fare system in European cities is different from that of Malaysia because the European cities accept exactly same fare level for all transport modes involved. By adopting the system, the followings can be realised:

- Increase of public transport passengers due to improve a convenience; and
- Reduction of operation cost due to simplified ticket inspection.

Some defects, however, exist as follows:

- Increase of cost due to complicated adjustment procedure; and
- Incentive to increase fare revenue by public transport businesses decrease.

The result of the common fare system is reported to be satisfactory. For example, the number of passengers in 1978 increased by 1% for subway, by 5% for regional express railway, by 5% for suburban buses, by 1% for national railway and by 36% for urban bus transport against previous year in the case of the Orange Card in Paris.

Transfer discount, which is the second strategy, is also effective in increasing public transport mode users. The discount system is also popular in European cities together with the common fare system.

Usually, fare for the first ride in a public transport is expensive, when it practices a distance based fare system. So, if a passenger uses two different modes to reach

his/her destination, he/she has to pay for an expensive first ride ticket twice to complete the trip. The discount system decreases the resistance of passengers against travel cost by reducing, or sometimes eliminating the price of the ticket for the second public transport usage. Thus, the system is effective in increasing passengers.

The following s are the effects by the discount transfer fare system:

- Increase the number of public mode passengers through network effects due to the reduced travel cost for passengers who use more than one mode to travel; and
- Enhancement of the integrated urban public transport network.

This system is commonly seen in European cities. The reason why European cities has such a fare system is because its urban transport are undertaken mainly by the public sector, as seen in Paris and Stockholm, and it is relatively easy to integrate the fare systems of different operators.

On the contrary, it has not been easy in Japan, except in some cities such as Sapporo and Osaka where the public sector dominates the urban public transport market. For example, private railways play a big role in urban public transport market in Tokyo. These private railways are compete very seriously with each other. The common fare system is therefore not possible in this situation, thus not popular in Japan, although the transfer discount system has been introduced.

2) Public Transport Fare System Strategy

In the Klang Valley area, the urban public transport systems are operated by the private sector. No public sector is in charge of public transport. Therefore, introduction of a common fare system will not be easy as in the case of Japan.

The study team feels that the introduction of a season ticket by the bus and LRT operators should come first, because it is considered to be very effective in increasing public transport users substantially. In addition, passengers who hold the season tickets are generally regular customers. The public transport businesses in the area would therefore obtain a firm management base.

As a next step, the study team feels that a transfer discount system should be introduced to vitalise the public transport network which has been extensively developed in recent years and will be completed in a few years time. The number of public transport systems are increasing. Therefore, the transfer discount system should be introduced to fully utilise the developed urban public transport network.

The common ticket system is being materialised in Klang Valley area. The Common Clearing House is in operation to adjust fare revenues including highway toll revenue. The study team feels that the system should be expanded to all public transport modes to encourage public transport usage after due consideration of the compatibility and expansion potential of the current system.

Furthermore, the common ticket system is considered to be useful in introducing the transfer discount system through its advanced information technology.

As a conclusion of this section, the study team proposes the following strategies for the public transport fare systems in the Klang Valley area:

- Expand the common ticket system to all public transport operators after due consideration mentioned above;
- Introduce season tickets to all public transport modes; and
- Study the implementation of a transfer discount ticket among different public transport modes.

8.3 Integrated Transport Information System

8.3.1 Necessity of Integrated Transport Information System

(1) Transport Information System

To operate and/or administrate an urban transport system properly, transport information is important. Train/bus operation schedules, service network and fare tables should be provided clearly to passengers in the case of urban public transport services. For road users, information signboards such as traffic rules and destinations of the roads should be provided properly. Markings on the roads such as lanes, zebra crossings and turning prohibition should be clearly drawn to provide accurate information to drivers.

Traffic flows and passenger flows are kept smooth and efficient by transport information.

In this section, a transport information system will be discussed, which needs to be improved and modernised to vitalise the urban transportation facilities in the study area.

The study team defines the transport information system as a system that utilises information technology in transport fields in this study.

The purpose of the transport information system is to realise traffic safety and environmental improvement through rational and smooth traffic flows by providing appropriate transport information, mainly to the administrators and the users of the roads.

Table 8.3.1 shows examples of typical transport information systems by mode of transport, and by type of information, which consists of information system for operation, information delivery system and information collection system.

The rail-based system has an advanced transport information system compared to other modes. This is natural because the rail-based system has an exclusive right-of-way to operate trains as scheduled. Modern railway information systems consist of central train control system, coupled with a signal and telecommunication system, to operate a safe and punctual transport service.

However, transport information system for road-based transport is less developed compared to that for the railway. Three reasons for the resulting situation are as follows:

- Uncontrollable demand;
- Unpredictable vehicle activity, and;

- Undeveloped information technology.

In the case of the railway system, it is easy to control the number of operations, operation route and departure/arrival time from/to stations at control centres, because the railway system is a closed system.

The road system, however, is basically not able to restrict road usage to vehicles except for toll roads. Furthermore, the activities of road vehicles are not predictable. Not only is the number of vehicles on the road unpredictable but so are the origins and destinations of each vehicular travel. Therefore, it has been very difficult to develop an information system to control road traffic efficiently and effectively in the past.

Table 8.3.1 Typical Urban Transport Information System

	Information System for Operation	Information Delivery System	Information Collection System
Rail-Based System	*Signal/Communication System *Train Operation System	*Time/Fare Table Signboard *Network Information *Transfer Information *Operation Information	*Seat Reservation/Ticket Sales Information System
Bus	*Bus Operation System *Automatic Vehicle Monitoring System *Demand Bus System	*Time/Fare Table Signboard *Network Information *Transfer Information *Bus Location System	*Ticket Sales Information *Telephone
Taxi	*Automatic Vehicle Monitoring System	-	*Telephone
Road Vehicle	*Traffic Signal Control System *Electronic Toll Collection Syste	*Traffic Information *Parking Information System *Signboards, Road Markings	*Traffic Monitoring System

Source: SMURT-KL

Very often, some roads are badly jammed while other roads are clear at that same moment in time. Buses are sometimes locked up in a jam for a long time and passengers are forced to wait in hot and crowded vehicles.

Some countries have developed advanced transport information systems to attain a more efficient and effective use of the road network, independently. For example, a parking information system provides information about an empty parking lot and its route information, although the system has no relation to other information systems and/or traffic control system.

In recent years, however, efforts to integrate the transport information system has been progressing remarkably, with the assistance by state-of-the-art information technology development. The Intelligent Transport System (ITS) is such an advanced system which is now being developed in many countries that covers safety, improvement of traffic efficiency and comfort, preservation of the environment and so on.

According to Highway Industry Development Organisation in Japan, the nine areas for the ITS development are as listed as below:

- Advances in navigation systems
- Electronic toll collection systems
- Assistance for safe driving
- Optimisation of traffic management
- Increasing efficiency in road management
- Support for public transport
- Increasing efficiency in commercial vehicle operations
- Support for pedestrians
- Support for emergency vehicle operations

Targeted ITS user services are summarised in Table 8.3.2.

Important characteristics of the ITS are road traffic innovation through new interactive communication technologies.

In terms of the progress of ITS, these technologies are now being developed. According to the "ITS Hand Book in Japan" by the Highway Industry Development Organisation, ITS will be developed in four phases as shown below:

- First Phase (Around 2000);

  Beginning of ITS: leading systems including the navigation system will be put in service.

- Second Phase (Around 2005);

  Traffic system revolution: beginning of user services

- Third Phase (Around 2010); and,

  Realisation of a Dream: Advances in ITS and enhanced social system – Automated Highway Systems

- Fourth Phase (After 2010)

  Maturity of ITS: Innovation of social systems

Furthermore, a standard, which ensures future integration of the ITS, is now under discussion by Technical Committee Working Groups (TC204) in International Standardisation Organisation (ISO).

Table 8.3.2 Framework of ITS User Services

User Services	Development Areas	Viewpoints for User Service Specification		
		Main Users	Needs	Situations
(1)Provision of route guidance traffic information	1. Advances in navigation systems	Drivers	To obtain traffic information from navigation systems	Travel from starting points of destinations
(2)Provision of destination-related information				Obtaining information on and selecting destination
(3)Electronic toll collection	2.Electronic toll collection systems	Drivers, carriers and management agencies	Automatic toll exchange without stop	Toll payment at toll gates
(4)Provision of driving and road conditions information	3.Assistance for safe driving	Drivers	Safe driving	Recognition of traffic conditions
(5)Danger warning				Recognition of hazardous incidents
(6)Assistance for driving				Operation to avoid hazardous incidents
(7)Automated highway systems				Automated driving
(8)Optimisation of traffic flow	4.Optimisation of traffic management	Drivers and management agencies	Optimisation of traffic flow	Traffic Management
(9)Provision of traffic restriction information on incident management			Adequate measures against traffic accidents	
(10)Improvement of maintenance operations	5.Increasing efficiency in road management	management agencies	immediate and adequate management of road maintenance	Road management
(11)management of special permitted commercial vehicles		Drivers, carriers and management agencies	immediate and adequate issue of permits for special vehicle passage	
(12) Provision of roadway hazard information		Drivers and management agencies	Adequate measures against natural disasters, etc.	
(13)Provision of public transport information	6.Support for public transport	Public transport passengers	Optimal use of different transport modes	Use public transport
(14)Assistance for public transport operations and operations management		Carriers and public transport passengers	More convenient public transport, more efficient management and safer transport	Implementation of fleet management and priority control
(15)Assistance for commercial vehicle operations management (16)Automated platooning of commercial vehicles	7.Increasing efficiency in commercial vehicle operations	Carriers	Efficient collection and delivery and safer transport More efficient transport	Implementation of fleet management
(17)Pedestrian route guidance (18)Vehicle-pedestrian accident avoidance	8.Support for pedestrians	Pedestrians and cyclists	More convenient travel Safer travel	Travel by walking, etc.
(19)Automatic emergency notification	9.Support for emergency vehicle operation	Drivers	Request for immediate and adequate ruled	Request for emergency relief
(20)Route guidance for emergency vehicles and support for relief activities		Drivers	Immediate and adequate route guidance to accident sites	Restoration and relief activities

Source: Vehicle, Road, and traffic Intelligence Society (VERTIS)

Therefore, it will take more than ten years from now to materialise the ITS as an integrated intelligent transport system.

(2) Necessity of Transport Information System

It was forecasted in Chapter 7 that future traffic demand in the Kuala Lumpur conurbation area would increase remarkably. It would be difficult to satisfy future vehicle traffic demand completely, even with strong measures such as extensive reversible lane increase, improvement on traffic signal control phasing and the Purtra Jaya new administration centre project, which intends to move federal government administration functions away from congested Kuala Lumpur.

However, it is getting harder to both widen the existing roads in Kuala Lumpur and to build new roads to satisfy the future traffic demand. Therefore, a strong proposal to develop an advanced Transport Information System, by applying Information Technology to cope with the future traffic problems as well as to promote enhanced public transport usage, is made.

The Transport Information System will be effective in utilising the existing transport infrastructure resources under restrained development. The system should become an Integrated Transport Information System by linking independent information systems in future. The Intelligent Transport System should be included in the Integrated Transport Information System.

8.3.2 Development Plan

(1) Existing Transport Information System

Malaysia is one of the most developed countries in terms of Transport Information Systems. For example, full-scale operation of electronic toll collection was begun in 1995. Touch'N Go Card has been developing well in toll collection areas. The PUTRA LRT System II is going to use the card system from September 1998. In addition, the KTMB, too, is scheduled to adopt the system after 1999.

In this context, Malaysia has a sound foundation to promote the Transport Information System, including the Intelligent Transport System.

However, there is much room for improvement in terms of the Transport Information System when it comes to urban transport in the study area. For instance, SCATS, which is a dynamic vehicle responsive traffic signal control system in Kuala Lumpur, is not a satisfactory traffic control system because of its relatively simple detectors for vehicle information gathering. As for public transport, the information system is poor, as in the example of the current bus operation.

It is proposed to facilitate the information system, not only for the highway system, but also for the urban public transport, targeting at the future Intelligent Transport System.

In Japan, a lot of transport information systems have been developed and implemented simultaneously. It has caused confusion in terms of system integration because some are incompatible with each other. As mentioned before, standardisation of each information systems are in progress by ISO. Therefore, it is proposed that the Transport Information System in Malaysia should be developed by correctly judging the future direction and world standards.

(2) Development Plan

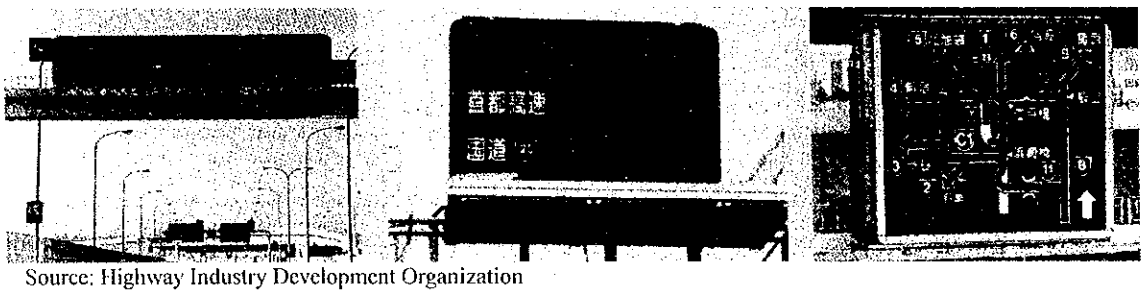
Based on the above, a Transport Information System Development Plan for the study area was formulated as shown in Table 8.3.3.

1) First Stage

In the first stage, the modernisation and improvement of the current transport information systems are the major targets.

As for the road transport, the current SCATS system should be modernised to enhance its efficient traffic control ability by facilitating more advanced vehicle detectors. Such a move will alleviate traffic congestion within the city remarkably.

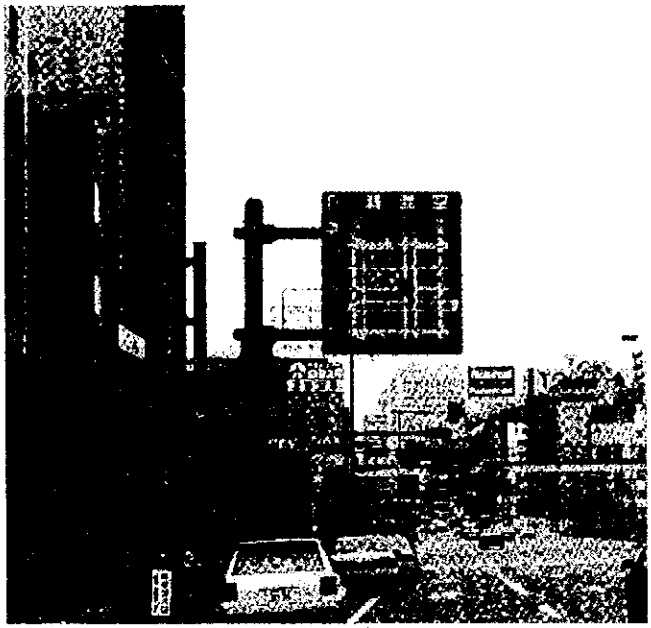
Road traffic information systems should be equipped with traffic congestion information board showing nearby road network situation, weather forecast signboard and so on. Drivers can choose less congested roads to arrive at their destinations, and jams could be eased by the utilisation of less congested roads. Figure 8.3.1, below shows examples of information boards. The left board displays earthquake information, while the centre shows the time required to reach a certain destination. The right board illustrates a road congestion information map.



Source: Highway Industry Development Organization

Figure 8.3.1 Examples of Taffic Information Boards

A parking information system will also help traffic congestion caused by vehicles looking for vacant parking lots. This system is relatively simple and easy to develop. It displays parking lot vacancies and routes to the parking areas. Figure 8.3.2 shows the display for parking area and vacancy information.



Source: "Urban Transport Facilities in Japan 1993", City Bureau Ministry of Construction and Japan Transportation Planning Association

Figure 8.3.2 An Example of Parking Information System

In terms of public transport, public transport service information such as route, network, transfer points and operation is considered to be important to the users. This information system does not alleviate traffic jams directly, but indirectly by encouraging people to use public transport mode.

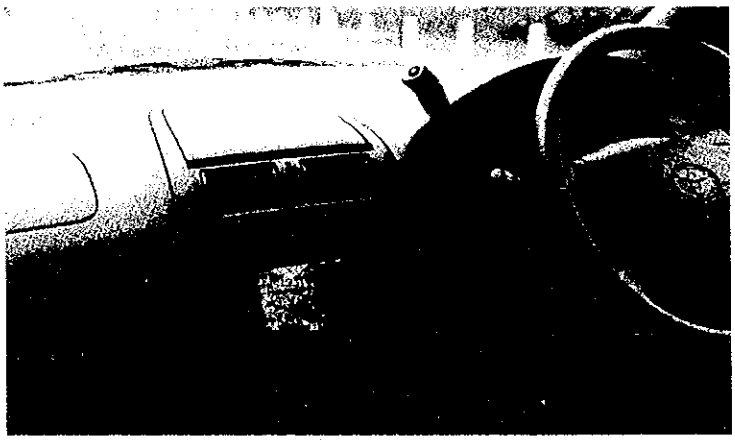
The Touch 'N Go smart card is now becoming popular in the Klang Valley as described before. The card will be a common means to pay fares and tolls to buses, railways and toll highways. It will decrease the resistance to using various modes of transport. Therefore, extensive use of the card should be encouraged.

In the first stage of the development plan, the transport information systems will be introduced and improved independently, since the initial integration of the systems would normally have some technical difficulties. However, it should be noted that compatibility and extendibility are the most important issues in introducing and/or improving information systems for the purpose of future integration.

2) Second Stage

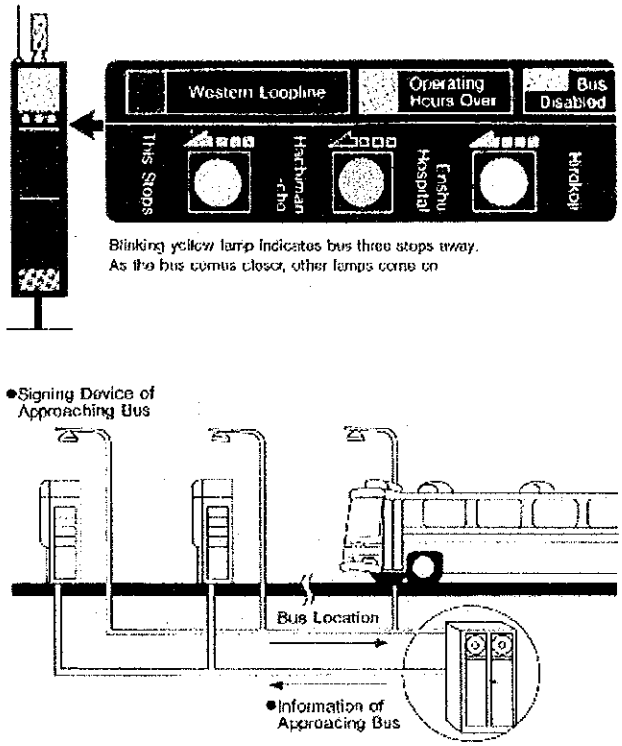
In the second stage, major attention should be paid to the navigation system and the route guidance system for vehicles (refer to Figure 8.3.3). The traffic signal control system and the road traffic information system would have reached maturity.

As for public transport, the introduction of an Automatic Vehicle Monitoring System or Bus Location System would be important. The system will enable public transport operators to manage and control their business operations effectively and efficiently. Furthermore, the system will alleviate users' frustration at unreliable services by displaying relatively accurate bus arrival schedule at bus stops. The system, therefore, is expected to increase public mode users extensively. Figure 8.3.4 shows an information board of the system and a mechanism of the system.



Source: Highway Industry Development Organization

Figure 8.3.3 Car Navigation System



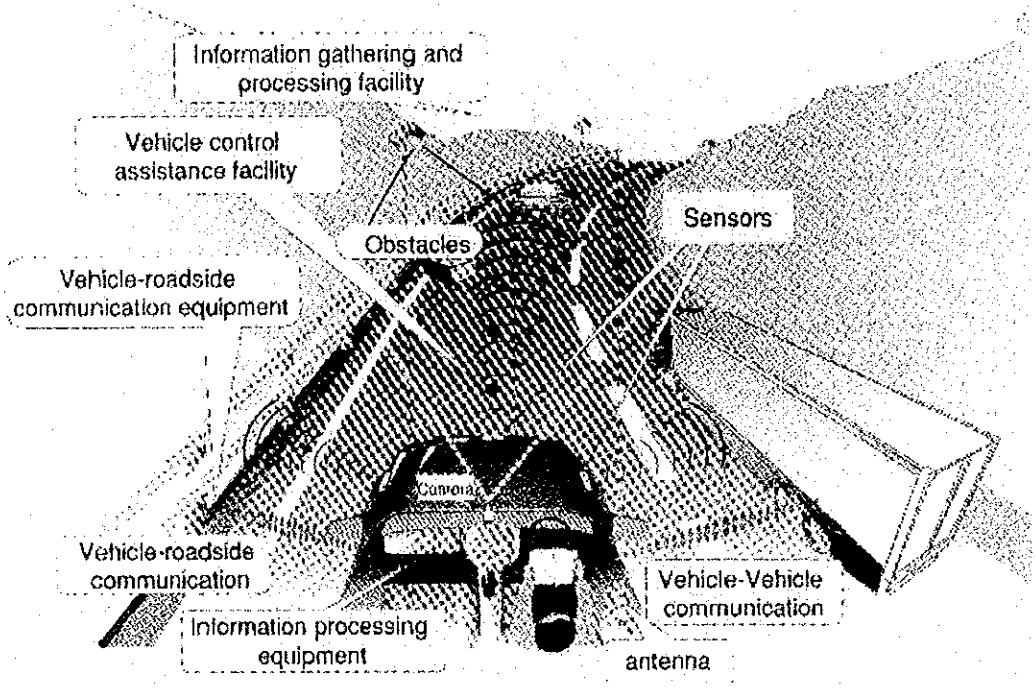
Source: "Urban Transport Facilities in Japan 1993", City Bureau Ministry of Construction and Japan Transportation Planning Association

Figure 8.3.4 Bus Location System

3) Third Stage

The third stage is the final stage of the transport information system development plan. An automated driving system (refer to Figure 8.3.5) will be introduced based on the Intelligent Transport System technology and the advanced transport information systems for road transport; reliable public transport will ultimately be realised based on the technology and other efforts explained in the former chapters.

In conclusion, the most important matter would be the integration of the various information systems including the transport information systems and the Intelligent Transport System. The Integrated Transport Information System, therefore, would be a system which would enable appropriate urban transport performances from both operators and users by jointly owning common transport information through an advanced communication technique. Further study is considered necessary, as the technologies are progressing at a marvellous pace.



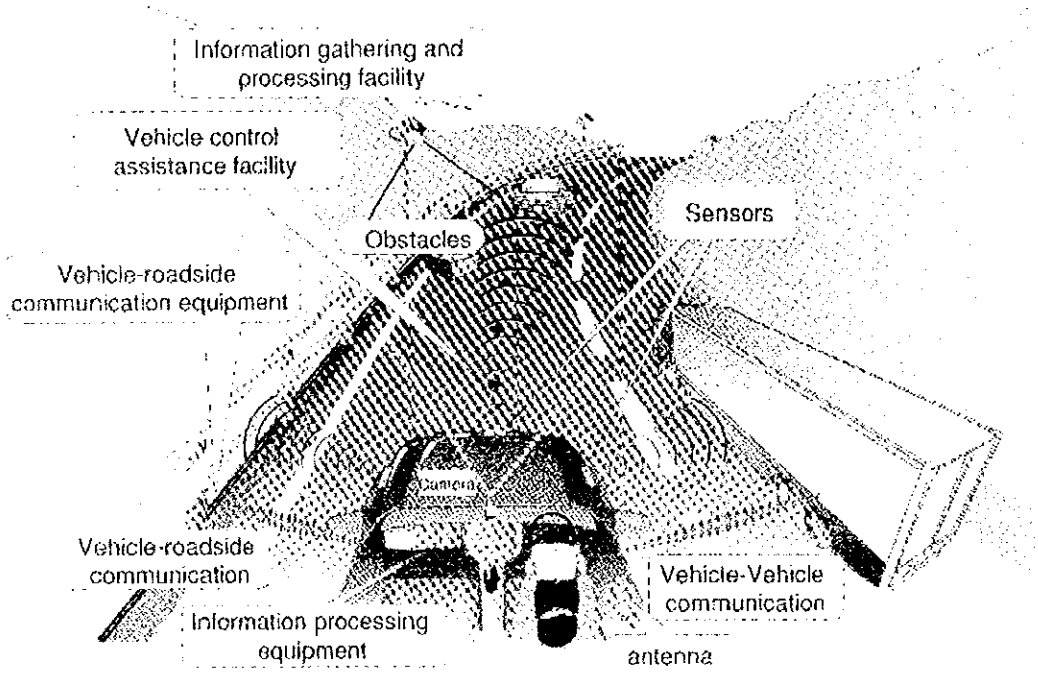
Source: Highway Industry Development Organization

Figure 8.3.5 Automatic Driving System

Table 8.3.3 Transport Information System Development Plan

Transport Information System	First Stage	Second Stage	Third Stage
Road Transport			
Traffic Signal Control System	■	■	□
Road Traffic Information	■	■	□
Electronic Toll Collection System	■	□	□
Parking Information System	■	□	□
Navigation System	□	■	■
Route Guidance	□	■	■
Automated Driving	□	□	■
Public Transport			
Public Transport Service Information (Network, Service, Transfer, Operation)	■	□	□
SMART Card	■	■	□
Automatic Vehicle Monitoring System (Bus Location System)	□	■	■
Integrated Transport Information System	-	□	■

Source: SMURT-KL



Source: Highway Industry Development Organization

Figure 8.3.5 Automatic Driving System

Table 8.3.3 Transport Information System Development Plan

Transport Information System	First Stage	Second Stage	Third Stage
Road Transport			
Traffic Signal Control System	■	■	□
Road Traffic Information	■	■	□
Electronic Toll Collection System	■	□	□
Parking Information System	■	□	□
Navigation System	□	■	■
Route Guidance	□	■	■
Automated Driving	□	□	■
Public Transport			
Public Transport Service Information (Network, Service, Transfer, Operation)	■	□	□
SMART Card	■	■	□
Automatic Vehicle Monitoring System (Bus Location System)	□	■	■
Integrated Transport Information System	-	□	■

Source: SMURT-KL