5.3 Committed and Proposed Transportation Infrastructure Projects

5.3.1 History and Road Policy Direction

During the First Outline Perspective Plan (OPP1) from 1971 - 1990, which is known as the New Economic Plan (NEP), massive investments in the field of road infrastructure were made to provide better road transport system throughout the country. Road projects in the rural areas and under-developed regions were given priority so as to accelerate the development of these potential regions.

In the Second Outline Perspective Plan (OPP2), known also as the National Development Plan (NDP), a different function of roads, that is, the inter-urban linkages and alleviation of transport related problems was emphasised in accordance with the rapid urbanisation of major towns. In this context, improvement of the existing roads and construction of ring roads in the urban centres have proceeded in addition to the new road constructions.

For the coming decades, development of the road transport network is expected to play a more important role as the major mode of transport both for freight and passengers. In this context, The Highway Network Development Plan (HNDP) study has proposed a road network system for all over the country.

According to the recommendations of the HNDP Study, the total fund required for road development under the Seventh Malaysia Plan will be double that allocated under the Sixth Malaysia Plan. In view of the figures, privatisation of new highways and road projects are expected to accelerate progress and to reduce the financial burden on the public sector.

5.3.2 Privatisation Policy

As stated in the Road Policy Direction, road developments under privatisation scheme must have a vital role in the coming decades. Actually, the Malaysian Government has introduced the privatisation policy to achieve the following objectives since 1983:

To relieve the financial and administrative burden of the Government;

To facilitate national economic growth;

To promote achievement of the New Economic Policy targets;

To improve the efficiency and productivity level of the country; and

To reduce the size and presence of the public sector in the economy.

The Federal Roads Act 1984 allows the Government to grant private companies the right to collect toll on public roads. Private operators are allowed to construct, operate and maintain new roads and thereafter to recover back the costs through the collection of tolls. This privatisation scheme also allowed the Government to hand over sections of completed roads to private companies for upgrading and subsequent maintenance over a concession period.

In line with this, all of the existing toll expressways and highways have been operated by private sectors. Consequently, the Malaysian Highway Authority has changed its function to planning and supervising rather than constructing and operating toll roads.

Table 5.3.1 Road Projects in the Klang Valley under the Seventh Five Year Plan

Name	Opened / Under Construction Project
SHAH ALAM EXPRESSWAY	The 35km Shah Alam Expressway was privatised to KESAS sdn. Bhd. It commences from Sri Petaling and ends at Langat Road, Klang. The construction works was divided into 2 packages, namely Package A from Sri Petaling to Subang
NORTH-SOUTH EXPRESSWAY CENTRAL LINK	The North-South Expressway Central Link was privatised to the Expressway Linkaran Tengah Sdn. Bhd (ELITE) under the Build, Operate and Transfer for a concession period of 24 years beginning from the 26th. April 1996. The 10km package 1 from
KUALA LUMPUR - KARAK HIGHWAY	The Luala Lumpur-Karak highway was privatised to Kuala Lumpur-Karak highway MTD Construction Sdn. Bhd. The section 1 which commences from Gombak Toll Plaza and ends Genting Sempah Tunnel was open to traffic in 1997. It continue from Genting Sempah Tunne
DAMANSARA-PUCHONG HIGHWAY	The Damansara - Puchong highway was privatised to Linkaran Transkota Sdn. Bhd. (LITRAK) with a 33 year concession in April 1996. The highway alignment starts at Sri Damansara and ends at Putra Jaya (40km). The scope of works involves the upgrading of th
NEW PANTAI HIGHWAY	The highway has been privatised to MAXTRO Engineering Sdn, Bhd with a 30 year concession. The 19.6 km expressway is a dual three lane carriageway which is divided into two packages: Package A from Jlan Subang to Jalan Klang Lama and Package B from Temple
AMPANG ELEVATED HIGHWAY	The expressway has been privatised to Projek Lintasan Sdn. Bhd. In 1996 with a 33 year concession. The alignment starts at Sultan Ismail Road and ends at Ampang Road. Most of the alighnment falls with the Klang and Ampang River reserves.
SUNGAI BESI HIGHWAY	The highway has been privatised to Bersraya (M) Sdn. Bhd. With a 30 year concession period. The project involves the upgrading of the existing Sungai Besi Road to a 6 lane dual carriageway for an approximate distance of 16km.
CHERAS-KAJANG HIGHWAY	The project has been privatised to Grand Saga Sdn. Bhd with a 30 year concession since 1995. This project involves upgrading and widening of Federal Route 1 from Cheras to Kajang.

Source: MHA Annual Report 1996

5.3.3 Current Privatisation Projects

Table 5.3.2 summarises the existing privatisation road projects including both approved ones and proposals. Among them, the Kuala Lumpur Western Traffic Dispersal Scheme, Kuala Lumpur Elevated Expressway, Ampang Elevated Expressway, and Kuala Lumpur Transit Route projects are expected to directly contribute to the alleviation of the present severe traffic congestion in Kuala Lumpur.

Once these projects are completed, most people will not be able to go into the city centre without paying toll, that is, these projects will form a "Cordon Toll Gate" system for the CPA. Accordingly, these projects can be utilised as a physical system for traffic demand management in the future. They, however, have potential to add more traffic to the city centre due to its configuration of radial-type.

The KLIA Dedicated Highway has a special function, by directly connecting the new international airport and the Kuala Lumpur City Centre as well as by providing an alternative route for north-south traffic movement. Traffic congestion in southern part of the Middle Ring Road I and on arterial roads in the eastern area of the central area of Kuala Lumpur could worsen, because the road space within the central area would have reached saturation levels.

In general, these privatised new road projects, especially the radial-type ones, are being proposed on alignments / links where heavy vehicular traffic is expected. That is, from a financial point of view the private sector has selected such the projects. However, we should not forget that additional road space will be necessary within the city area to accommodate the new vehicular traffic generated by those projects.

Furthermore, due to the fact that these projects are privatised and that they are being proposed independently by different companies, connectivity among the system is not well organised. The Ampang Elevated Highway for example, starting at Jln. Ampang and ending at Jln. Sultan Ismail, will add excessive vehicular traffic to the roads in the central area of KL. It is safe to say that this system needs be connected to other high standard systems such as Jln. Kuching, Jln. Syed Putra, and the KL Transit Route for example. A series of numerical test results is discussed in the following sections (see Chapter 7)

Table 5.3.2 Currently Proposed Highway Projects

COMMITTED HIGHWAY PROJECTS BY THE YEAR 2000

as of July 1998

Name	Section From	Section To	Length (km)	Facility Type	Cost (RM)	Land Cost (RM)	Type	Status	Construction start	Construction completion	Investor	Concession from	Concession to
1 North-South Interurban Toll Expressway	Bukit kayu Hitam	--- Johor Baharu	847.0	4/2, 6/2	6,000 million	N.A.	Closo	Open to public		1998.08	PLUS	1988	2018
2 North-South Central Link Toll Express way	Total		48.0		704 million	N.A.	Close	Open to public	1994.01	1997.10	Elite Sdn.Bhd	1994.04	2018.05
Package 1A (0 000 - 4+720)	Shah Alam I/C	--- USJ I/C		6/2					1994.11	1996.11			
Package 1B (4+720 - 9+800)									1994.11	1996.11			
Package 2A (8+800 - 26+600)	USJ I/C	--- Nilai Utara		6/2					1994.11	1997.10			
Package 2B (26+600 - 32+900)									1995.02	1997.10			
Package 2C1 (32+900 - KLIA)	Nilai Utara	--- KLIA		6/2					1995.02	1997.08			
Package 2C2 (38+900 - 45+900)									1995.08	1997.06			
Package 2C3	Nilai I/C			I/C					1995.04	1997.04			
3 New Klang Valley Toll Expressway	Jln. Duta	--- Bt. Raja, Kelang	22.0	6/2		N.A.	Close	Open to public	1994.01	1997.04	PLUS	1988.00	2018.00
4 Federal Highway 2 Extension			18.0	6/2	1.3 billion	N.A.	Open	Open to public			Arab Malaysia Development Bhd. and Umited Engineering Malaysia	30 years	
5 Shah Alam Toll Expressway	Total		34.5	6/2	1,300 million	N.A.	Open		1993.11	1998.03	Kesas Sdn.Bhd	1993.11	2021.08
Project A	Seri Petaling	--- Subang West						Open to public	1994.04	1997.03			
Project B	Subang West	--- Jalan Langat						under construction	1995.04	1998.03			
6 KL-Karak Highway	Total		68.0		400 million	N.A.	Open		1994.07	1999.07	MTD Construction Sdn.Bhd	1994.07	2021.07
Package 1	New Gombal Toll Plaza	--- Genting Turn Off		4/2, 6/2				Open to public		1997.07			
Package 2A	Genting Turn Off Bridge	--- Sungai Tanglir	41.1					under construction		1998.05			
Package 2B	Sg. Tanglir	--- Bentong West Junction								1999.09			
Package 2C	Bentong West Junction							under construction		1999.09			
7 Cheras-Kajang Highway	Total		11.7	6/2, 8/2	275 million	N.A.	Open	under construction	1995.09	1998.08	Grand Saga Sdn.Bhd.	1995.09	2025.09
Section 1	Connaught I/C	--- Telecom I/C							1996.06	1998.08			
Section 2	Telecom I/C	--- Saujana Impian I/C							1996.04	1998.08			
8 Sungai Besi Highway	Total		16.0	6/2	300 million	N.A.	Open		1996.05	1999.01	Besraya Sdn. Bhd.	30 years	
Package 1	UPM	--- Club Lumba Kuda						under construction	1996.07	1999.01			
Package 2	Club Lumba Muda	--- Flat Razak Mansion Salak Selatan						under construction	1996.08	1999.01			
9 Damansara-Puchong Highway	Total		40.0	4/2	1.3 billion	N.A.	Open		1996.04	1999.04	Lingkaran Transkoto Sdn. Bhd	33 years	
Package 1	Seri Damansara	--- Puchong Jaya	23.0					under construction	1996.10	1999.04			
Package 2	Puchong Jaya	--- Persimpangan Dengkil	17.0					under construction	1996.10	1999.04			
10 Ampang Elevated Highway Phase 1	Total		7.4	4/2, 6/2	462.7 million	N.A.	Open		1996.03	2000.08	Prolintas Sdn.Bhd.	30 years	
Package 1	Jalan Tun Razak	--- Jalan Sultan Ismail						under construction	1996.11	2000.08			
Package 2	Jalan Tun Razak	--- Ampang							1996.11	2000.08			
11 KL North-East Highway	Total		18.3	6/2	1.2 billion	N.A.	Open	under planning			Consortium	30 years	
(NKVE EASTERN ROUTE)	Segambut Dalam	--- Hill View I/C									Lebuhraya Kuala Lumpur Sdn. Bhd (KEKAL)	not sign yet	
	Elevated I/C	--- Ulu Klang											

Source: Malaysian Highway Authority (1997)

COMMITTED HIGHWAY PROJECTS BY THE YEAR 2010

Name	Section From	Section To	Length (km)	Facility Type	Cost (RM)	Land Cost (RM)	Type	Status	Construction start	Construction completion	Investor	Concession from	Concession to
12 New Pantai Highway	Total		19.0	6/2	642 million	N.A.	Open		1996.03	1999.12	Maxtro Engineering Sdn. Bhd.	30 years	
Package A	Subang Jaya	--- Jalan Templer	10.4					under construction	1997.01	1999.12			
Package B	Jalan Templer	--- Jalan.Bangsar						under construction	1997.01	1999.12			
13 KLIA Dedicated Highway	Total		45.0	6/2	2.8 billion	N.A.	Open		1997.10	2001.04	Consortium	30 years	
Section 1	Pandan Roundabout	--- Technology Park						under construction			Lapangan Terjaya telah dipilih	1997.10	
Section 2	Technology Park	--- KLIA						under construction			untuk melaksanakan projek ini		
14 Kajang Traffic Dispersal Ring Road (Balakong-SG.Long-Semenyih-UPM Junction)	Total		36.0	6/2	699 million	N.A.	Open	under construction	1997.10		SILK Sdn. Bhd.	30 years 1997.10	
15 Kajang-Seremban Expressway	Kajang	--- Seremban	46.0	6/2	250 million	N.A.	Open & Close	under construction	1997.10	2001.04	Antah Holding Berhad	30 years 1997.07	
16 Kajang Bypass													
17 Asam Jawa-Taman Rimba Templer Expressway	Assam Jawa	--- Taman Rimba Templer Rawang	36.0	6/2	415 million	N.A.	Open	under construction	1996.00	1999.00	Lebuhraya Assam Jawa Taman Rimba Bhd	30 years 1997.11	
18 Banting-Taiping Expressway (West Coast Expressway)	Banting	--- Taiping	255.0	4/2, 6/2	5.6 billion	N.A.	Close	land acquisition (freezing corridor)			Consortium Lebuhraya Persisiran Barat Sdn Bhd	30 years not sign yet	
19 Western KL Traffic Dispersal Scheme	Total		26.0	6/2	610 million	N.A.	Open	land aquistion (freezing corridor)			Sistem Penyuraian Trafuk KL Barat Sdn Bhd	30 years 1997.10	
20 Pandan Corridor Extension	Jln. Ampang	--- Jln. Syed Putra	12.7	6/2		N.A.	Open	under planning			Alloy Consolidated Sdn. Bhd.		
	Bt. Belacan												
21 KL Elevated Inner Ring Road	Total		30.0	4/2, 6/2		N.A.	Open	under planning			Madang Permai Sdn Bhd		
Section 1	SG.Besi	--- KLCC											
Section 2	Jln. Duta	--- KLCC											
22 KL Transit Route	Total		11.0		60 million	N.A.	Open	under planning			SPEKTRA		
Package 1	upgrading Jln. Kuching	---											
Package 2	upgrading Jln. Duta	---											
Package 3	Damansara Transit Route	---											
23 Kuala Lumpur-Rawang Expressway	Kepong Roundabout	--- Rawang (Serendah I/C)	30	6/2		N.A.	Open	under planning			LEKLAS		
24 Shah Alam-Rawang Expressway	Total		25	4/2, 6/2		N.A.	Open	under planning			GUTHRIE		
	Sg.Damansara	--- Tmn. Subang I/C	9										
	Tmn. Subang I/C	--- Paya Jaras I/C	9										
	Paya Jaras I/C	--- Kuang System I/C	7										
25 Wangsa-Keramat Expressway	Kg.Relawan	--- Wangsa maju	20	6/2			Open	under planning			Konsortium Lebuhraya Wangsa-Keramat Sdn Bhd		
	Kg. Dato Kermat	--- Kg. Pandan											
26 South Klang Valley Expressway (SKVE)	Total		57.0	6/2	545 million	N.A.	Open	under planning			Gadek / Perspek Consortium	30 years not sign yet	
(not in Klang Valley)	Ikatan I/C	--- West Port											
	Kajang	--- Port Klang											
27 East Coast Expressway (not in Klang Valley)	Total		365.0		2.77 billion	N.A.		under planning			MMC-UEM-MTD Capital	not sign yet	

EXPECTED HIGHWAY PROJECTS BY THE YEAR 2020

Name	Section From	Section To	Length (km)	Facility Type	Cost (RM)	Land Cost (RM)	Type	Status	Construction start	Construction completion	Investor	Concession from	Concession to
28 Subang-Kajang Highway	Total		25.3		665 million	N.A.		postponed			SILK Sdn. Bhd.		
29 PJ-Puchong-Serdang Highway	Total					N.A.		postponed			Panzana Enterprise Sdn. Bhd.		
30 KL Outer Ring Road	Total		69.0		4.65 billion	N.A.		postponed					
31 Jalan Sungai Besi Extension	Total					N.A.		canceled					

Source: Malaysian Highway Authority (1997)

Highway Project by the year 2020

OUTER RING ROAD

Highway Project by the year 2010

- ASAM JAWA-TAMAN RIMBA-TEMPLER
- KAJANG BYPASS
- KAJANG TRAFFIC DISPERSAL RING ROAD
- KAJANG-SEREMBAN EXPRESSWAY
- KILA DEDICATED HIGHWAY
- KL ELEVATED EXPRESSWAY
- KL TRANSIT ROUTE
- KL W TRAFFIC DISPERSAL SCHM
- KL-RAWANG EXPRESSWAY
- NEW PANTAI HIGHWAY
- PANDAN CORRIDOR
- SHAH ALAM-RAWANG EXPRESSWAY
- WANGSA-KERAMAT EXPRESSWAY
- WEST COAST EXPRESSWAY

Highway Project by the year 2000

- AMPANG ELEVATED HIGHWAY
- CHERAS-KAJANG HIGHWAY
- DAMANSARA-PUCHON PACKAGE 1
- JLN LAPANGAN TERBANG EXTENSION
- JLN SULTAN ISMAIL EXTENTION
- KARAK HIGHWAY
- KL NORTH-EAST HIGHWAY
- MRR II
- NORTH KLANG STRAITS BYPASS
- SHAH ALAM PROJECT B
- SUNGAI BESI HIGHWAY
- NO NAME

N W E S

5 0 5 10 15 20 25 30 35 40 Kilometers

Figure 5.3.1 Currently Proposed Highway Projects

SMURT-KL

INTEGRATED URBAN TRANSPORTATION STRATEGIES FOR ENVIRONMENTAL IMPROVEMENT IN KUALA LUMPUR

JAPAN INTERNATIONAL COOPERATION AGENCY

5.3.4 Railway Projects

Similar to the privatised road projects, urban transit projects have been implemented by ambitious private companies. Part of the new transit routes were to be completed before the Commonwealth Games in order to provide visitors with good transportation. Although the companies appear to be in a critical situation in terms of raising funds due mainly to the country's economic uncertainty, the final network will be completed soon to realise the target of Vision 2020.

(1) LRT System 1 Phase II (STAR)

The Phase 1 project was completed in late 1996. It commences from Ampang station and ends at Sultan Ismail Station with a the length of 12 km, providing convenient travel for the citizens of Kuala Lumpur at an average operation speed of 35 km/h. It, however, is not yet revealing its expected vital potential as an urban transit due to the less effective network and interchanges with other transport systems. The Phase II project consists of two additional sections, namely a 9.5 km. extension from Chan Sow Lin to the Commonwealth Games Village and a 3 km. northern extension from Sultan Ismail to Sentul Timur.

(2) LRT System II (PUTRA)

The network covers a distance of 29 km. from People' Park to Gombak with 24 stations at intervals of about 1.1 km. The construction is divided into two sections: Section 1 is Lembah Subang to Pasar Seni, and Section 2 is Pasar Seni to Ampang Park & Ampang Park to Gombak. The average operating speed is 40 km/h and its service frequency is 1-3 minutes in peak hours and 5-10 minutes in off-peak hours. As part of an integrated urban transit system, this system has interchanges at Brickfeild with the KTM and at Benteng with the STAR Phase 1 system and at KL Central with the dedicated railway named ERL.

Bus feeder services will also be provided by PUTRA itself. Park May, the sister-company of PUTRA, will operate the buses in order to facilitate easy transfers between buses and the LRT.

As this system will provide better public transport service to the Petaling area where rather high-income car users inhabit, it is expected to attract these people to use the public mode of transport.

(3) People Mover Rapid Transit (KL Monorail)

The system is a 16 km. long elevated monorail with 20 stations and a spur line to the KL Central Station at Brickfeild. The construction is divided into two sections, namely Section 1: Northern part of the line from Jln. Tun Razak with an interchange with the LRT System 1 phase II to KL Central; and Section 2: from KL Central to Kampung Pasir. Section 1 has stopped construction since 1997 as a result of the

currency drop, but the project is expected to be completed by year 2000. Together with other transit systems, the PRT system will provide better transport service within the Golden Triangle area, where major offices, hotels, retail shops are concentrated.

(3) KTMB

During the past five years, about 1.5 billion Ringgit has been investment to make the double tracking system within the Klang Valley region, namely from Rawang to Seremban and from Kuala Lumpur to Port Klang. The system now provides better transport services with commuters going to / coming from the KL City Centre. At stations in sub-urban area, parking spaces are provided so that people can practice "Park & Ride" in their commuting.

The Batu Caves line extension of the KTMB from Sentul to Batu Caves is expected to start construction in 1999 and to complete in 2001.

The following table summarises the character of railway systems in Klang Valley.

Table 5.3.3 Urban Transit System in Klang Valley

Name	Company	Length	Section	Average Speed	Capacity
LRT SYSTEM 1	STAR	12km	Phase I: Ampang Sultan Ismail	35 km/h	Phase I: 16,000 passenger / hour direction 792 / train
LRT SYSTEM 1 Phase II		3.2km	Phase II: Sultan Ismail-Sentur Timur	35 km / h	Phase II: 33,200 passenger / hour direction
		11.8km	Phase II: Cha Sow Lin-Commonwealth		1200 / train
LRT SYSTEM II	PUTRA	29km	Section 1: Lembah Subang - Pasar Seni Section 2: Pasar Seni - Ampang Park & Ampang Pari - Gombak Terminal	40 km/h	Initial : 10,000 - 16,500 passenger/hour direction Maximum: 30,000 passenger / hour direction
THE PEOPLE-MOVER RAPID TRANSIT	KL PRT	8 km	Section 1: Jalan Tun Razak - Brickfeild	30 km / h	Maximum: 18,960 passenger / hour direction
		8 km	Section 2: Brickfeild - Kg. Pasir		632 / train
KTMB	KTMB	48.5 km	Sentul - Pelabuhan Klang	48.5 km / h	
		105.5 km	Rawang - Seremban	54.5 km / h	
		7.6 km	Sentul - Batu Caves		

Table 5.3.3 contd.

Name	Frequency	No. of Stations	Travel Time	Operating Hours	Operation
LRT SYSTEM 1	Peak hours: 3-5 minutes Off-peak hours: 8-15 minutes	13 stations	Ampang - Sultan Ismail : 21 minutes Cempaka - Masjid Jamek : 14 minutes	0600 hrs to 2400 hrs	
LRT SYSTEM 1 Phase II	Peak hours: 2 minutes Off-peak hours: 4 minutes	12 stations		0600 hrs to 2400 hrs	
LRT SYSTEM II	Peak hours: 1-3 minutes Off-peak hours: 5-10 minutes	At grade: 1 station Elevated: 18 stations Underground: 5 stations	People's park to Gombak : 45 minutes People's park to Pasar Sini : 21 minutes Pasar Seni to Gombak : 24 minutes	0600 hrs to 2400 hrs	Initial : Kelana Jaya to Pasar Seni, 10 stations, 23 trains Ultimate: Kelana Jaya to Terminal Putra, 24 stations, 35 trains
THE PEOPLE-MOVER RAPID TRANSIT	Peak hours: 4-5 minutes Off-peak hours: 10-15 minutes	12 stations 8 stations	Tun Razak to Brickfeild : 19 minutes Brickfeild - Kg.Pasir : 11 minutes	0600 hrs to 2400 hrs	Initial: 14 trains (4-car unit)
KTMB	Peak hours: 15 minutes Off-peak hours: 30 minutes	22 stations	Sentul - Pel. Klang : 60 minutes Sentul - Subang Jaya : 39 minutes	0545 hrs to 2400 hrs	18 trains
	Peak hours: 20 minutes Off-peak hours: 30 minutes	20 stations	Rawang - Serembang : 116 minutes Bank Negara - Kajang : 36 minutes	0545 hrs to 2400 hrs	

Name	Fare	Park & Ride	Inter Change with Others	Project Cost
LRT SYSTEM 1	RM 0.75 - 2.95		Masjid Jamek Station Hang Tuah Station	RM 1,270 Million
LRT SYSTEM 1 Phase II			Bandar Tasik Selatan	RM 2,230 Million
LRT SYSTEM II	Maximum : RM4.00	Jelatek Station Kelana Jaya Station	KL Sentral Station Masjid Jamek Station	RM 4.35 Billion
THE PEOPLE-MOVER RAPID TRANSIT	will be similar to LRT's rates	Taman Desa (8,000 cars)	Sultan Ismail Utara Station Benteng KL Central Station	RM 1,900 Million
KTMB	RM 1.00 - RM 16.60 (adult)			RM 1.5 Billion

Figure 5.3.2 Currently Proposed Railway Projects

SMURT-KL

INTEGRATED URBAN TRANSPORT STRATEGIES FOR ENVIRONMENTAL IMPROVEMENT IN KUALA LUMPUR

JAPAN INTERNATIONAL COOPERATION AGENCY

Chapter 6

Urban Transportation Policies and Strategies

Chapter 6 Urban Transportation Policies and Strategies

6.1 Understanding on Existing Transportation Problems and Causes

The relationship between traffic congestion and its causes are summarised in the followings through the analysis of the existing conditions.

(1) Car-Driven Society

1) High Car Ownership

Although the vehicle registration system has been firmly established in Malaysia, the system allows vehicles to be registered anywhere in the country. This makes it very difficult to estimate the current exact number of vehicles actually registered in KL and its conurbation. The Home Interview Survey, however, revealed the vehicle possession ratio through the processing of data acquired. Table 6.1.1 sets forth the number of vehicles estimated in KL.

Table 6.1.1 Estimated Number of Vehicles in Klang Valley, 1997

District	Population (000 persons)	Number of Vehicles			Possession Ratio (Veh./Person)		
		Motor Cycle	Car	Total	Motor Cycle	Car	Total
Kuala Lumpur	1,373.9	225,031	289,521	514,552	0.164	0.211	0.375
Gomback	477.5	83,134	88,818	171,952	0.174	0.186	0.360
Hulu Langat	568	110,466	109,829	220,295	0.194	0.193	0.388
Petaling	833.1	140,891	192,222	333,113	0.169	0.231	0.400
Klang	520.6	99,056	107,356	206,412	0.190	0.206	0.396
Total	3,773.1	658,578	787,746	1,446,324	0.175	0.209	0.383

Source: SMURT-KL

2) Dispersal Land Use Pattern

The land use pattern in the Study Area is of a dispersal pattern as a whole, based on the British town planning style. The sub centre system or cluster style development idea has been introduced in regional planning. Residential areas in suburbs are mainly composed of detached or semi-detached houses having a wide garden and well-arranged neighbourhood streets with as low as 40-50 population per hectare with sufficient open space. On the other hand, since land is scarce in the city area, many condominiums are seen surrounding the KL centre. These developed areas are usually away from through traffic. This land use pattern is very much comfortable and convenient for people to live in, with automobiles as indispensable means of transportation when population size is still small. Such circumstances have existed

for a long time. However, such a land use pattern is not very suitable for the development of a public transport system.

3) Car-driven Society

Both the high car possession ratio and the dispersal land use pattern have induced a car-driven society and created a lifestyle strongly dependant on private cars.

(2) Heavy Traffic into CPA

According to the results of the Home Interview Survey, the following outstanding features on person trip demand commuting to the CPA with "Home-Based Work (HBW)" and "Home-Based School (HBS)" were observed.

- A remarkable share of motorcycle and bus in the northern and eastern regions.
- Cars have a very high share in HBW trips in the Damansara area.
- Cars also have a high share in HBW trips generated from the areas alongside the Federal Highway (II) such as Petaling Jaya and Subang Jaya.
- The number of HBS trips coming from the southern region is remarkable, and bus transport plays a major role.

(3) Vehicle Traffic Crossing at CPA Boundary

One of the key issues on urban transportation in KL is how to control and manage the traffic demand to the CPA, especially in the morning peak hour.

Figure 6.1.1 shows the vehicular traffic volume crossing the screen line at the CPA. The vehicle traffic volume at the following stations is remarkable:

- 191,000 vehicles from the south-west section (Jln Tun Sambanthan/17, Jln Syed Putra/16a, Jln Belfield/16b) including motorcycles (the same below)
- 182,000 vehicles from the south-east section (Jln Loke Yew/14)
- 171,100 vehicles from the north-west section (the ramp to PWTC/1b and Jln/ Kuching/1a and 1b)

Attention has to be paid to the high traffic volume of 70,000 vehicles at Jalan Sultan Salahhuddin/20. The traffic comes mainly from Damansara, which is recognised as one of the outstanding residential areas where the rather high-income group lives.

(4) Characteristics of Peak Period

1) Hourly Fluctuation

In Figure 6.1.2, which indicates the departure time of trips obtained from the results of Home Interview Survey, outstanding peak traffic can be seen in the morning peak hour. Figure 6.1.3 also sets forth several typical fluctuations patterns of the in-bound traffic counted at the screen line alongside Jalan Tun Razak, the boundary of CPA.

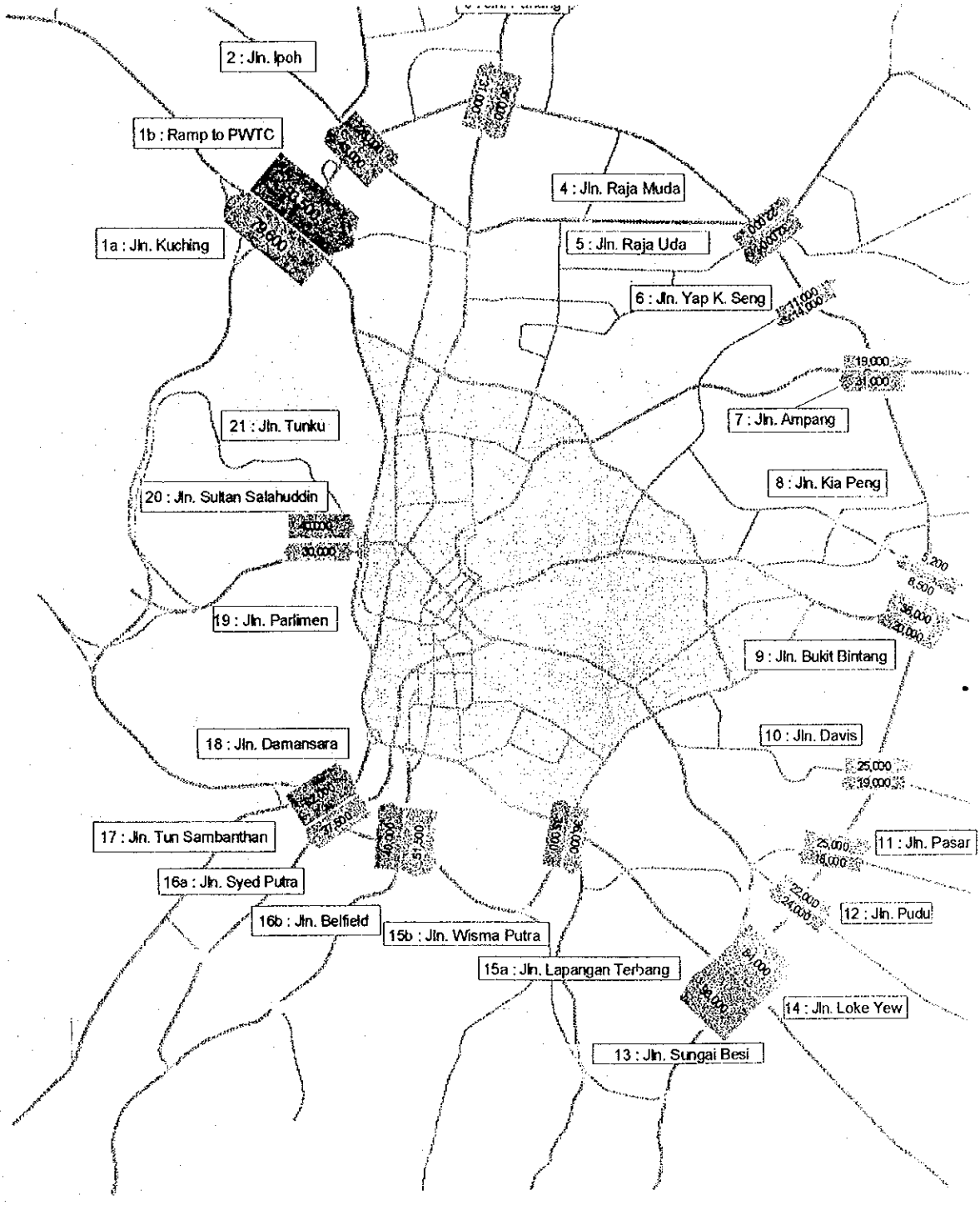
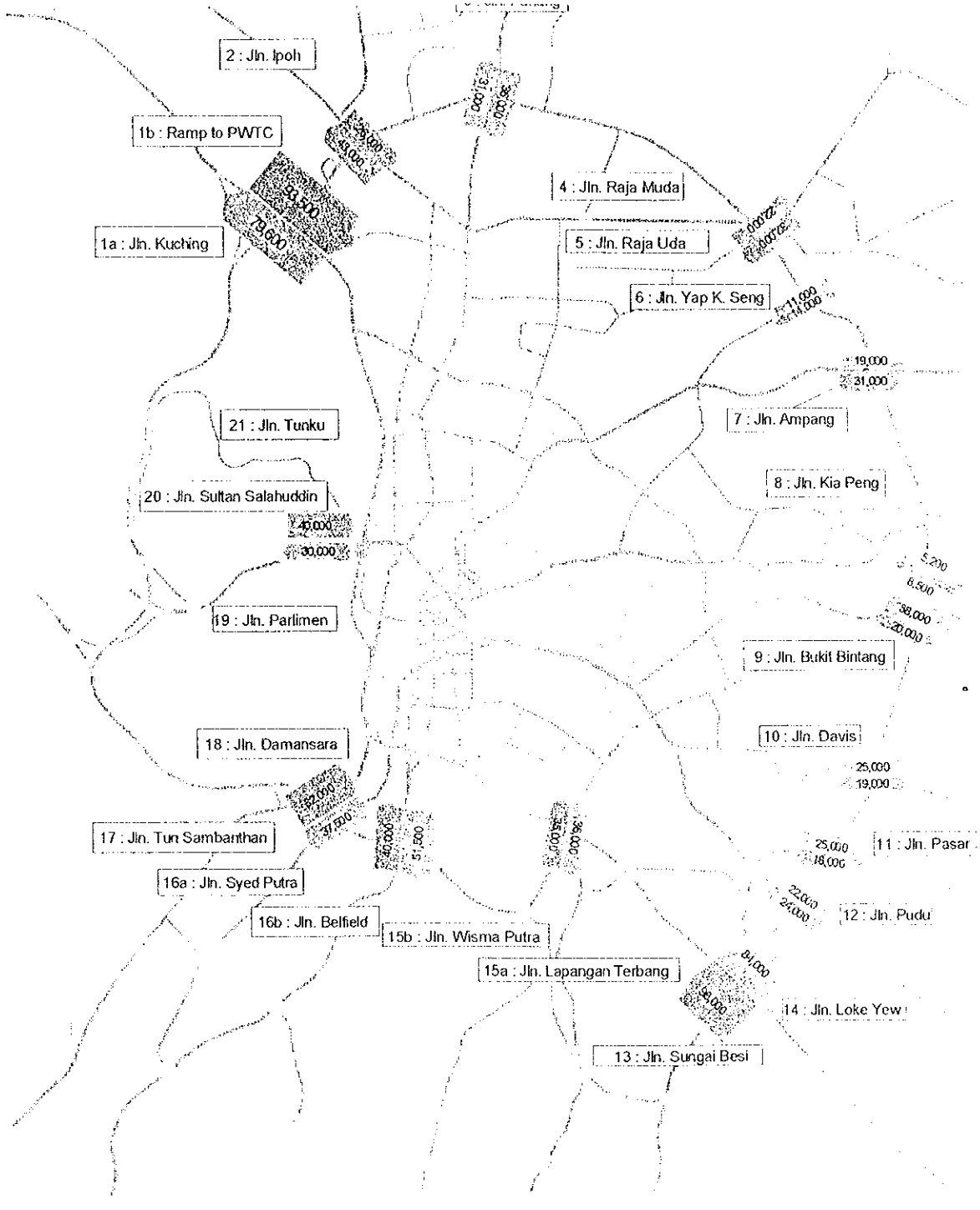


Figure 6.1.1

Vehicular Traffic Volume at CPA boundary

SMURT-KL

Japan International Cooperation Agency



Traffic Volume (PCU / DAY)

In-bound — Total In-bound : 593,000 pcu / day

Out-bound — Total Out-bound : 556,000 pcu / day

Figure 6.1.1

Vehicular Traffic Volume at CPA boundary

SMURT-KL

Japan International Cooperation Agency

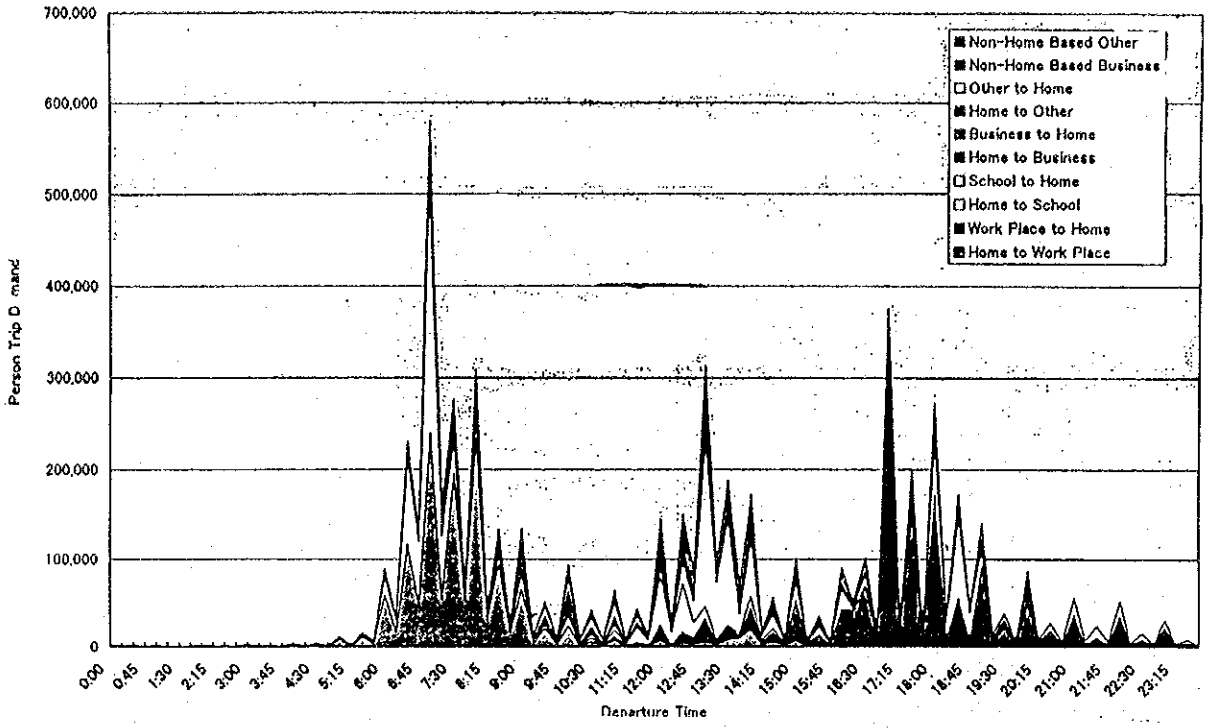


Figure 6.1.2 Hourly Fluctuation of Person Trip Demand

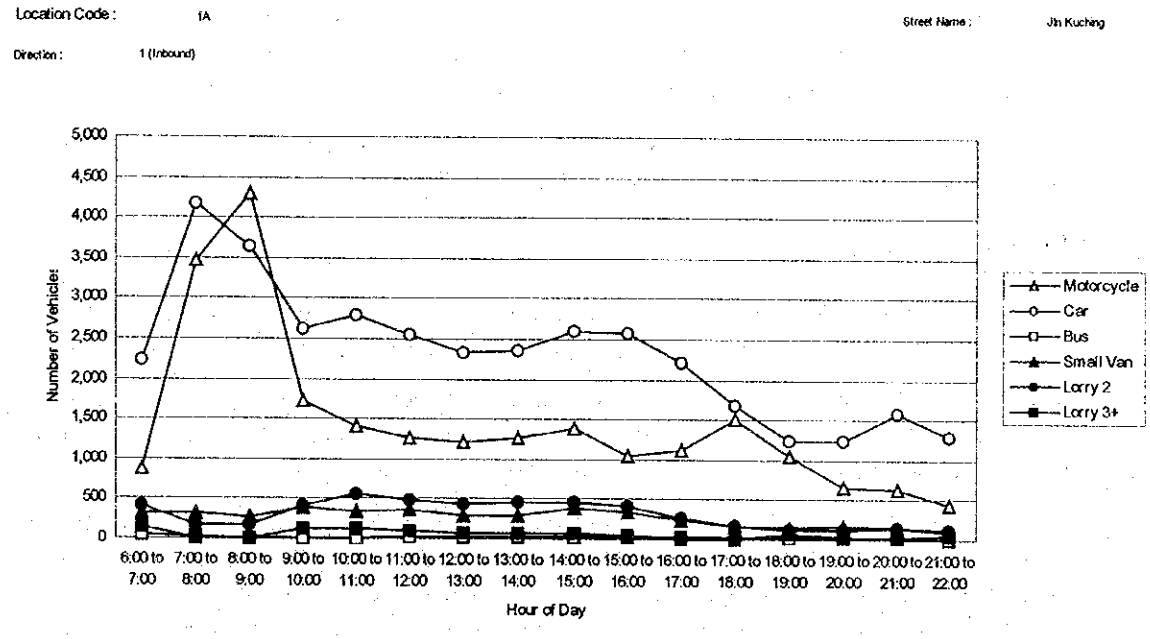


Figure 6.1.3(1) Hourly Fluctuation of Inbound Traffic at CPA Boundary

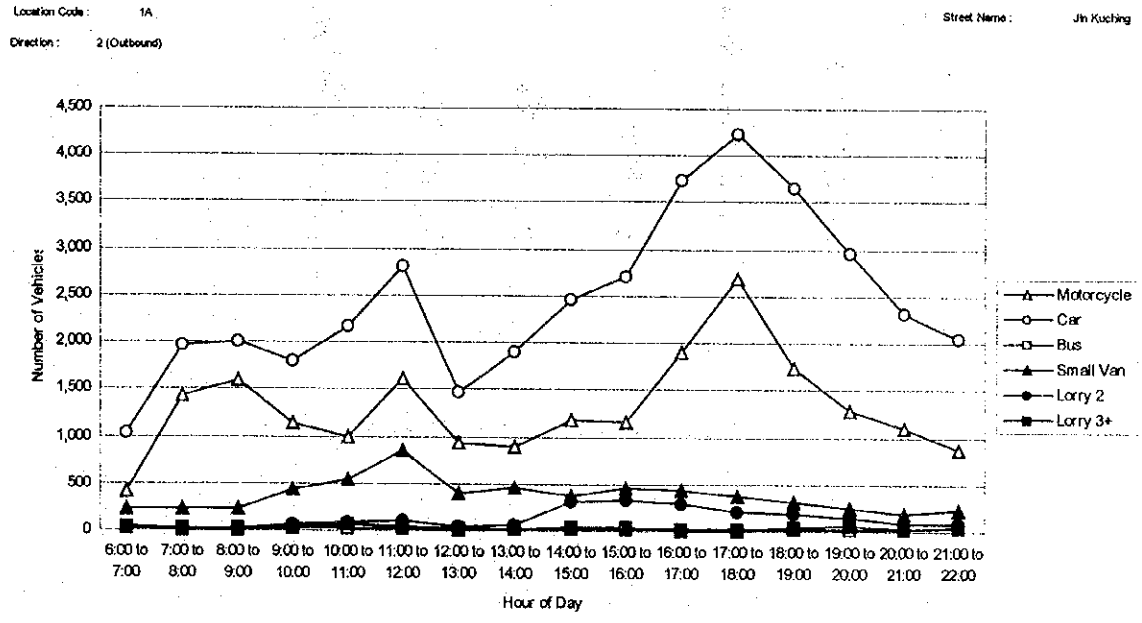


Figure 6.1.3(2) Hourly Fluctuation of Outbound Traffic at CPA Boundary

All the figures show that the traffic plunges into the CPA during a limited morning peak hour.

On the other hand, Figure 6.1.3 also shows a more moderate concentration of out-bound traffic in the evening peak hour. In general, people are more flexible in selecting their departure time to go back home compared to the morning hour.

These characteristics clearly indicate that the traffic problem is brought about by commuting trips to the CPA during a limited morning peak hour.

2) Morning Peak Duration

The traffic volume in the morning peak hour on the screen line alongside the CPA was aggregated into several sections to analyse the characteristics of peak hour traffic.

Looking at the aggregated traffic volume into these sections, peak hour traffic volume does not last for two hours. This means that the existing capacity still has room for traffic demand to expand to two-hour time bands.

Figure 6.1.5 shows that the true peak hour is from seven a.m. to eight a.m. and there is some space on road capacity for two-hour time bands. Although chronic traffic congestion can be observed in the CBD, which is inside Jalan Sultan Ismail, peak hour traffic volume coming from outside Jalan Tun Razak and passing through the radial arterial roads has a comparatively short peak hour.

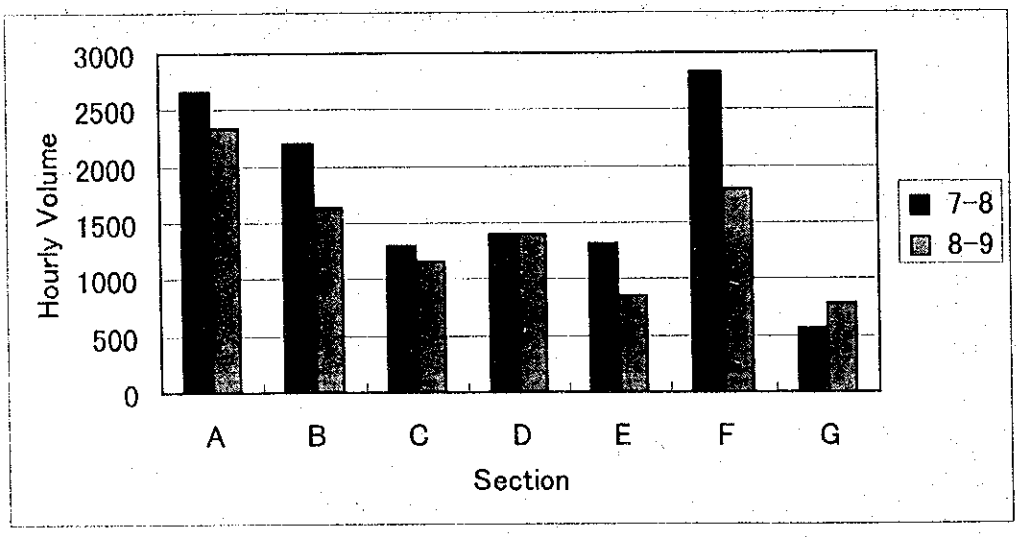


Figure 6.1.4 Traffic in Two Peak Hours

(5) Traffic Congestion at the Screen Line of CPA

Traffic congestion ratio in the morning peak hour at the screen line of CPA is set forth in Table 6.1.2.

Table 6.1.2 Congestion Ratio on Arterial Roads in Morning Peak Hour

No.	Jl	Daily Vol. (pcu)	Hourly Vol. (pcu)	Peak Ratio	Capacity (pcu)	V/C
1a	Jl. Kuching	62,802	6,255	0.100	4,200	1.489
2	Jl. Ipoh	22,055	1,432	0.065	3,780	0.379
3	Jl. Pahang	29,931	3,711	0.124	2,520	1.473
7	Jl. Ampang	25,348	2,867	0.113	2,520	1.138
9	Jl. Bukit Bintang	17,200	1,598	0.093	2,520	0.634
12	Jl. Pudu	19,991	1,592	0.080	2,520	0.632
14	Jl. Loke Yew	70,749	6,583	0.093	4,200	1.567
15b	Jl. Wisma Putra	22,976	1,741	0.076	2,520	0.691
16a	Jl. Syed Putra	33,819	3,483	0.103	4,200	0.829
17	Jl. Tun Sambanthan	17,272	1,728	0.100	2,520	0.686
18	Jl. Damansara	37,811	3,468	0.092	4,200	0.826
19	Jl. Parlimen	23,859	1,901	0.080	2,520	0.754
	Total	383,813	36,359	0.095	38,220	0.951

Source: SMURT-KL, CPA Screen Line Survey
Note: In-bound traffic only

(6) Excessive Urban Development

Many large-scale urban development projects have been planned in KL. Some of those are under construction at present and the remaining ones are expected to be constructed in the near future. However, investors are facing financial difficulties due to the recent economic slow down. If all of the approved projects are completed, it can be easily predicted that additional traffic generated from these large-scale projects will reach a huge volume.

1) Floor Area and Traffic Volume

The results of the Trip Generation/Attraction Survey at large-scale facilities, which was conducted by the Study Team, brought forth the car trip generation rates by type of building (see Figures 6.1.5 and 6.1.6).

Meanwhile, the total floor area of planned large-scale projects in the CPA is tabulated in Table 6.1.3.

Table 6.1.3 Planned Total Floor Area in CPA

Status	Floor Area (square meters)				
	Office	Hotel	Residential	Others	Total
Current	601,790	241,633	108,879	381,449	1,333,802
Under construction	939,245	192,308	191,428	921,970	2,244,951
Development Order	310,952	419,182	58,634	190,001	978,768
Approved	79,156	116,598	96,343	121,693	413,791
Total	1,931,143	969,720	455,284	1,615,113	4,971,311

Source: DBKL
Note: Projects with more than 1 million square feet only

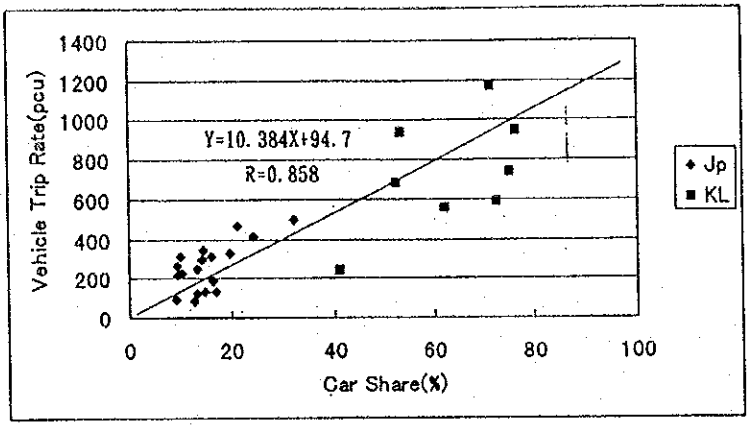
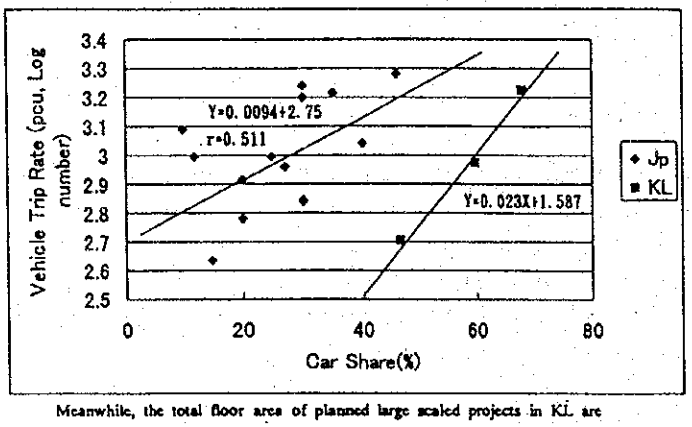


Figure 6.1.5 Car Share and Car Trip in Office Building



Meanwhile, the total floor area of planned large scaled projects in KL are tabulated in Table XXX.

Figure 6.1.6 Car Share and Car Trip in Commercial Building

As shown in Table 6.1.5, the total current floor areas of large-scale facilities in the CPA is around 1.3 million square meters, while the floor areas under construction is around 2 million square meters, i.e. 1.7 times the present available floor space.

b. Vehicle Trip Generated by Urban Development Projects

The vehicle trip rates by floor area by type were surveyed in the Study and the results are shown in Table 6.1.4.

The vehicle trip generation by development projects was calculated by using unit trip rates, which was estimated under the assumption that car utilisation ratio will decrease from the current 60% to 40% in the future due to their location adjacent to rail stations (see Table 6.1.5).

Table 6.1.4 Car Trip Generation Rate by Land Use

Unit: trips/ha

	Office	Hotel	Residential	Others
Car Trip	500	300	375	400

Source: SMURT-KL, Trip Generation Survey, 1997
Note : These are calculated based on 40% of car in Office, Hotel and others
Car usage for residential is set as 30%

Table 6.1.5 Car Trip Generation/Attraction by Projects in CPA

Unit: Vehicles/day

Status	Traffic Volume				
	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
Sub. Total	66,468	21,843	12,990	49,347	150,647

Source: SMURT-KL Estimate
Note: Under the assumption of 40% car utilisation ratio

The trip generation /attraction of future development projects is estimated to be 141,000 vehicle trips after the completion of the projects in the CPA. However all of the traffic will not be added to the current traffic because there are some offsets between both traffics. It is inevitable that traffic congestion will deteriorate due to the traffic generated from new development projects, which may account for more than 40% of the total vehicle trips.

Meanwhile, based on the traffic count survey, the current daily in-bound and out-bound daily traffic volume has reached more than 1,000,000 vehicles as shown in Table 6.1.6.

Table 6.1.6 Screen Line Traffic at CPA

Direction	Vehicle	PCU
Inbound	561,728	506,935
Outbound	523,110	473,749
Total	1,084,838	980,684

Source: SMURT-KL, CPA Screen Line Survey, 1997
Note: Volumes in 16 hours

Although all of the estimated traffic volume generated by urban development projects will not cross Jalan Tun Razak because some trips will vanish only inside the CPA, beside some offsets, a large traffic volume of 142,000 trips is anticipated from the large scaled projects in the CPA. This traffic accounts for an additional 14-15% increase to the current traffic congestion at the CPA boundary.

This is apparently beyond the traffic control and management measures despite the fact that the traffic volume may vary depending on presuppositions and assumptions, reflecting change of external situations from time to time.

(7) Out-migration and Suburbanisation

Although Malaysia has kept a fairy high population growth, out-migration tendency has been remarkable in KL these years (see Table 6.1.7). This undermines the total population growth in KL as shown in Figure 6.1.7. Recent population growth in KL is decreasing to as low as 1.4 % per annum during 1991-1997.

Many people have moved away from KL to the fringe areas due to the progress of current urban development, which has changed the land use of the central area in KL to business and commercial use. This has accelerated the decline in residential population in the CBD and its peripheral area, and these people will have to make a longer commuting trip. In addition to the increase in car ownership, the land use changes are also affecting the current traffic congestion in the CBD and it is inevitable that the excessive urban development will accelerate further out-migration. This will, undoubtedly, bring about additional traffic and worsen the traffic congestion in the CPA.

Table 6.1.7 Migration Tendency

Unit: Population

State	In Migration	Out-Migration	Net Migration
Johor	22,387	24,471	-2,084
Kedah	18,798	17,943	855
Kelantan	22,406	17,679	4,727
Melaka	13,224	10,961	2,263
Negri Sembilan	23,535	15,438	8,097
Pahang	17,218	25,488	-8,270
Perak	15,975	36,346	-20,371
Perlis	2,897	2,484	413
Pulau Pinang	24,436	11,925	12,511
Sabah	6,846	9,808	-2,962
Sarawak	8,133	9,709	-1,576
Selangor	78,005	40,370	37,635
Terengganu	11,689	15,913	-4,224
W.P.KL	14,137	45,183	-31,046
W.P. Labuan	5,839	1,807	4,032
Malaysia	285,525	285,525	0

Source: Migration Survey Report 1995, Department of Statistics

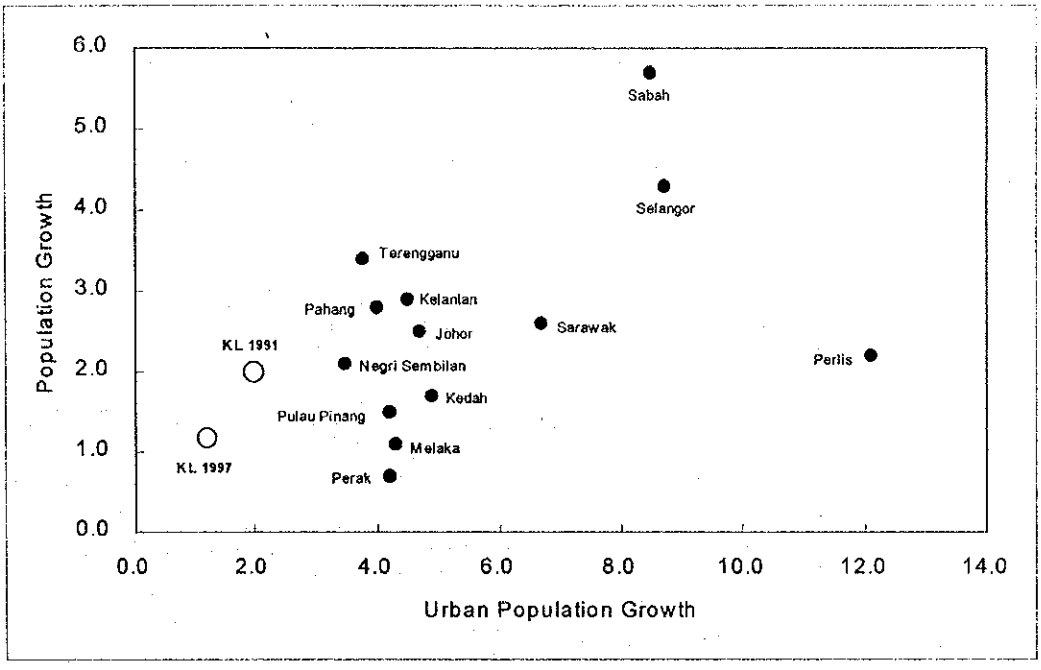


Figure 6.1.7 Population Growth

(8) Inter-relationship among Factors

The high economic growth has been maintained over a period exceeding ten years since 1987 in Malaysia. Although some economic problems have risen these days, the basic car-driven society itself, which had been fostered mainly by both land use development pattern and high car possession ratio, has not drastically changed so far.

As a capital of Malaysia, excessive urban development has also progressed during the past decade with the economic growth. The out-migration is attributable to this tendency and these facts have also increased commuting traffic into the CPA. All these phenomena has led to a concentration of heavy traffic into the CPA from the external areas, although the peak hours do not stretch for long at present (see Figure 6.1.8).

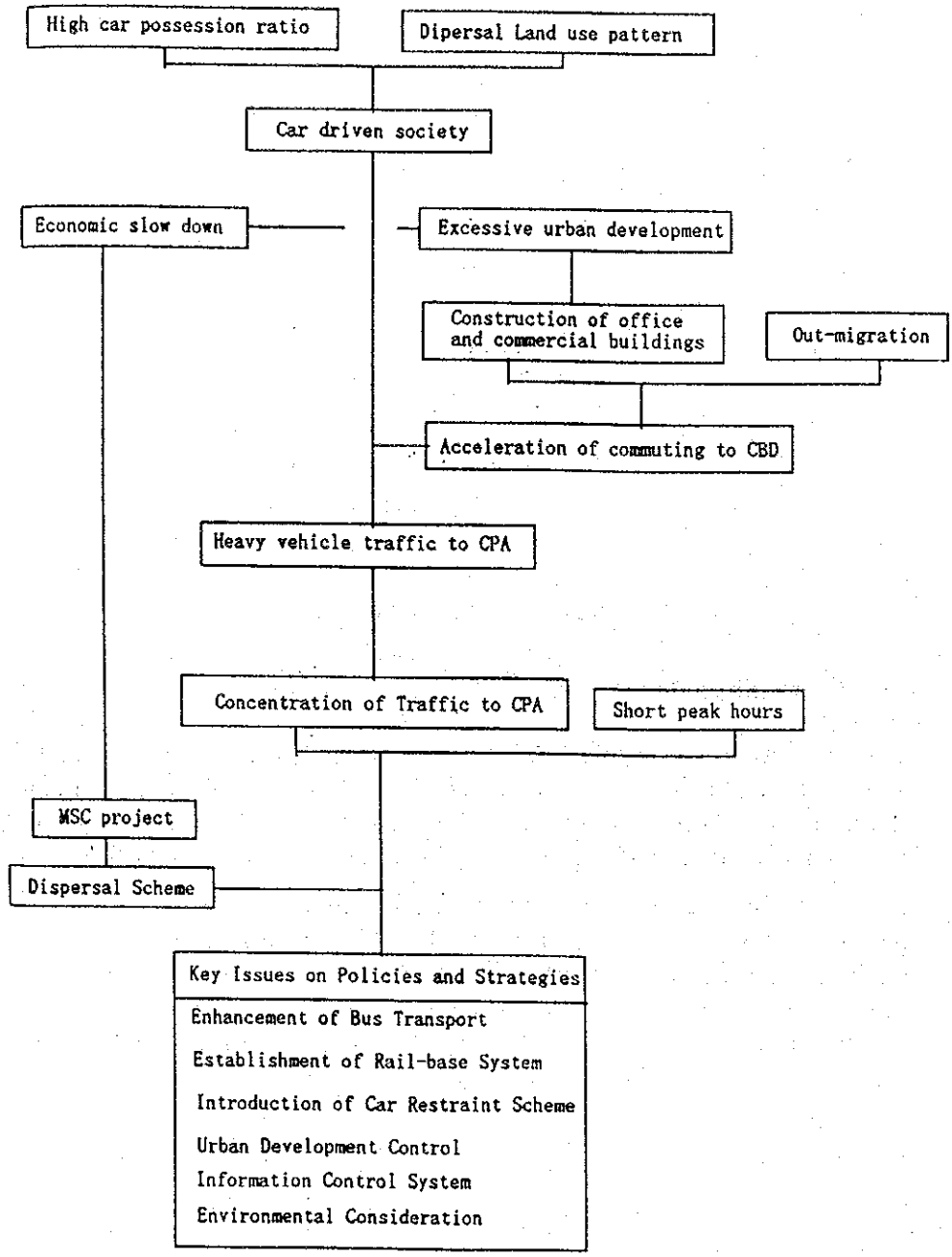


Figure 6.1.8 Causes and Effects of Traffic Congestion

6.2 Urban Transportation Policies and Strategies

6.2.1 Urban Transportation System Development Objectives and 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) Betterment of the Environment

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

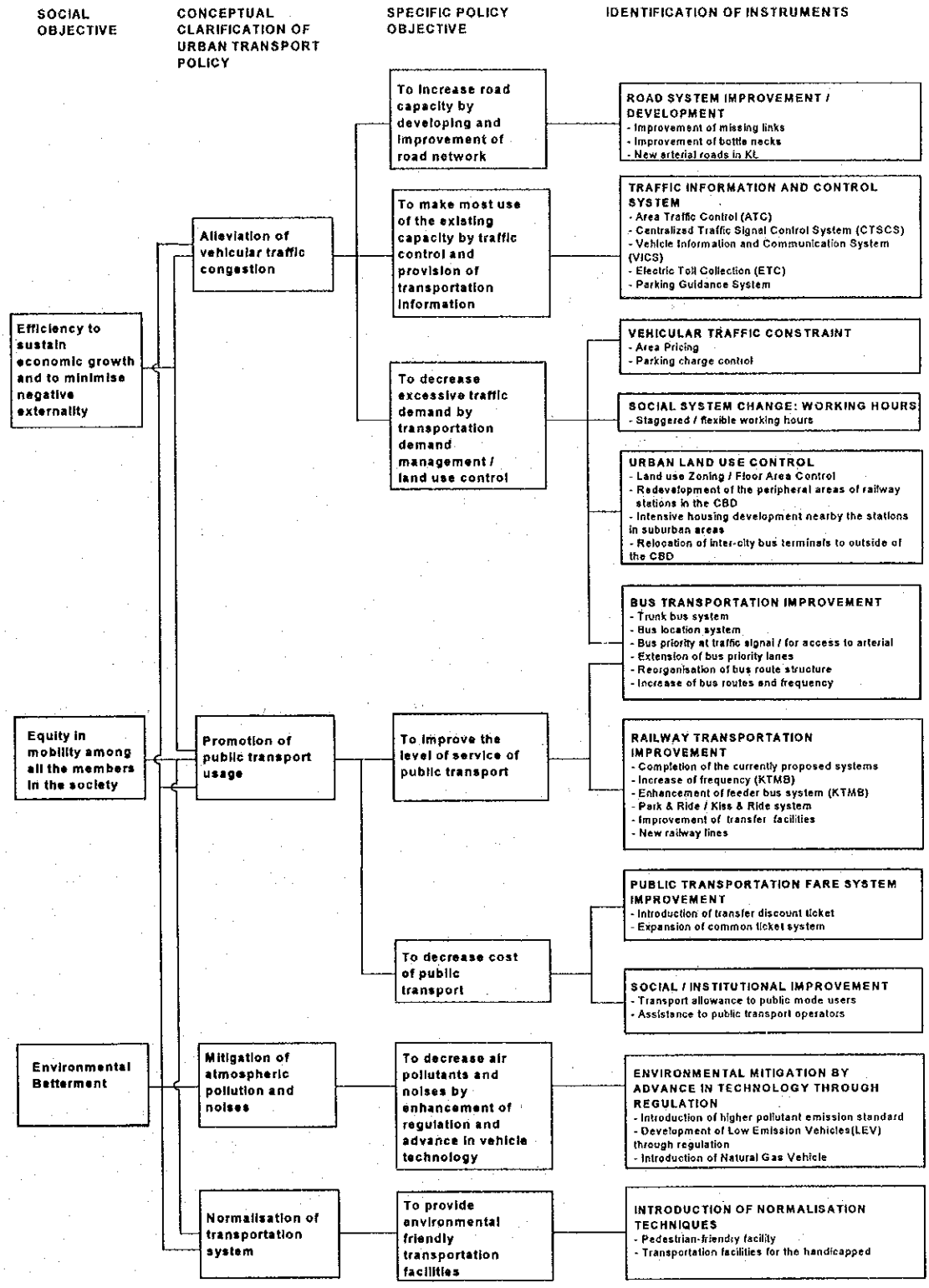


Figure 6.2.1 Objectives of Urban Transportation System Development and Policy Measures

6.2.2 Urban Transportation Policy Measures

(1) Road System Development and 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 Control and Traffic Information 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.

1) 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.

2) 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 Figure 6.2.2.).

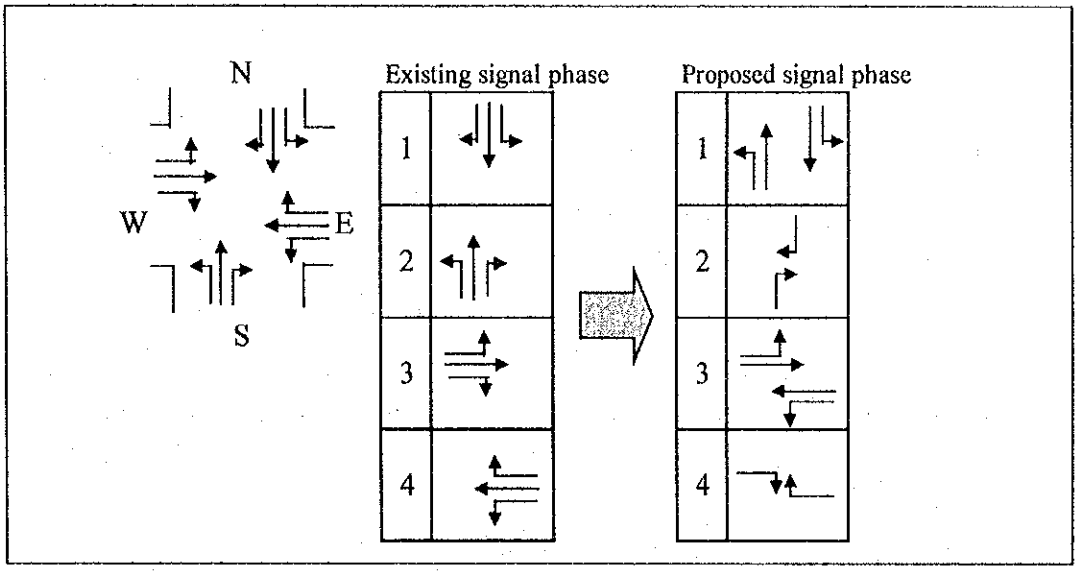


Figure 6.2.2 Proposed Signal Phase

3) Co-ordinated Signal Control

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

4) Conversion of Roundabouts into Signalised Intersections

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

5) 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

1) Viewpoint of Examination

Many studies on urban transport have been conducted in the Klang Valley and Kuala Lumpur, and most reports contained a section on private passenger car restraint programme such as the so called "area licensing system" or "cordon pricing system", which was introduced in Singapore since 1975. JICA undertook the Klang Valley Transportation Study in 1987. Following the results of the study, City Hall had planned to implement area licensing system in the CBD. This attempt was, however, abruptly suspended due to the insufficient public transport system at that time. Around a couple of years ago City Hall also proposed a plan to appoint a sub-

contractor for the implementation of the Kuala Lumpur Area Traffic Restraint Scheme (KLATRS) but this plan was also interrupted for the same reason.

KL and its conurbation have been subjected to chronic traffic congestion and there are no signs showing improvement of the current situation to date. There are many big road projects implemented or going to be implemented by the BOT scheme, some of which are currently under construction. However, it seems that there is no additional space for further construction of streets in the CBD or the CPA, where the most serious traffic jam is observed.

Considering these situations analysed in the Study and these transport climates, one must inevitably discuss whether a passenger car restraint scheme should be introduced in KL or not as one of the measures to minimise the gap between vehicle traffic and road capacity in the CPA. This analysis is not done from the viewpoint of only to control the passenger car traffic, but on how to use the limited road capacity to meet the current traffic demand.

2) Possible Measures for Car Restraint Scheme

There are many schemes for restraining passenger cars. A rough evaluation of the countermeasures was carried out and the results are shown in Table 6.2.1.

Table 6.2.1 Initial Assessment of Major Car Restraint Schemes

	Measures	Description	Evaluation	Mark
1)	Route Pricing System	Impose charges to passenger car users passing through designated roads	Actual enforcement is very difficult in CBD or CPA	○
2)	High Occupancy Vehicle (HOV)	Priority lanes for high occupancy vehicles are provided and only HOV can pass the designated route	This is available as the first stage of restraint but effectiveness is not large without priority lanes	△
3)	Car Pooling System	People use cars as a pool and usually the cars with high occupancy can pass through the priority lanes	This is available as the first stage of restraint but effectiveness is not large without priority lanes	△
4)	Three in One	This system has been introduced in Indonesia. Only cars with more three passengers including driver can pass through designated routes	This is available as the first stage of restraint but there is a way of escape	×
5)	Area Licensing System	Cars are imposed with some charges to enter into designated area.	Very effective but consensus among citizens is necessary	◎
6)	Staggered Working Hours	People commute in different hours	Effective and consensus among citizens	○
7)	Park and Ride System	Parking facilities are provided near rail stations and users park their cars and transfer to the rail system	Effective at areas where public transport service is poor	△
8)	Parking Restraint Policy	Control construction of parking facilities or impose surcharge fees to restrain users from car parking	Less effective for commuters due to allowance by office but effective for users with private activities	△

According to the initial assessment, area pricing scheme seems to be the best measure to alleviate the traffic congestion in KL. The detailed plan and scheme are illustrated under "Area Pricing " in another section of this report.

3) Parking Policy and Strategy

Measures for car parking are one of the essential components for urban transport policies and strategies. There are several alternatives to deal with car parking activities as itemised below.

- Promote construction of parking facilities to meet demand,
- Restrain construction of parking facilities, and
- Restrain utilisation of parking facilities

These alternative measures for parking policies have close relationship with the car restraint scheme mentioned above and toll fee policies. All measures are considered to be the same types of impedance to vehicle traffic. So these measures should be well co-ordinated with each other. From this point of view the following measures are recommendable.

a. Parking Allowance for Commuters

Many governmental and private offices give the employees a parking allowance for easy commuting at present and this encourages the employees to use cars for commuting. Considering the custom and historical situation, such a parking allowance will not be abolished for the time being. Instead, as there is less allowance for people commuting by public transport, this will be legally implemented, so that a similar transport allowance is provided to public transport users. This transport allowance for public transport should be tax exempted, so that employers would be willingly to provide it.

b. Parking Facilities

Restriction via limitation of parking facilities is being discussed these days in KL. However, the provision of parking facilities greatly contributes to maintaining the road capacity, that is, on-street parking could be eliminated. Well-managed towns and cities have to keep suitable level of service for car parking. At present, KL seems to have a good parking condition. Such good climates shall be maintained.

c. Parking Charge

Raising the parking charge is one of the possible measures to control and restrict car traffic. This should be considered in conjunction with the car restraint scheme mentioned above.

As many governmental and private employees are given a parking allowance, it seems less effective to reduce the utilisation of cars for commuting by raising car the parking charges. It is only more effective for people who are accustomed to using cars for private activities such as for shopping, entertainment and so forth. In addition, car users will have to pay more toll for their commuting in the future since many toll

roads constructed by the BOT scheme will be open for service and all these roads are toll roads. Taking these factors into account, raising the parking fees shall be discussed as another subject, separate from the car restraint scheme.

d. On-Street Parking

Roads should be fully used by making the most use of the existing capacity. In this view, on-street parking has to be strictly prohibited on major and arterial roads except minor arterial road on the periphery. Loading and unloading by lorries should be done for limited duration only.

(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 Development Control

1) Floor Area Control

a. Current Regulation for Development

A Planning Standard is widely used for the physical planning of cities and towns in Malaysia. It contains some standards for residential, open space/recreation, and industrial areas, parking space, public facilities, roads and other items concerning town and city planning. As for the floor area control measures, building coverage ratio, building height and plot ratio are outlined in the standard with the following definitions.

i) Building Coverage Ratio

The standard describes the building coverage ratio as 100% for shop houses and not more than 60% for commercial complex and offices.

ii) Height of Building

Decision on the height of building is based on various conditions but there is no mentioning of the actual height of buildings.

iii) Plot Ratio

The concept of plot ratio is introduced in the standard mainly for commercial buildings based on the following definition.

Plot ratio = total floor area / (1.3*total site area)

According to the note for plot ratio, a coefficient of 30 % is provided for neutral areas and empty spaces, and floor area excludes those for parking facilities.

The standard describes that the plot ratio shall be decided by taking the following items into consideration:

- That it does not worsen traffic congestion in the surrounding area
- That it promotes the conservation and preservation of the surrounding precincts

It is also mentioned that the plot ratio has to be decided by taking into account various conditions such as the functional features of the commercial activities; for instance, a higher plot ratio will be applicable for hotels and motels but a low ratio is preferable for retail shops. However no actual plot ratio is described. It is most likely decided through negotiations with the authorities concerned.

b. Development Control on Floor Area

The authorities concerned can bring into effect an amendment to the development plans to reduce floor area in order to not affect the current traffic congestion seriously, at the time of the development order.

However, considering the current development trend in KL, it seems that many development projects have been implemented without any order since investors or implementation bodies have ignored the impact of the development to the road traffic. Large-scale projects are truly necessary to revive the towns and cities in order to maintain the urban environment and vital activities, thus bringing about eventual prosperity.

It is also essential to control the development so that urban development takes place in the desired direction and to keep and maintain the vitality and attractiveness of KL. Attention also has to be paid to keep urban development and traffic congestion in check.

All facts mentioned above lead to the necessity to introduce rules and regulations to formulate proper town and city planning guidelines, which describe detail development control measures to meet the above mentioned objectives.

Introduction of a floor area ratio method seems to be the best way to control and guide the diversified development projects in order to construct a well functioning and comfortable urban environment with minimal traffic congestion.

The Study Team is not in a position, as a matter of course, to discuss about the guideline for floor area ratio for KL. Instead, this shall be discussed in the Review Work of Structure Plan in KL. The Review Work of Structure Plan has been just started by the Master Plan Unit in the KL City Hall after a long deferment from the initial schedule. This review shall be seriously discussed, especially from a comprehensive city planning point of view.

c. Example of Floor Area Control

Table 6.2.3 shows the floor area ratio of current and planned projects including on-going ones:

Based on this comparison, the average floor area ratio of 3.73 for the existing large buildings is the lowest, while those under construction and development order stage are slightly higher at 5.14 and 4.64 respectively. These higher floor area ratios will contribute to a higher traffic being generated. They also indicate that the highest floor area ratio of some specific projects could reach more than 10.0.

It is very difficult to discuss this subject in isolation. However, the regulation has to be discussed from both points of view, i.e. incentive for future development projects and control of excessive development. The following direction seems preferable for this discussion.

- Considering the large area of project sites which are currently under construction, the maximum floor area ratio for each development project is around 5.0 (500 %).
- Sites near rail station should be given the maximum floor area ratio
- Plans with open space for the public shall be given the maximum ratio.
- The idea of maximum floor area ratio shall be introduced not only for development projects but also in all urbanised areas in KL. The ratio will, of course, vary from area to area depending on the characteristics of area such as high-rised development, low densely development, residential, commercial and so forth. The guideline shall be discussed from an overall view of city planning.

Table 6.2.2 Floor Area Ratio of Large Development Projects

Type	Site Area (square meters)	Floor Area Ratio
Current	427,061	3.73
Under Construction	867,779	5.14
Development Order	575,330	4.64
Approval	1,005,921	3.65
Grand Total	2,876,091	4.31

Source: Master Plan Unit, DBKL
Note: Floor area is more than 1 million sq feet.

2) Development near Rail Stations

a. Location of Projects

It is essential to minimise the car trips generated from the large-scale development projects. One way is to reduce the total floor area of the projects themselves and

another way is to increase the utilisation of public transport systems such as rail-based and bus systems. A well-developed rail-based system may be able to absorb many car trip generation, hence contributing to reducing car utilisation.

Table 6.2.4 shows car share ratios in office and commercial buildings in Japan.

Table 6.2.3 Car Share in Japan

Type	Car Share
Office Building	8.31%
Commercial Building	15.4%

Table 6.2.5 shows shares of car trips generated from/ attracted to large-scale buildings in KL, which was obtained from the results of the traffic survey.

Table 6.2.4 Car Trip Share at Large Buildings in KL

Type	Car Share
Office	62.9 %
Commercial	58.2 %

Source: SMURT-KL

Around 60 % of the total trips generated / attracted from / to large-scale building is made by car in KL, while less than 20 % is made by car in Japan.

The difference between the figures in Japan and in Malaysia is due to their history and custom. Besides, a city with a matured rail-based system also significantly affects the share ratio.

The current rail-based system in KL does not spread throughout the city to create an impact on trips generated from and attracted to large-scale building by car in KL. According to the Japanese instance, around 20 % of the car rates can be reduced when the buildings are located near railway stations. This implies that the car share ratio will also be decreased to around 40-45 % in Malaysia with the provision of a good rail-based system.

b. Complex Development nearby Rail Stations

One of the important issues in promoting a rail-based system is the development of a densely populated area near stations, since the bus feeder system is sometimes inconvenient and inefficient in providing service to areas far from the stations.

The trend of sub-urbanisation in the surroundings of KL and out-migration from KL due to the urban redevelopment in the central area has been remarkable, and it will be accelerated even further in the future. In this context, a plan for a mixed developments near railway stations outside the CBD, including commercial, residential, and office functions is desirable. This will absorb the current out-

migration from KL, provide residential areas adjacent to working places, and shorten the commuting trip.

Therefore, the formulation of a plan for future land use preferable for the rail-based system is a focal issue in the long-term perspective.

3) Site Plan of Ex-Governmental Offices

It is also important to elaborate the plans for governmental offices in KL after their relocation to Putra Jaya. Residential use seems preferable to help the citizens from making long commuting trips. Detailed plans should be prepared at an early stage for smooth implementation at the project sites. Economic activities will then be revived in the central districts with the increase in residents, while traffic congestion could also be mitigated.

(6) Enhancement of Bus and Taxi Public Transport

1) Necessity of More Effective Bus System

One of the key points in enhancing public transport is to maintain steady operating speed and punctuality of the bus operation. The bus transport appears unable to compete with private car passengers under the current situation. On the other hand, the rail-based transport system could attract private car passengers after the establishment of the network system together with the provision of a better feeder bus system and inter-modal facilities.

Figure 6.2.3 was obtained from the results of the travel time survey conducted by the Study Team, showing both the strengths and weaknesses of the existing bus priority lanes.

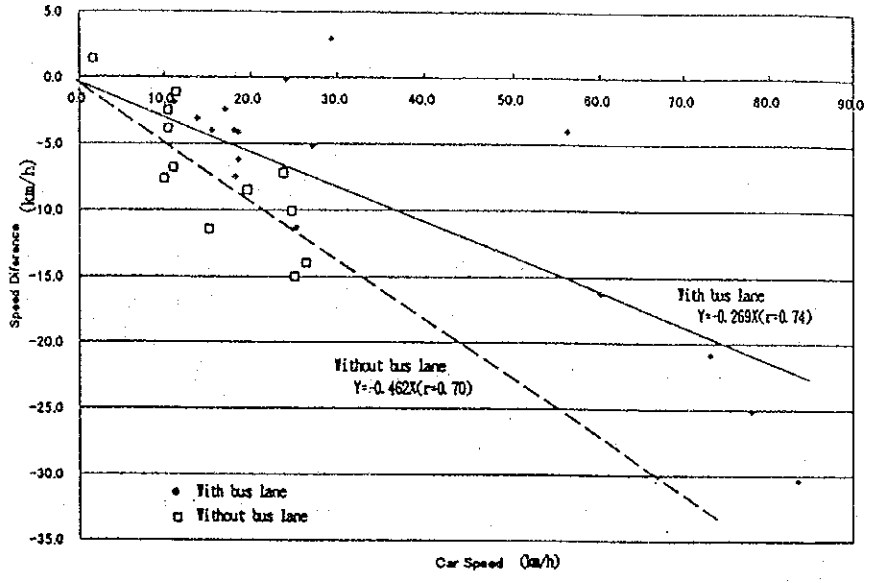


Figure 6.2.3 Bus Speed and Bus Lane

The data consist of two categories, i.e. bus lanes and without bus lanes. From these figures, the following points can be deduced.

- Bus speed becomes much slower than that of cars in the case with no bus lane
- It seems difficult for buses to run faster than cars even with the provision of bus priority lanes.

These show that it is necessary to provide conventional bus lanes on required sections of roads but also that more effective bus lanes need to be provided to compete with private car transport. In this view it is necessary to provide more intensive and effective bus lanes to operate on the lanes alongside the median strips (bus lanes alongside centre lanes), where buses can easily run without obstruction from passenger cars turning to the right and left. This is the so-called "Trunk Bus System" and it would raise the bus operating speed and its punctuality as well.

2) Service Level from Coverage by Bus Stops

Table 6.2.5 and Figure 6.2.4 show the population coverage by distance from bus stops on the current bus network.

Table 6.2.5 Coverage by Bus

Area	Total Population	350m		650m	
		Covered Population	Cover Ratio	Covered Population	Cover Ratio
	(,000)	(,000)	%	(,000)	%
Kuala Lumpur	1374	925	67.3	1266	92.1
Other than KL	1146	616	53.8	994	86.8
Whole Study Area	2520	1541	61.2	2260	89.7

Source: SMURT-KL

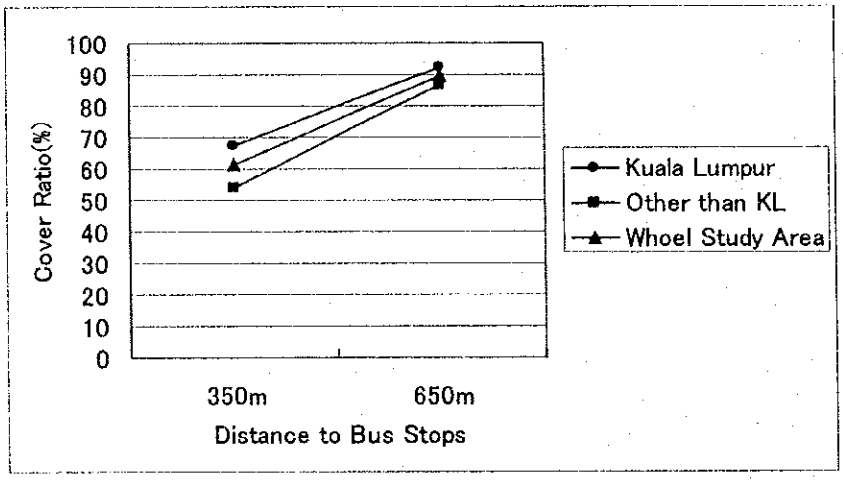


Figure 6.2.4 Population Coverage

According to the figures of coverage by distance, 50% of KL residents can reach bus stops within 350 metres, while about 90% can reach them within 650 metres. This indicates that the bus network and bus stops are well distributed to meet the patronage requirements from the viewpoint of accessibility to the bus stops.

3) New Type of Bus Services : 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.

4) 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-Based Transportation Improvement

1) Operation as Network

Considering the limitation of the current bus system to compete with private transport, the rail-based system is expected to establish itself as a key public transport to cover KL and its conurbation. Table 6.2.6 shows the current transport share by mode; the rail-based system contributes a low 0.4% share at present due to its sole operation.

Table 6.2.6 Share by Transport Mode

Unit: %

Mode	Share
Rail	0.4
Bus	18.0
Car	37.1
Lorry	1.1
Motorcycle	20.0
Walking	23.3
Others	0.1
Total	100.0

Source: SMURT-KL, Home Interview Survey, 1997
Note: Taxi is included in car

At present, the LRT and KTM have been operated in isolation and this is one of the main reasons that they are unable to catch the patronage necessary to make them feasible. Fortunately, as KL has a plan to establish a rail-based system to cover the whole conurbation, the key issue is how to service the covered areas to meet the patronage's demand. In this view, high frequency service, punctuality of operation, pertinent fare system, easy transfer to another system to take advantage of the rail-based network is of importance.

2) Reinforcement of Feeder Bus Services for Rail-based Transport

In terms of enhancing the rail-based transport system, good & reliable feeder bus services should be established. In some cases, bus and rail-based systems may be competing with each other. However, both systems have to complement each other to support public transport comprehensively, or they will lose their patronage by the private transport. Supporting the rail-based system is one of the key issues for the survival of the bus transport as a public transport system.

Figures 6.2.5 through 6.2.7 show the service coverage area of the bus and rail-based systems. By reinforcing the feeder bus system, the rail-based system can increase its coverage area and is expected to eventually build up an integrated public transport system composed of both the bus and rail-base systems.

Table 6.2.7 and Figure 6.2.8 show the population coverage ratio by the existing and planned rail stations.

Table 6.2.7 Population Coverage Ratio by Railway

Area	Total Population	350 m		650 m		2000 m	
		Covered Population	Cover Ratio	Covered Population	Cover Ratio	Covered Population	Cover Ratio
	(,000)	(,000)	%	(,000)	%	(,000)	%
Kuala Lumpur	1374	58	4.2	180	13.1	835	60.8
Other than KL	1146	44	3.8	129	11.3	469	41.0
Whole Study Area	2520	102	4.0	309	12.3	1304	51.8

Source: SMURT-KL

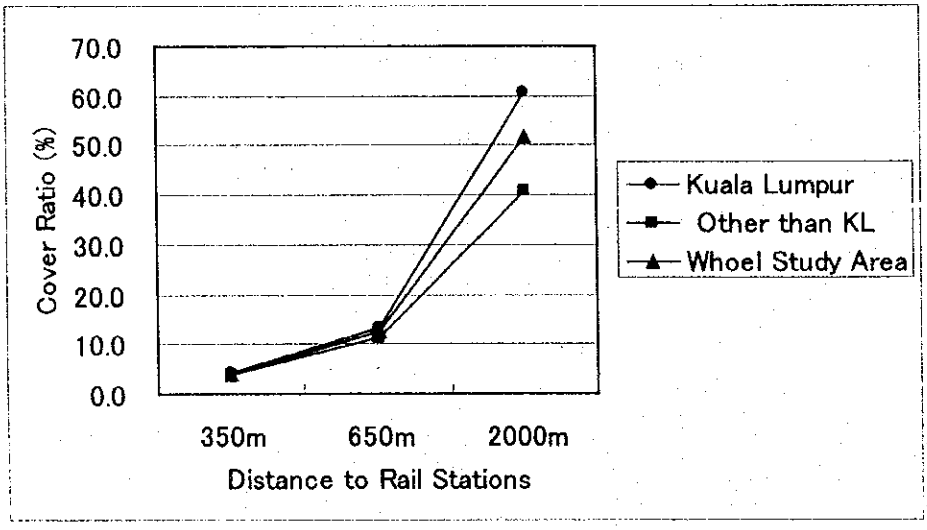


Figure 6.2.8 Population Coverage by Rail Stations

LEGEND

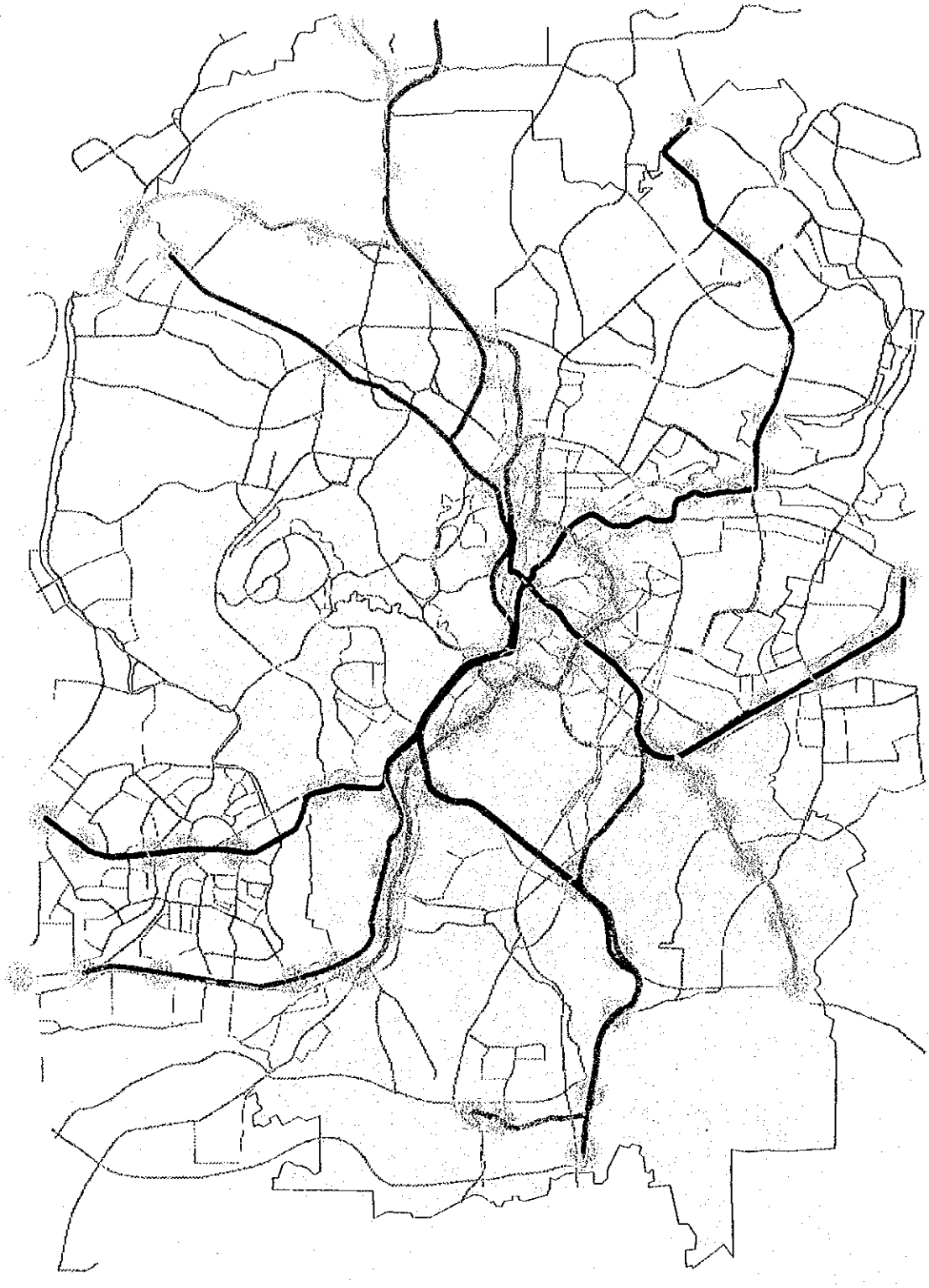
- Motorway
- Main Traffic Route
- Alternative Traffic Ro
- KTM
- LRT SYSTEM I
- 250 m radius
- 350 m radius
- Kuala Lumpur Boundary

Figure 6.2.5 Bus Service Coverage

0 1 2 3 4 5 Kilometers

SMURT-KL

Japan International Cooperation Agency



KTM
LRT SYSTEM I
LRT SYSTEM I PHASE II
LRT SYSTEM II
MONORAIL
ERL
LRT FUTURE (1)
LRT FUTURE (2)

Motorway & Main Traffic Route
Alternative Traffic Route

250 m radius from station
350 m radius from station

Figure 6.2.6 Future Railway Service Coverage

0 1 2 3 4 5 Kilometers

SMURT-KL

Japan International Cooperation Agency

Figure 6.2.7 Bus Service Future railway Service Coverage

3) Inter-Modal Facility Development at Transport Node

Attention has to be paid to smooth transfers between public transport modes especially between different railway lines and between feeder buses and railways. With respect to the LRT System (I) and (II), and PRT (Monorail), these systems seem to complement each other since the central area of KL will be fully covered by the network formed by the three lines. This implies that convenience in transferring between the systems would be the key to enhancing public transport.

The followings are key transfer stations, although much attention had already been given in the design stage. Inter-modal facilities such as air-conditioned automated walkway and escalators need to be provided to cater for the patronage.

- Sultan Ismail (LRT system II), P. Ramlee and Wawasan (monorail)
- Masjid Jamek (LRT system I) and Benteng (LRT system II)
- Hang Tuah (LRT system I and Monorail)
- Tun Razak (LRT system I, monorail and KTMB)
- KL Central (LRT system II and monorail)

Moreover, provision of station plazas near rail stations is indispensable for the smooth transfer to feeder buses.

4) Financial Viability

The current rail-based system is facing insufficient ridership to meet their feasibility. It is supposed that the situation will not change drastically even in the future due to its huge initial costs. One of the most important things is how to support the implementation of the rail-based system. Chapter 13 is prepared to give some options for this theme.

Population coverage by railway station is shown as follows:

- The coverage by a 350-meter diameter, which is the preferred walking distance for patronage, is as low as 4 %.
- The coverage by a 650-meter diameter, which is the average walking distance for people, is also low at around 12 %.
- The coverage by a 2000-meter diameter, which is impossible for people to walk reaches 40 % to 60 %.

This analysis revealed that even the 2000-meter diameter from rail stations can cover only around 50% of the population. This implies that a larger influential area is necessary to collect more potential passengers to meet the ideal demand for the rail stations. Unless bus transport can service such distant areas, the rail-based system will lose its merit.

4) Park and Ride

A park and ride system may not necessarily attract many railway users as a whole. A park and ride system, however, will be very much helpful for people living in poor public transportation areas since feeder bus systems are not feasible in the less populated areas. Therefore, parking facilities should be provided near railway stations in the outskirts of the CPA (Central Planning Area).

(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.

1) 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.

2) 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.

1) 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.

2) 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 by 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 Transport Facilities

1) Providing Well-Developed Pedestrian Facilities

Pedestrian facility development is one of the key components of urban transport in KL. The pedestrian facilities in KL have not been well maintained ever the past few years, and has thus discouraged the public from walking.

The Pedestrian Interview Survey revealed that the average walking distance in Malaysia is very similar to those in Japan, around 10 minutes, and there is no significant difference in walking speed as compared to that of other countries, 1.22 meters per second (98 meters per minute). Another finding of the survey revealed that well-developed facilities could extend people's comfortable walking distance to 350 meters comparing to that of 250 meters under poor conditions. This extension of 100 meters has great meaning in urban transportation planning.

The extended walking distance will greatly contribute to the promotion of public transport as it can widen the distance between rail-based system stations and bus stops as well.

2) Pedestrian-Friendly Facilities

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.

3) 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.

6.2.2 Level of Service

From the analysis mentioned above, the four key subjects listed below regarding policies and strategies for urban transportation in KL will be discussed:

- How to establish an integrated public transport system including both rail-based system and bus system.
- How to cope with the car traffic plunging into the CPA.
- What problems need to be solved after the completion of the currently proposed highway network.
- How to control the urban development to meet the road traffic capacity.

These subjects can be interpreted from the following three points in terms of level of service:

1) To maintain the volume-capacity (V/C) ratio at CPA boundary below 1.0 in terms of LOS C or D condition,
2) To keep the V/C ratio of major arterial roads in the Study Area below the current level, and
3) To increase the public transport share of bus and rail-based systems by as much as 25% of all motorised person trip demand.

(1) Capacity at CPA Boundary

According to the analysis done by the dynamic simulation model, traffic inside the CPA has already almost reached the saturation level during the morning peak period. The V/C ratio of the current arterial road at the boundary of CPA was almost 1.0 in 1997. Considering these conditions, it is essential that congestion at the CPA boundary not be increased but be kept at the current condition.

In the future it is obvious that more vehicle traffic will be generated or attracted in accordance with population increase, urban development and other factors, even after the completion of rail-based system. Thus, various measures should be taken to resolve the situation.

(2) Major Arterial Roads in CPA

Regarding the V/C ratio of major arterial roads in the Study Area, a ratio of less than 1.0 will be deemed to be the ideal planning criteria. Meanwhile, there are many major arterial and arterial road projects based on the BOT scheme in the Study Area. However, it is not easy to maintain the V/C ratios in the Study Area to below 1.0. A minimal increase in the V/C ratio compared to the current figure is expected.

(3) Share of Public Transport

More than 25 % share of public transport is required for the revitalisation of public transport in the year 2020. Bus transport will lose its patronage and a more car-driven society is guaranteed if no effective measure is taken in the future. Therefore, strong and firm measures have to be considered to enhance public transport.

6.2.3 Scenario Setting

The planning term is divided into three stages to set the scenario of policies and strategies for urban transportation. z

Stage 1: Traffic Control and Management Stage

Stage 2: Facility Development Stage (period when major highways and other facility development projects will be opened).

Stage 3: Information Management Stage (when most major roads and other projects are completed)

Figure 6.2.9 shows the relationship between future traffic demand and the policies to be taken.

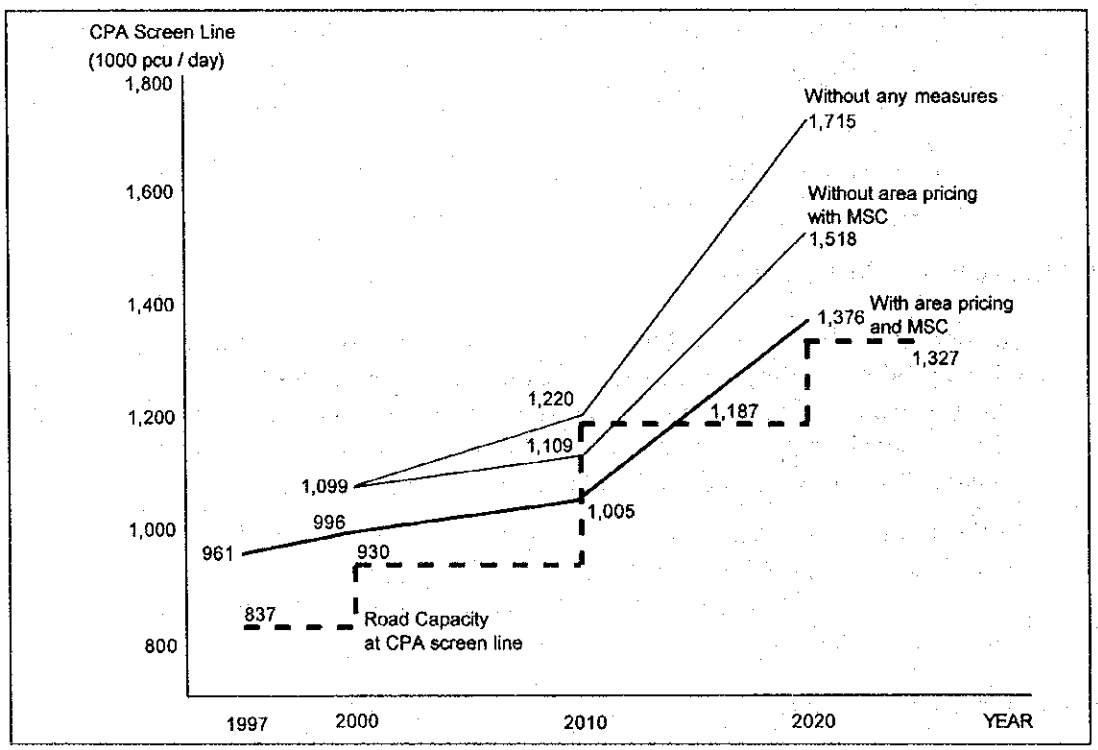


Figure 6.2.9 Traffic Demand and Transport Policy

(1) Stage 1: Traffic Control and Management Stage

First and foremost, emphasis is placed on how to control and manage the traffic in the near future without major improvements and construction of transport facilities. The following three major measures should be taken:

a. Preconditions

The following facility development conditions are assumed in this stage though some minor deferment may occur.

- Currently planned rail-based system will be opened to the public
- Several road projects, which are now under construction, will be completed

b. Implementation Measures

The following implementation measures will be taken corresponding to the planning issues. Table 6.2.8 illustrates the details.

Table 6.2.8 Implementation Measures

	Policies and Strategies		Action Plan and Measures
1	To enhance public transport	1-1	Establishment of bus priority lane network
		1-2	Introduction of trunk bus system
		1-3	Immediate construction of rail system
		1-4	Park & ride facility
		1-5	Bus re-routing in China Town
2	To moderate the traffic volume plunging into the CPA in the morning peak hour	2-1	Staggered working hours for private companies as well as the government offices
		2-2	Introduction of area pricing system
3	To increase road capacity	3-1	Intensive provision of reversible lanes on arterial roads
		3-2	Improvement of roundabout intersections
		3-3	Minor improvement of intersections or others
		3-4	Intensive line co-ordinate signal control
		3-5	Adoption of two phase signal control at major intersections
		3-6	Traffic control measures such as upgrading of signal control system, parking location system, bus location system and others
4	To maintain pedestrian safety	4-1	More installation of traffic signals
		4-2	More installation of pedestrian crossings
5	Development control	5-1	Introduction of regulations on floor area ratio for development projects and whole area of KL

Major emphasis is placed on the implementation of control measures against vehicle traffic attracted to the CPA. In this context, the following six major measures should be taken in this stage:

- Make the most use of reversible flow lanes, a trunk bus system shall be provided on arterial roads located in areas where the rail-based system is not available,
- Introduce intensive reversible flow lanes to maintain the existing road traffic capacity for in-bound traffic in the morning peak duration,

- Introduce an area pricing scheme to restrain the vehicle traffic into the CPA,
- Implement pedestrian safety programme,
- Examine the introduction of a floor area control for urban development projects and for the whole KL to control excessive urban development, and
- Draw up a plan to lay out residential facilities at the former sites of governmental offices, which will be vacated when they relocate to Putra Jaya.

(2) Stage 2: Facility Development Stage

There are many infrastructure projects, road development projects and rail-based development projects currently under construction. A few of the road projects and rail-based projects will be opened to public in the near future. However, most of them are expected to contribute to an increase in transport facilities' capacity in the Study area only in the intermediate term, after 2005.

On the other hand, most of the MSC plan will be completed and this will contribute to the mitigation of traffic congestion in the Study area, especially in the CPA in KL. This will come to effect only during 2005 and 2010. At this stage only areas outside of KL will be able to increase their transport capacity. The point is that the capacity of the transport facilities in the CPA has to be enlarged even in the intermediate term in the Study Area, even though a reduction in trip generation by MSC is expected in the future.

In this context, the following measures have to be taken at this stage.

- Establishment of pertinent implementation priority programme of privatised road projects
- Extension of currently planned rail-based plan
- More improvements to increase the road capacity into the CPA
- Facility development to create a better environment for the aged and disabled persons
- Modification of land use pattern through:
  - Implementation of intensive area development near rail stations
  - Laying out residential facilities for the former sites of governmental offices, which will be relocated to Putra Jaya
  - Actual impact of floor area control is expected in this stage.

(3) Stage 3: Information Management Stage

Large development of transport facilities cannot be expected at this stage. In terms of urban transport, full and complete management and control via the existing facilities is once again important to create a better traffic environment to provide a better quality of life in the future.

In this context, the introduction of an Intelligent Transport System is the focal point in this stage. The following are the major issues during this stage.

- Integrated Transport Information System

  All independent traffic control and management systems shall be integrated into one system.

- Environmentally sound traffic system including vehicle renovation
- Advanced traffic safety system

6.3 Staged Implementation Programme

A staged implementation programme is summarised in Figure 6.3.1. The key issues of the programme are described below:

6.3.1 Traffic Control and Management Stage

(1) Countermeasures for Peak Traffic to CPA

1) Restricting Traffic into CPA

i) Moderate the Traffic Demand with Public Co-operation

It is essential to moderate the traffic volume plunging into the CPA in the morning peak hours. Staggered working hours have been introduced in governmental offices with four staggered-working shifts at present. This system is important to moderate the traffic demand in the peak hour and should also be introduced in private companies. The government might not force the private companies to introduce staggered working hours officially but they can ask for their co-operation through the practice of public relations. What is important is to create a climate in which even private companies have to co-operate to alleviate traffic congestion. This can be accomplished in co-operation with mass communication and other media.

ii) Area Pricing

In addition to the current traffic congestion, large-scale projects such as KLCC are expected to be fully open for service in the near future, and this will inevitably greatly contribute to further traffic congestion. There is no way to mitigate the current traffic jam except through area pricing. This is one of the push type measures to reduce the vehicle traffic.

2) Increase of Road Capacity

i) Reversible flow Lane

Further application of extensive reversible flow lane system should increase the road capacity for buses and vehicles to deal with the traffic volume in the morning peak hour. The line co-ordinated signal control system should be installed for further smooth operation. In addition, a bus location system should be installed to promote the smooth bus operation with high speed and punctuality.

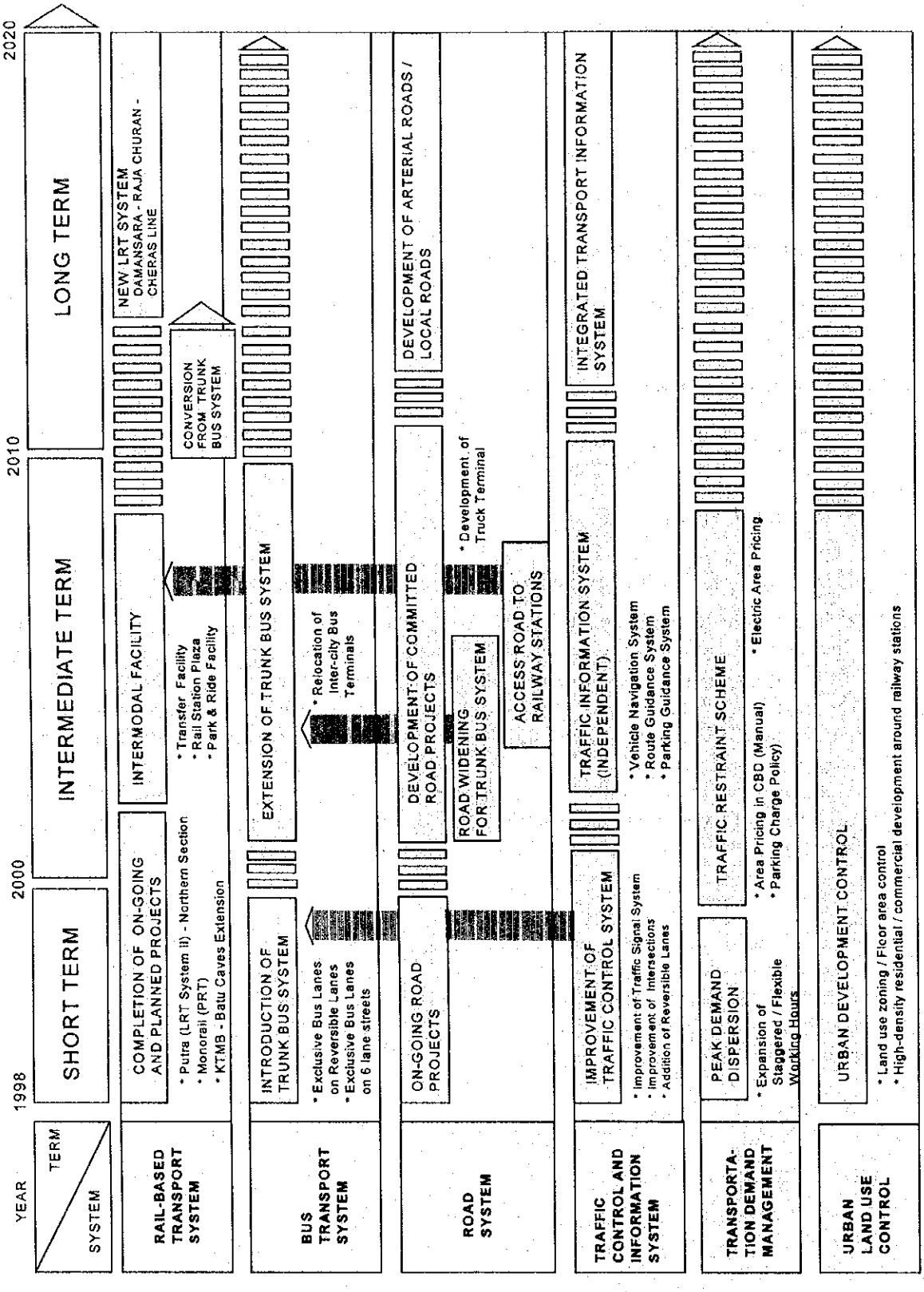


Figure 6.3.1 Schematic Implementation Programme

ii) Increase Capacity of Roundabout Intersections

Roundabout intersections are not suitable for the heavy vehicular traffic seen at present. They should at least be improved into signalised at-grade intersections. Some new road projects including the Ampang Elevated Expressway are expected to open for service in the near future. The traffic volume from these new roads will result in additional traffic at existing intersections. It is essential to improve such interchanges to cope with the additional traffic generated by the new road projects.

iii) Signal Phasing

A multi-phase type signal system, which sets "one-phase for one-direction," has been commonly used in KL. However, it tends to lead to a longer cycle length in total and reduce traffic capacity, and it should be replaced by a "one-phase for two-directions" system at the major intersections where applicable. (See Sub-section 9.2.2 for more details.)

3) Improvement of Signal System

A more sophisticated signal control system with extensive installation of detectors to identify occupancy, running speed and so forth is necessary to cope with the large traffic volume in the CPA.

(2) Bus Transport

1) Bus Priority Lane

An exclusive bus priority network (not limited to separate road segments but a continuous network) should be established to take advantage of the reversible lanes mentioned above. This will greatly contribute to getting people to switch from cars to buses.

2) Trunk Bus System

A trunk bus system should be established to compete with private cars in terms of time saving.

3) Re-routing of Bus Transport

The main point is how to mitigate the traffic jam caused by buses in China Town. A through type operation is preferable to avoid the overlapping of routes in the area.

4) Circular Bus Services in CPA

It is very inconvenient for users to go to their destinations using the current bus system in the CPA. One of the reasons is the radial type of bus operation. A circular bus system may be able to increase the service level of the bus transport in the CPA.

(3) Pedestrian Safety Programme

After the completion of the LRT and monorail, the area covered by the rail services will account for more than 70% of the CPA. Walking, then, becomes a very essential mode of transport in the CPA. Pedestrian safety, therefore, is very important. The current situation is very inconvenient and dangerous for pedestrians. These poor conditions should be thoroughly improved to bring about a pedestrian-friendly environment.

A pedestrian network composed of wide sidewalks, which make the most use of minor streets paralleling or connecting arterial roads as pedestrian malls, and scramble signal controls should be established.

(4) Road Development

Some road projects currently under construction are expected to open to the public at this stage.

(5) Development Control

The following items should be planned for the next actual implementation.

- Regulation of floor area ratio for urban development projects and the whole KL area
- Complex developments with multiple functions near rail stations
- Residential development at the sites of governmental offices after their relocation.

6.3.2 Facility Development Stage

(1) Rail-based Transport System

1) Rail Transport Facility

Cheras and Damansara areas could be provided with an additional rail-based system. However, due to financial uncertainty, further extension of the rail-based system may have some limitation.

2) Inter-modal Facility

Development of the following facilities are focal points in enhancing rail-based transport:

- Sstation plaza,
- Pedestrian network to access to rail stations,
- Comfortable facilities to facilitate smooth transfers, and

- Facility development for park and ride system.

(2) Bus Transport

The following facility development is considered.

- Further development of bus priority lanes and trunk bus system according to the improvement and development of roads
- Relocation of the current bus terminal functions to outside the central area

(3) Road Development

Privatised road projects and network seems to function well under the current plan. A prioritised implementation programme will be essential. Interchanges and intersections, through which new roads will access the existing arterial roads, should be improved to cope with the future traffic demand.

(4) Integrated Transport Information System

The following system will be introduced after the installation of a car navigation system or other equipment and devices.

- Information system in vehicles,
- Information system co-ordinated with rural and urban areas, and

6.3.3 Information Management Stage

(1) First Stage

An independent system will be required for early installation to control and manage the traffic.

- Route guidance and navigation system,
- Bus location system, and
- Parking guidance system and others.

(2) Second Stage

All system should be integrated into one in order to exchange necessary information in conjunction with traffic control and management for better co-ordination among systems.

(3) Final Stage

An Intelligent Transport System should be developed and introduced not only for traffic control and management but also to create a better quality of life in conjunction with social demand.