GOVERNMENT OF MALAYSIA

KLANG VALLEY TRANSPORTATION STUDY

FINAL REPORT

MAIN VOLUME

MARCH 1987

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

It is with great pleasure that I present this report entitled the Klang Valley Transportation Study to the Government of Malaysia.

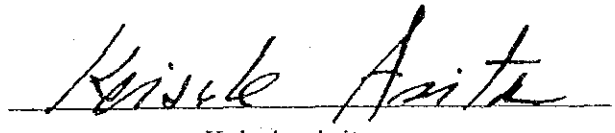
This report embodies the results of a transportation masterplan study which was carried out in the Klang Valley Region from December 1984 to December 1986 by Japanese study team commissioned by the Japan International Cooperation Agency following the request of the Government of Malaysia.

The study team headed by Mr. Toshio Kimura, Fukuyama Consultants International Co., Ltd. and Pacific Consultants International Co., Ltd. had a series of discussions with the officials concerned of the Government of Malaysia, conducted a wide range of field survey and prepared the report.

I hope that this report will be useful as a basic reference for development of the region.

I wish to express my deep appreciation to the officials concerned of the Government of Malaysia for their close cooperation extended to the team.

March, 1987



Keisuke Arita
President
Japan International Cooperation Agency

CONTENTS

CONTENTS

MAIN VOLUME

LIST OF FIGURES

CHAPTER 1 :

CHAPTER 2 :

CHAPTER 3 :

CHAPTER 4 :

CHAPTER 5 :

CHAPTER 6 :

CHAPTER 7 :

CHAPTER 8 :

CHAPTER 9 :

LIST OF TABLES

CHAPTER 4 :

CHAPTER 5 :

CHAPTER 6 :

CHAPTER 7 :

CHAPTER 8 :

INTRODUCTION

Background

In response to the request by the Government of Malaysia for technical cooperation in conducting a Klang Valley Transportation Study (hereinafter referred to as "the Study") the Government of Japan, through the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Study Team to carry out the Study jointly with the Government of Malaysia in preparing a comprehensive Transportation Masterplan for the Klang Valley Region to the year 2005.

The Study commenced on the 19th December, 1984 when the Steering Committee was held and accepted the Inception Report.

During the course of the Study, two (2) progress reports and two (2) interim reports were submitted to the said committee and the Draft Final Report was submitted in December 1986. This Final Report comprises the final proposals for the Transportation Masterplan for Klang Valley to the year 2005.

Objectives

The main objectives of the Study are to formulate a Klang Valley Transportation Masterplan taking into consideration the various development plans, to recommend major transportation policies and to suggest the priority projects in the course of the Study. In more specific terms the objectives of the Study are as follows : –

(a) Conduct traffic surveys that include Traffic Counting Survey, Public Transport Survey, Home Interview Person Trip Survey (HIS), Lorry Owner Interview Freight Traffic Survey (OIS), Cordon Line and Screen Line surveys.

(b) Identification of present transport issues and problems and hence set up short term transport policies and the preparation of short term transportation plan to 1990.

(c) Formulation of Regional Development and Landuse Plans to the year 2005

(d) Calibration of Landuse and Transport Models based on the results of the traffic surveys conducted

(e) Forecasting of traffic demands to the year 2005

(f) Formulation of Long-Term Road Network Plan to the year 2005

(g) Formulation of Public Transportation System Plan to the year 2005

(h) Formulation of Freight Transportation System Plan to the year 2005

Study Area

The main study areas are the Federal Territory of Kuala Lumpur and the four (4) districts of Gombak, Hulu Langat, Petaling and Klang in the State of Selangor and the to be established Federal Territory of Bukit Tinggi Twin City in the State of Pahang.

The secondary study areas are the Outer Klang Valley Region which include the other districts of Selangor and the neighbouring regions (Figure (i)).

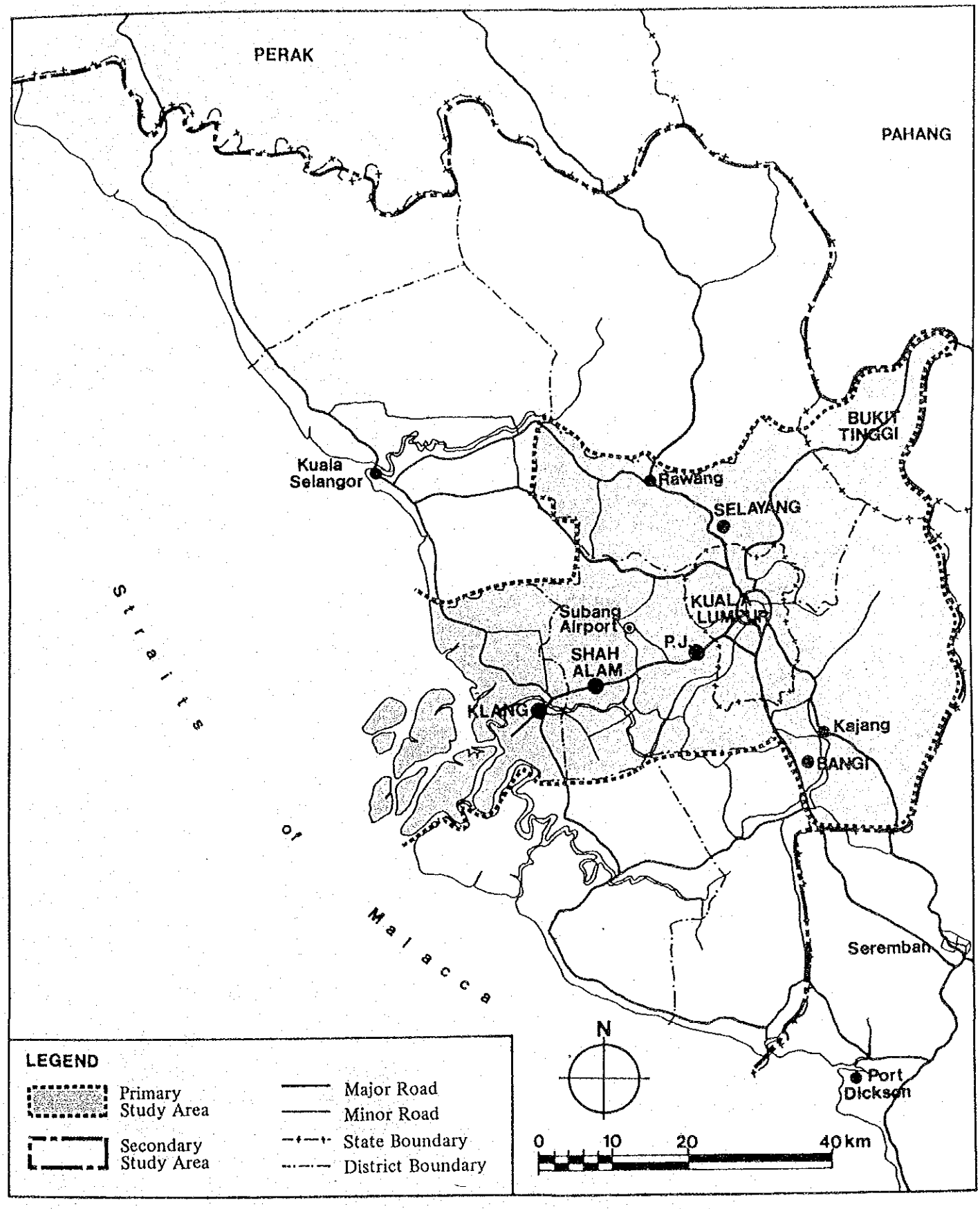


Figure (i) : Study Areas For The Klang Valley Transportation Study

Organization of the Study

The project is being carried out jointly by JICA and the Government of Malaysia in coordination with other related agencies. The organization for the project and the lists of committees members are as follows : –

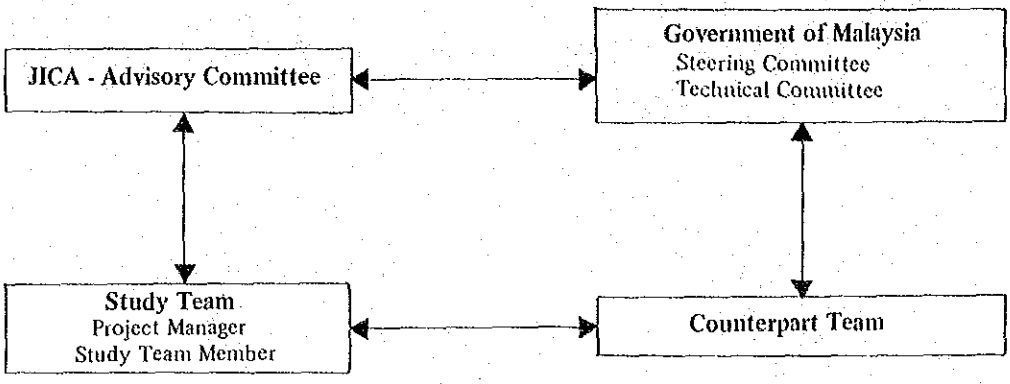


Figure (ii) : Organization Of The Klang Valley Transportation Study

JICA has set up an Advisory Committee to assist the Study Team by providing the latter with advice and suggestions from time to time.

Steering Committee, Government of Malaysia

Chairman	Dr. Mohd. Noor bin Haji Harun	Economic Planning Unit, Prime Minister's Department
	Mr. Ismail bin Mohamed	Economic Planning Unit, Prime Minister's Department
Secretary	Mr. Annuar bin Khabar	Economic Planning Unit, Prime Minister's Department
Secretary	Mrs. Faridatul Akmar Taib	Economic Planning Unit, Prime Minister's Department
	Dr. Johari bin Mat	Klang Valley Planning Secretariat, Prime Minister's Department
	Mr. Ahmad Kamaruddin	Klang Valley Planning Secretariat, Prime Minister's Department
	Mrs. Norasiah Yahya	Klang Valley Planning Secretariat, Prime Minister's Department
	Mr. Abdul Karim bin Munisar	Klang Valley Planning Secretariat, Prime Minister's Department
	Mr. Alexius Y.A. Loo	Department of Planning and Development Research, Ministry of Works

	Mr. Ong Eng Poe	Department of Planning and Development Research, Ministry of Works
	Mr. Teru Fukui	Department of Planning and Development Research, Ministry of Works
	Mr. Han Joke Kwang	Department of Planning and Development Research, Ministry of Works
	Mr. Kamarul Baharim bin Dato Haji Abdul Raof	Ministry of Federal Territory
	Mr. Shamsuddin Che' Mat	Ministry of Transport
	Mr. Mahfix bin Omar	Kuala Lumpur City Hall
	Mr. Jabbari bin Ahmad	Development and Planning Unit, Selangor State

Technical Committee, Government of Malaysia

Chairman	Dr. Johari bin Mat	Klang Valley Planning Secretariat, Prime Minister's Department
Secretary	Mr. Shaharuzzaman bin Abdul Rahman	Klang Valley Planning Secretariat, Prime Minister's Department
Secretary	Mr. Khalil bin Taha	Klang Valley Planning Secretariat, Prime Minister's Department
	Mr. Ahmad Kamaruddin	Klang Valley Planning Secretariat, Prime Minister's Department
	Mrs. Norasiah Yahya	Klang Valley Planning Secretariat, Prime Minister's Department
	Mr. Abdul Karim bin Munisar	Klang Valley Planning Secretariat, Prime Minister's Department
	Mrs. Faridatul Akmar Taib	Economic Planning Unit, Prime Minister's Department
	Mr. Ong Eng Poe	Department of Planning and Development Research, Ministry of Works
	Mr. Teru Fukui	Department of Planning and Development Research, Ministry of Works
	Mr. Han Joke Kwang	Department of Planning and Development Research, Ministry of Works

	Mr. Kamarul Baharim bin Dato Haji Abdul Raof	Ministry of Federal Territory
	Mr. Zainuddin Ahmad	Ministry of Federal Territory
	Mr. Shamsuddin Che' Mat	Ministry of Transport
	Mrs. Hew Kuan Wai	Ministry of Transport
	Mr. Mahfix bin Omar	Kuala Lumpur City Hall
	Mr. Ooi Goan Lee	Kuala Lumpur City Hall
	Mr. Lee Then Hong	Kuala Lumpur City Hall
	Mr. Jabbari bin Ahmad	Development and Planning Unit, Selangor State
	Mr. Khoh Joo Bee	Development and Planning Unit, Selangor State
	Mr. Ghazali Md. Noor	Malaysian Highway Authority
	Ms. Hanim bt Ali	Malayan Railway Administration
	Mr. Selamat Haji Tahir	Malayan Railway Administration
	Mr. Ahmad Rahimi Jaafar	Malayan Railway Administration

Advisory Committee, Government of Japan

Chairman	Mr. Kazuo Yoda	Ministry of Construction
	Dr. Koji Hasekura	Housing and Urban Development Public Corporation
	Mr. Makoto Mizoguchi	Honshu Shikoku Bridge Authority
	Mr. Izuo Kishita	Ministry of Construction
	Mr. Masayuki Mori	Ministry of Construction
	Mr. Hisashi Kataoka	Ministry of Transport
	Mr. Satoshi Kato	Ministry of Transport
	Mr. Takaaki Ishikawa	Ministry of Transport
	Mr. Fujio Tokumaru	Ministry of Transport

Study Team
Japanese Expert

Team Leader	Mr. Toshio Kimura	Transport Planning
	Mr. Kokuro Hanawa	Traffic Engineering
	Mr. Hironobu Sakai	Urban/Landuse Planning
	Mr. Takashi Kadota	Regional Planning
	Mr. Takanori Shibata	Land Readjustment Planning
	Mr. Naoya Ogawa	Highway Planning
	Mr. Tsuyoshi Sasaki	Public Transport Planning
	Mr. Yoshikazu Umeki	Railway Planning
	Mr. Hikaru Ishikawa	Railway Planning

Dr. Masaharu Fukuyama	Transport Economics
Mr. Toshisada Katsurada	Transport Economics
Mr. Satoshi Kishi	Transport Demand Forecasting/ System Engineering
Mr. Katsuyasu Nakata	Transport Survey
Mr. Michimasa Takagi	Transport Survey

Malaysian Counterpart Engineers

Mr. Shaharuzzaman bin Abdul Rahman	Highway Planning
Mr. Khalil bin Taha	Highway Planning
Mrs. Maisarah Ali	Highway Planning
Mr. Wan Ahmad Abdul Nasir	Public Transport Planning
Mr. Saffian b. Mohd. Ali	Highway Planning

Malaysian Engineers

Mr. Chua Mok You	Urban and Transport Planning
Mr. Chin Kar Keong	Transport Planning

Study Methodology

A flowchart summarising the Study Methodology is shown in Figure (iii). The Study commenced with establishing the future regional development pattern and forecasting future travel demand under the 'do-nothing' situation. The likely future transport problems under a 'do-nothing' situation is therefore identified at this stage.

Alternative transport solutions are generated and tested through the alternative transport plans. These plans are then compared and assessed from the financial, economic and functional analysis results. This evaluation of alternative plans hence culminated the Study in recommending the Transportation Masterplan for Klang Valley to the year 2005.

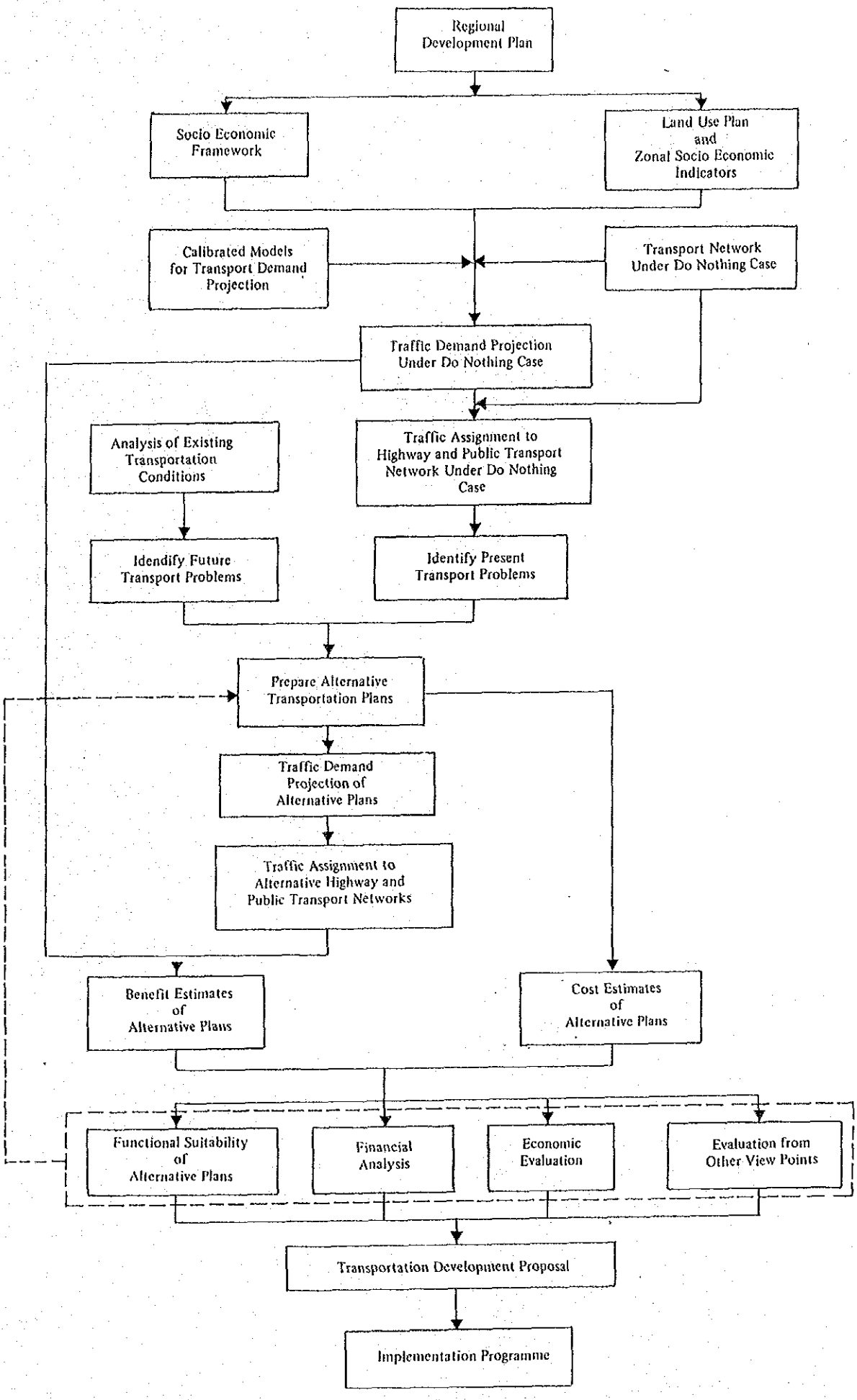
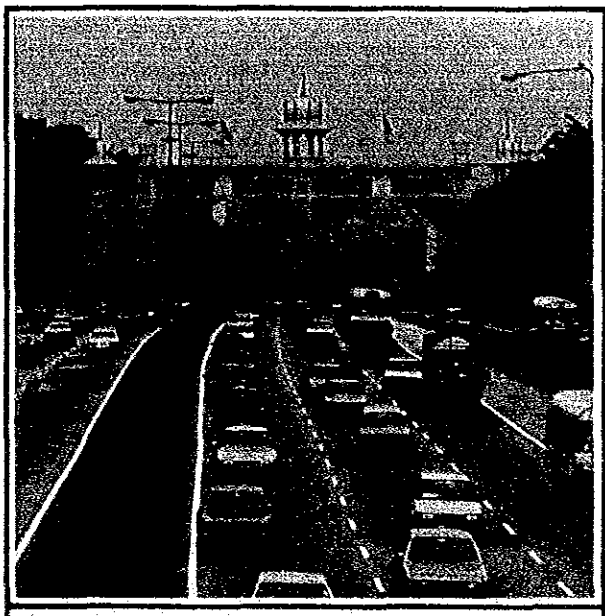
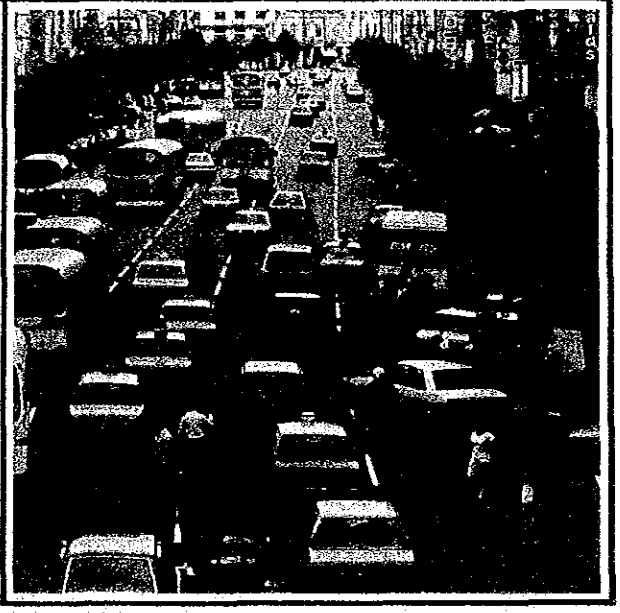


Figure (iii) : Summary Flowchart Of The Study Methodology

MAJOR FINDINGS AND RECOMMENDATIONS





1. SOCIO-ECONOMIC FRAMEWORK AND FUTURE DEVELOPMENT PATTERN

1.1 Socio-Economic Framework

The socio-economic framework for future development in the Klang Valley is based on the expectation that the Klang Valley Region is to play the role of a catalyst for National Economic Development.

The framework proposed in this Study is principally based on the perspective made in the Fifth Malaysia Plan taking into consideration possible economic fluctuations. The socio-economic framework is described below : –

(1) In the Klang Valley Region, the population is expected to increase from 2.5 million in 1985 to 3.9 million in 1995 and 5.5 million in 2005 with an average annual growth rate of 4.5 percent between 1985 and 1995 and 3.5 percent between 1995 and 2005 (Table 1).

Table 1 : Future Population Framework, Klang Valley, 1985 – 2005

(In '000)

	1) 1985	2) 1995	2) 2005	Average Annual Growth Rate (%) 1985 – 1995	1995 – 2005
Kuala Lumpur	1,215	1,770	2,240	3.8	2.4
Other Klang Valley	1,319	2,170	3,210	5.1	4.0
Bukit Tinggi	–	–	100	–	–
Klang Valley	2,534	3,940	5,550	4.5	3.5

Source : 1) Estimated on the basis of Home Interview Survey, 1985
2) Projected by the Klang Valley Transportation Study

(2) Considering the economic perspective reported in the Fifth Malaysia Plan, the past trend of economic performance in Malaysia and the likely changes in the world economy, the Study Team predicts the Gross Domestic Product (GDP) using three (3) scenarios, viz. low growth scenario (average annual growth rate of 3% between 1986 and 2005), medium growth scenario (average annual growth rate of 5% for the coming two (2) decades) and high growth scenario (average annual growth rate of 6% for the same period).

Among these, the medium growth scenario which coincides with the target growth rate established in the Fifth Malaysia Plan is adopted and assumed for the transport demand projection.

Based on the estimated Gross Domestic Product, the Gross Regional Product (GRP) is predicted. The GRP in the Klang Valley Region is expected to grow at an average annual growth rate of 5.9 percent from 1985 to 2005. In terms of value, it is estimated that the GRP in the Klang Valley will thereby expand from M$15,511 million in 1985 to M$28,274 million in 1995 and M$48,842 million in 2005 (Table 2).

Table 2 : Gross Domestic Product And Gross Regional Product in Klang Valley, 1985 – 2005

(M$ million)

		1) 1985	2) 1995	2) 2005	Average Annual Growth Rate (%) 1985 – 1995	1995 – 2005
GDP in Malaysia	Low	59,544	72,549	97,500	2.0	3.0
	Medium		96,665	157,457	5.0	5.0
	High		106,276	190,324	6.0	6.0
GRP in Klang Valley	Low	15,511	21,221	30,244	3.2	3.6
	Medium		28,275	48,842	6.2	5.6
	High		31,086	59,037	7.2	6.6

Source : 1) The Fifth Malaysia Plan
2) Projected by Klang Valley Transportation Study

(3) The number of employments in future is projected based on the future population by age group, participation rate and unemployment rate of the labour force. Consequently, the total employment in the Study Area is expected to grow from 950,000 in 1985 to 1,514,000 in 1995 and 2,190,000 in 2005 at an annual growth rate of 4.8% from 1985 – 1995 and 3.8% from 1995 – 2005.

Employment by industry is broken down using the predicted GRP, the the expected value added by industry and the total employment in the Study Area. Employment in the primary industry is expected to decline slowly whilst employment in the secondary industry is expected to double from 1985 to 2005 and employment in the tertiary industry is also expected to grow to 2.5 times for the same period (Table 3).

Table 3 : Employment By Industry, Klang Valley, 1985 – 2005

Industry	Employment (In '000) 1) 1980	2) 1985	3) 1995	3) 2005	Average Annual Growth Rate (%) 1985 – 1995	1995 – 2005
Primary	56.6	46.3	45.2	38.7	–0.2	–1.5
Secondary	230.2	269.3	400.6	550.5	4.1	3.2
Tertiary	473.2	634.4	1068.2	1600.8	5.3	4.1
Total	760.0	950.0	1514.0	2190.0	4.8	3.8

Source : 1) Depatement of Statistics
2) Modified from H.I.S. Data
3) Klang Valley Transportation Study

(4) The average household monthly income in the Klang Valley Region is expected to grow in view of the anticipated economic growth, increasing productivity per employed person and increasing number of employed person per household.

The average monthly household income in the Klang Valley Region will expand from M$1,383 in 1985 to M$1,578 in 1995 and M$1,870 in 2005 (Table 4).

Table 4 : Monthly Income Projection, Klang Valley, 1985 – 2005

(In M$ at 1985 prices)

Income	1) 1985	2) 1995	2) 2005	Average Annual Growth Rate (%) 1985 – 1995	1995 – 2005
Per Employee	763	873	1042	1.4	1.8
Per Capita	285	534	410	1.6	2.1
Per Household	1,383	1,578	1,870	1.3	1.7

Source : 1) Results of H.I.S.
2) Klang Valley Transportation Study

(5) The number of vehicles in Klang Valley is projected to grow by 5.9% annually from 1985 – 1995 and 5.5% from 1995 to 2005. The annual growth rate of motorcar for the period of 1995 – 2005 is projected to be 6.2%, motorcycle 4.7%, taxi 5.5% and lorry 5.1%. (Table 5)

In terms of motor vehicle (including motorcycle) per 1000 households, the Study Team estimated and increase from 1190 in 1985 to 1326 in 1995 and 1493 in 2005. By 2005 there will be 783 cars to every 1000 households in Klang Valley.

Table 5 : Motor Vehicle Projection, Klang Valley, 1985 – 2005

	No. of Motor Vehicles (In '000)			Average Annual Growth Rate (%)	
	1) 1985	2) 1995	2) 2005	1985 – 1995	1995 – 2005
Motor Cycle	264.7	433.6	662.0	5.1	4.7
Motor Car	284.5	551.2	955.3	6.8	6.2
Taxi	6.8	13.2	20.0	6.8	5.5
Lorries	67.5	111.4	184.1	5.1	5.1
Total *	623.5 (358.8)	1,109.4 (675.8)	1,821.4 (1,159.4)	5.9 (6.5)	5.5 (6.0)

Source : 1) Based on H.I.S. and O.I.S. Data
2) Projected by the Study Team

Note : * Figures in bracket exclude motorcycles

1.2 Regional Development Pattern

(1) Alternative Development Patterns

Three possible alternative scenarios for the future regional development pattern in Klang Valley are considered (Figure 1).

Scenario A : Concentrated Growth in Kuala Lumpur Conurbation Scenario

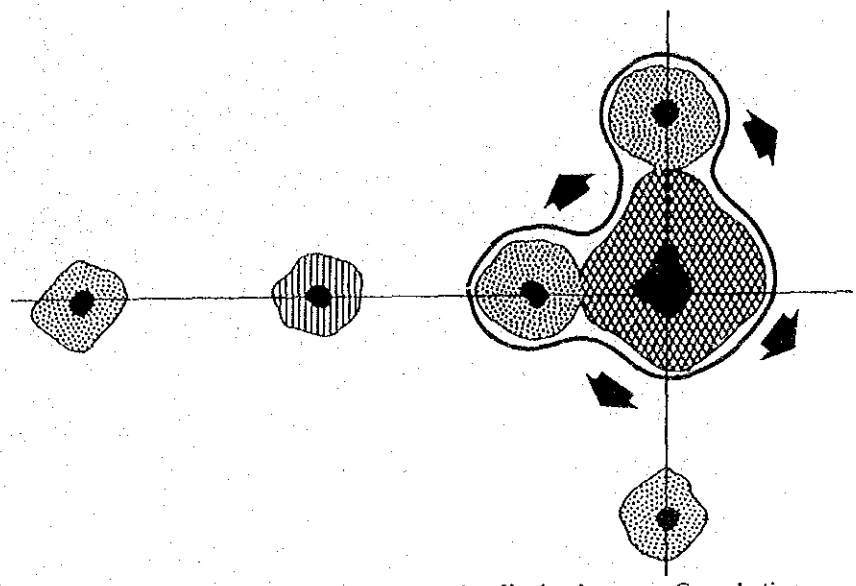
This scenario allows a further attainment of a primacy state where Kuala Lumpur Conurbation becomes a very large metropolitan area commanding the region's economy and employment.

Scenario B : Dispersal to Selected Growth Centres Scenario

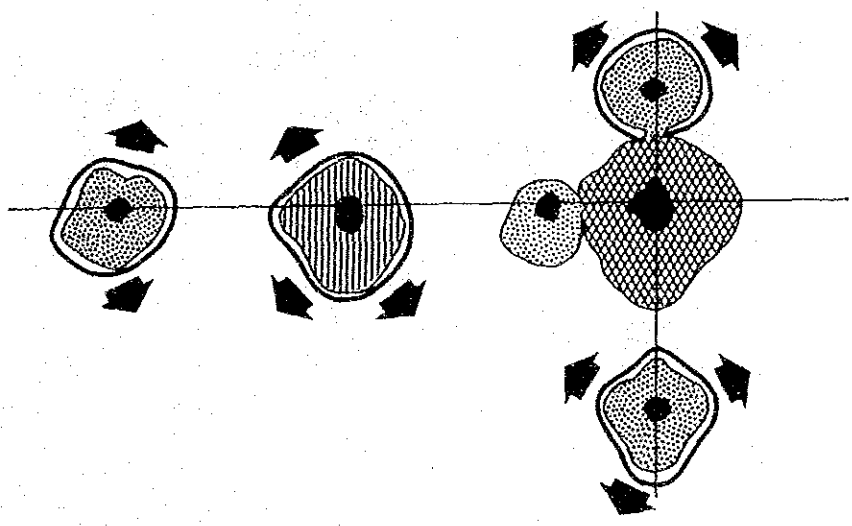
This scenario will produce a balanced urban hierarchy structure with each centre having specific function and providing their own employment so as to achieve more or less individual self-contained urban centre.

Scenario C : Dispersal and Twin City Scenario

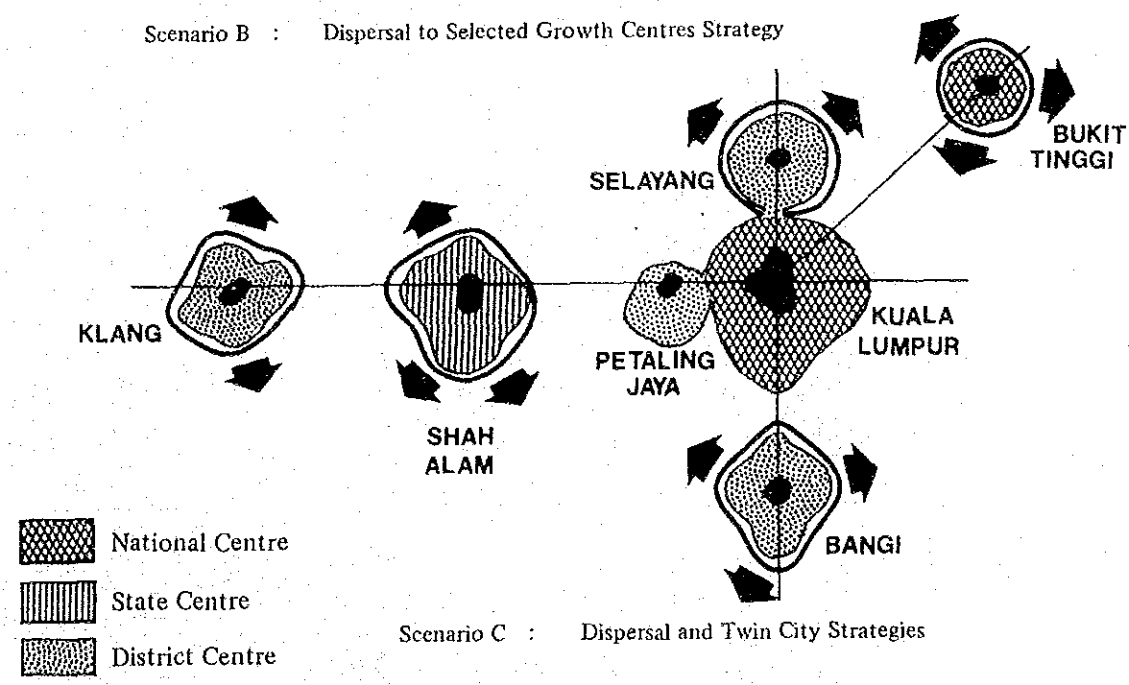
This scenario has the main features of Scenario B. Added to this however is the diversion of some development pressure on Kuala Lumpur to a new town at Bukit Tinggi under a long term planning strategy.



Scenatio A : Concentrated Growth in Kuala Lumpur Conurbation Strategy



Scenario B : Dispersal to Selected Growth Centres Strategy



Scenario C : Dispersal and Twin City Strategies

Figure 1 : The Three Alternative Regional Development Scenerios

Evaluating these alternative regional development scenarios, Scenario C is taken as the most likely development scenario in future. This is to be in line with the national and regional development policy which suggests that the future development pattern in the Klang Valley will consist of an urban system of six (6) growth centres namely Kuala Lumpur, Shah Alam, Petaling Jaya, Klang, Bangi and Selayang with Bukit Tinggi Twin City, each having its own specific hierarchy of function rather than allowing the urban growth to just sprawl and likely to result in a continuous urban settlement from Klang to Kuala Lumpur.

Figure 2 shows the proposed major functions of each growth centre.

City	Hierarchy	Population 2005	Major Functions							Remarks
			Administrative	Commercial Trading	Institutional	Residential	Heavy Industrial	Light Industrial	Transportation	
Kuala Lumpur	National Centre	2,240,000	National		*				Train/Bus	* UM * UTM
Shah Alam	State Centre	430,000	State		**				Air Port	** ITM
Petaling Jaya	District Centre	427,000	District							
Klang	District Centre	427,000	District						Port	
Bangi	District Centre	319,000	District		***					*** UPM UKM
Selayang	District Centre	142,000	District							
Bukit Tinggi	District Centre	100,000	District		#					# IIU

Strategic Function Central Function Basic Function Other Function

Figure 2: Major Functions of Each Growth Centre

(3) Landuse Requirements and Population Distribution

Based on the selected future development pattern and socio-economic framework, the future landuse requirements are estimated and are shown in Table 6.

The total urbanized area is expected to increase from 33,580 ha in 1985 to 48,280 ha in 1995 and 65,060 ha in 2005. The percent share of urbanized area to the total area is therefore expected to grow from 12% in 1985 to 17% in 1995 and 23% in 2005.

Table 6 : Future Urbanized Area Requirements

Year	Urbanized Area (ha)	Total Area (ha)	Percent Share to Total Area (%)
1985	33,580		11.8
1995	48,280	284,200	17.0
2005	65,060		22.9

Source : Klang Valley Transportation Study

The population and employment distribution are determined using the spatial distribution of landuses and population, employment densities in each area (traffic zones). The resultant population and employment distributions are illustrated in Figures 3 and 4.

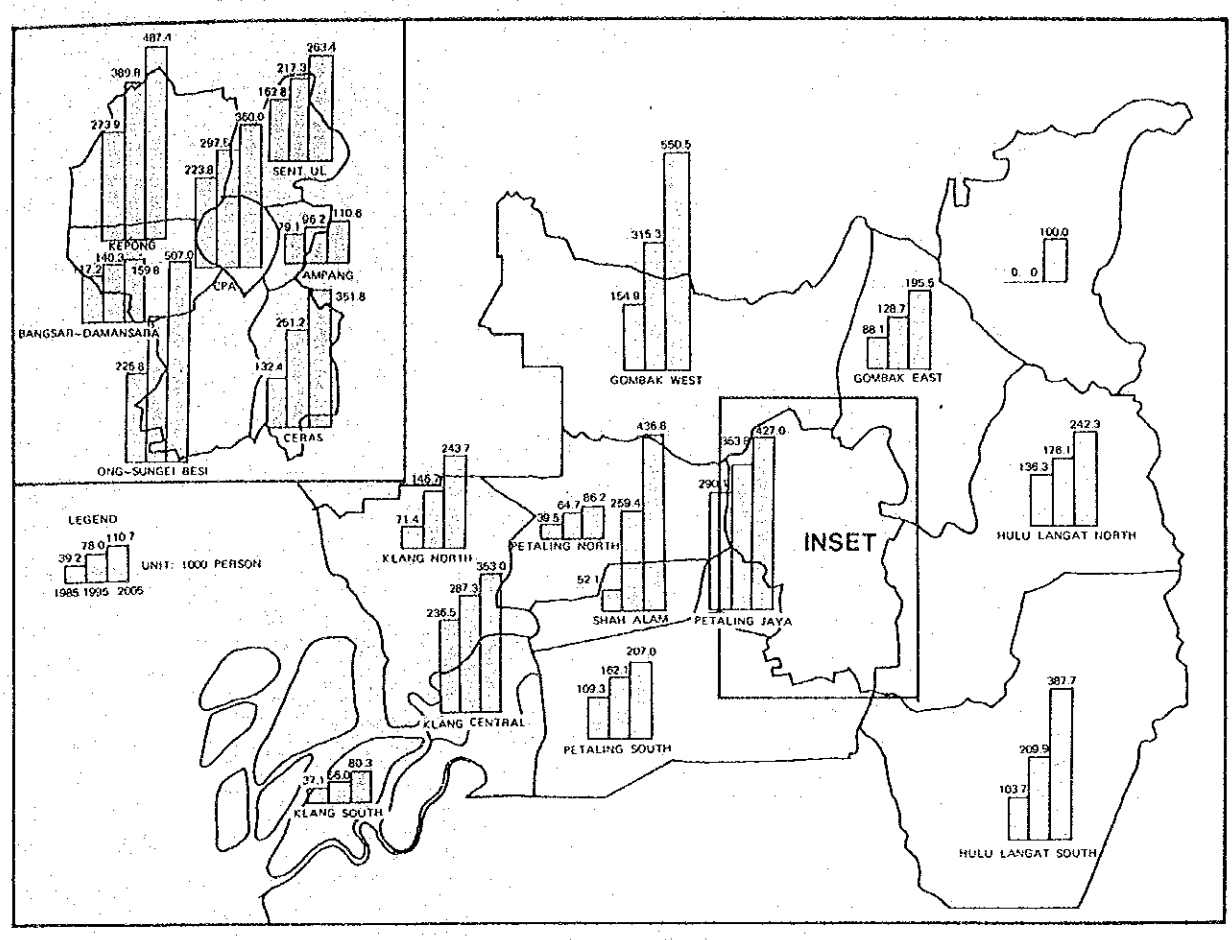


Figure 3: Population Distribution Plan

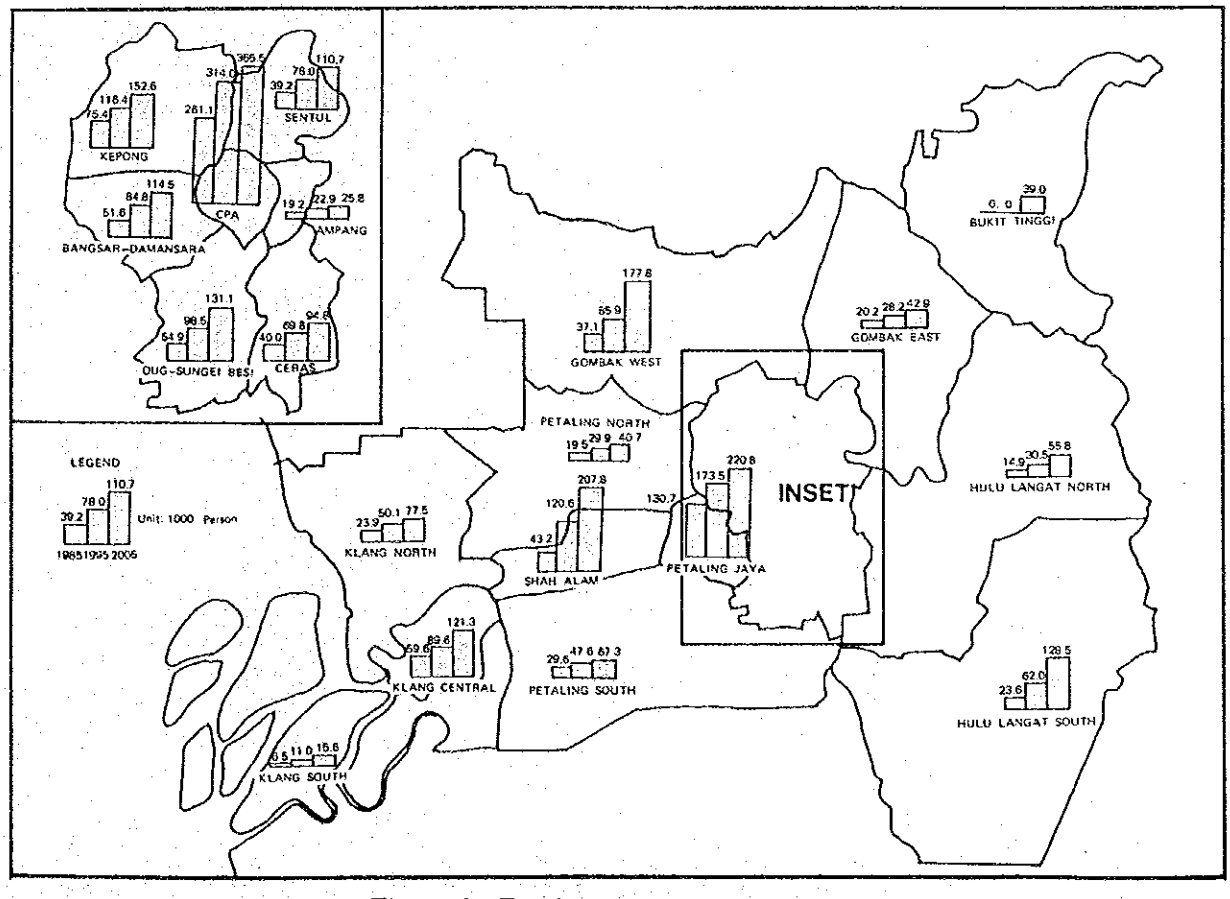
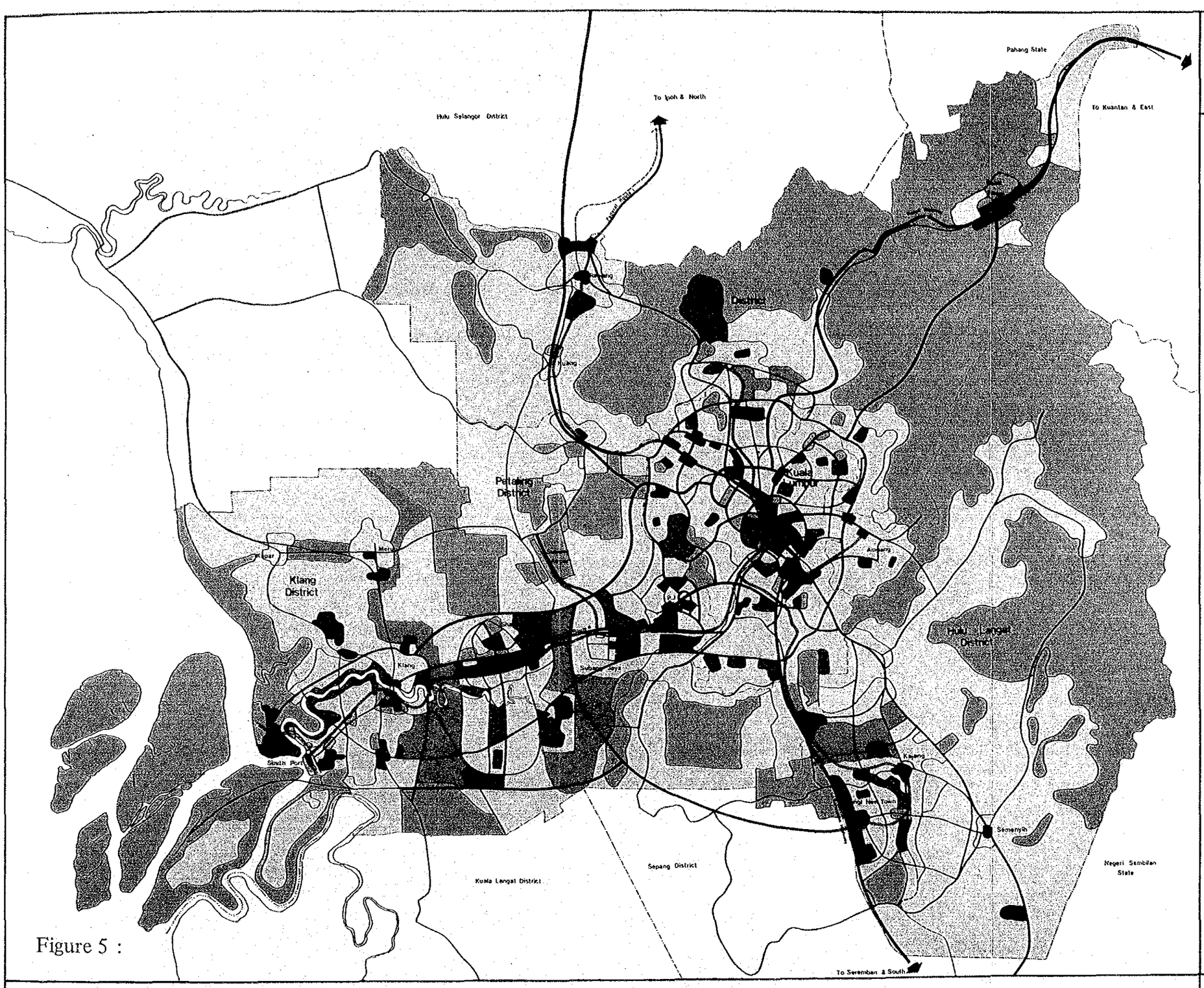


Figure 4: Employment Distribution Plan



KLANG VALLEY
TRANSPORTATION STUDY

LEGEND

- Residential
- Commercial
- Industrial
- Institutional
- Recreation
- Buffer Zone
- Mining
- Nature Reserve
- Agricultural
- Expressway
- Major Distributor
- Railway
- Mass Rapid Transit Railway
- Klang Valley Boundary
- District Boundary
- State Boundary

Figure 5 :

PROPOSED FUTURE LANDUSE PLAN IN YEAR 2005

0 1 2 5 10 15 Km

2. PRESENT AND FUTURE TRANSPORT PROBLEMS AND ISSUES

2.1 Present Transport Problems

(1) Road Transport

(a) Inadequate Road Network

Delay in the implementation of road network system in the Klang Valley has not been helpful in achieving the targets and growth strategy of the proposed six (6) urban centres structure in the Klang Valley.

(b) Lack of Coordination between Urban and Transport Development

The approvals for housing projects, office buildings and shopping complexes give little consideration to the needs of commuters to and from these developments and the resultant impact on traffic in the surrounding areas. Moreover, direct access to major distributors especially the Ring Roads are not satisfactorily controlled. The latter has resulted in a drop in their traffic capacities which they were planned to carry.

(c) Delay in Travel Time

The high travel demand on the semi-developed existing road network has caused serious traffic congestions during the morning and evening peak hours. This has resulted in the doubling or sometimes tripling of travel times and costs for the road users during these hours.

(d) Traffic Bottlenecks and Low Capacity Transport Facility

Incompatible and low capacity intersections such as roundabouts, at-grade intersections along the major roads in Kuala Lumpur Conurbation, in Klang and along the Kuala Lumpur-Klang Corridor; narrow bridges and at-grade rail crossings are traffic flow bottlenecks and causes of traffic congestion. This is particularly conspicious along Jalan Cheras, Jalan Kepong and Jalan Ipoh.

Traffic congestion in the surrounding areas of Kuala Lumpur Conurbation and the other urban centres occur during the peak and working hours mainly because of under-capacity road conditions and facilities. Major radial roads in Kuala Lumpur like Jalan Ampang and Jalan Pahang have relatively low capacity for their functions.

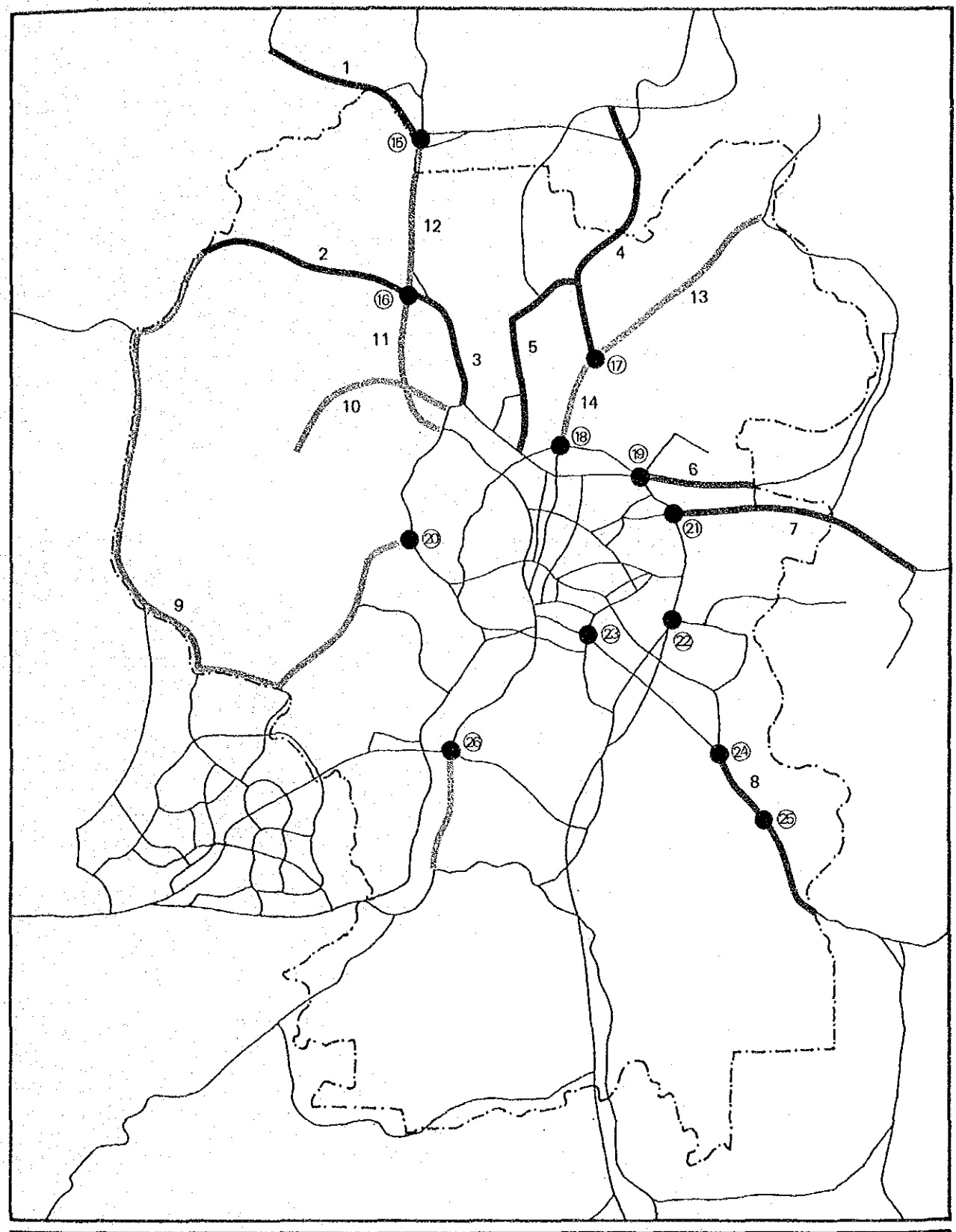
Table 7 : Existing Traffic Conditions in the Klang Valley

A) Kuala Lumpur Conurbation (see Figure 6)

Traffic Conditions	No.	Location
Roads with Traffic Congestion Degree 2.0 and above	1	Jalan Ipoh (From Batu Caves to Pasar Borong)
	2	Jalan Kepong
	3	Jalan Ipoh (Kepong Roundabout to Jalan Duta Junction)
	4	Jalan Gombak
	5	Jalan Sentul
	6	Jalan Datuk Keramat
	7	Jalan Ampang
	8	Jalan Cheras
Roads with Traffic Congestion Degree 1.5 to 1.9	9	Jalan Damansara
	10	Jalan Segambut
	11	Jalan Kuching
	12	Jalan Ipoh (Kepong Roundabout to Batu Caves Junction)
	13	Jalan Genting Klang
	14	Jalan Pahang
Congestion Caused by Low Capacity Intersection	15	Jalan Batu Caves Junction
	16	Kepong Roundabout
	17	Jalan Gombak/Pahang Intersection
	18	Jalan Pahang Roundabout
	19	Jalan Gurney Intersection
	20	Jalan Duta/Semantan Intersection
	21	Jalan Ampang/Tun Razak Intersection
	22	Jalan Tun Razak/Jalan Kg. Pandan Intersection
	23	Edinburgh Roundabout
	24	5.5 km Jalan Cheras Roundabout
	25	8 km Jalan Cheras Roundabout
	26	Jalan Klang Lama/Syed Putra Intersection

B) Other Klang Valley Area (see Figure 7)

Roads with Traffic Congestion Degree 2.0 and above	27	Federal Highway (From Subang to Shah Alam)
	29	Jalan Vantooren
Roads with Traffic Congestion Degree 1.5 to 1.9	28	Federal Highway (Klang to Shah Alam)
	30	Jalan Langat
Congestion Caused by Low Capacity Intersection	31	Jalan Kim Chuan Intersection
	32	7-Legged Roundabout
	33	Berkely Roundabout
	34	North Klang Straits Bypass/Federal Highway II I/C
	35	Batu Tiga Intersection
Congestion due to Narrow Bridgeway	36	Kota Bridge over Klang River
Area with Large Volume of Through Traffic on poor Condition Street	37	Kajang
	38	Rawang



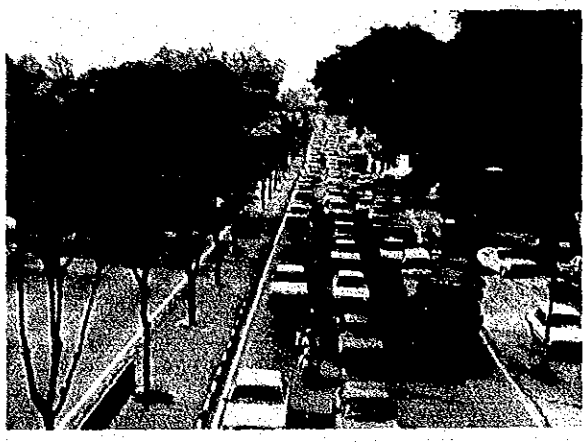
LEGEND

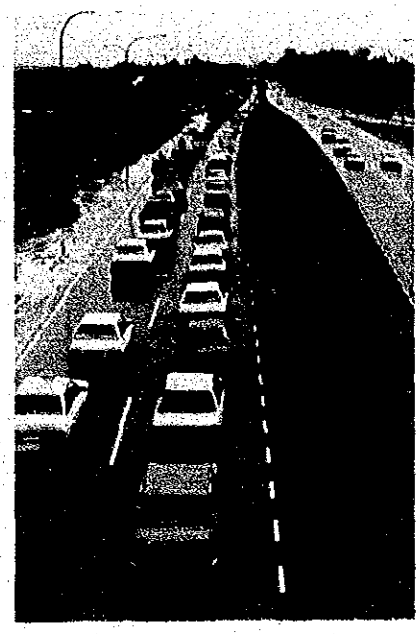
- ROAD WITH CONGESTION DEGREE 2.0 & ABOVE
- ROAD WITH CONGESTION DEGREE 1.5 - 1.9
- CONGESTION CAUSED BY LOW CAPACITY INTERSECTION

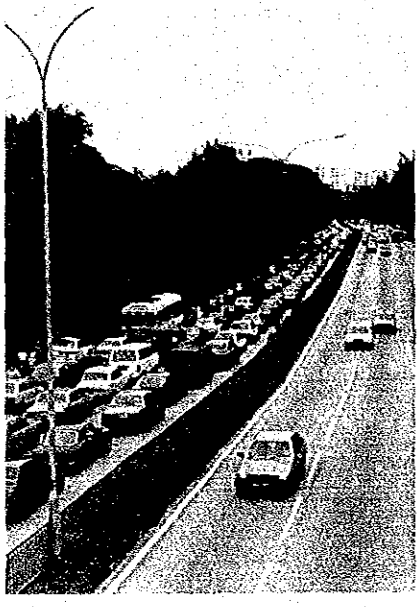
Figure 6:
Existing Traffic Conditions
in Kuala Lumpur Conurbation

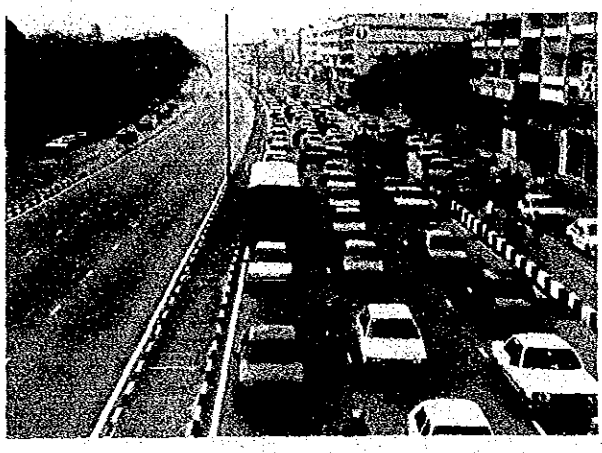
0 1 2 3 4 5 km

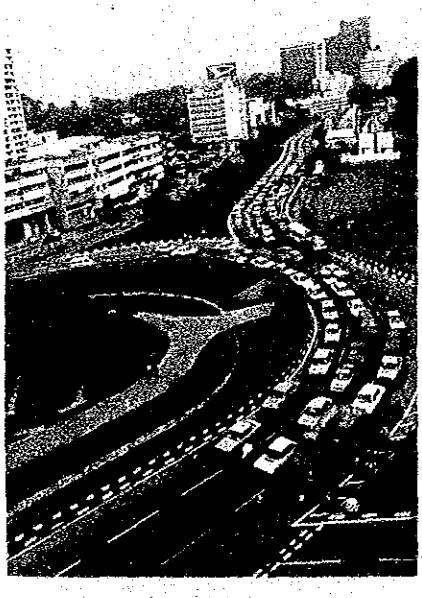
KLANG VALLEY
TRANSPORTATION STUDY

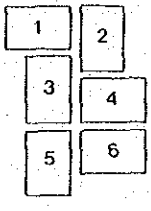












1. Heavy traffic congestion on Jalan Cheras during the morning rush hours.
2. Bumper to bumper queue of vehicles on the Federal Highway between Shah Alam and Subang towards Kuala Lumpur in the morning.
3. Traffic standstill on Jalan Tun Razak towards Jalan Pahang in the evening hours.
4. Traffic Congestion on Jalan Loke Yew towards Kuala Lumpur in the morning rush hours.
5. There remains a number of roundabouts like the Edinburgh Circle here which often are the traffic bottlenecks in the city.
6. Another obsolete roundabout at 5 km. Jalan Cheras with vehicles jamming up the roundabout.

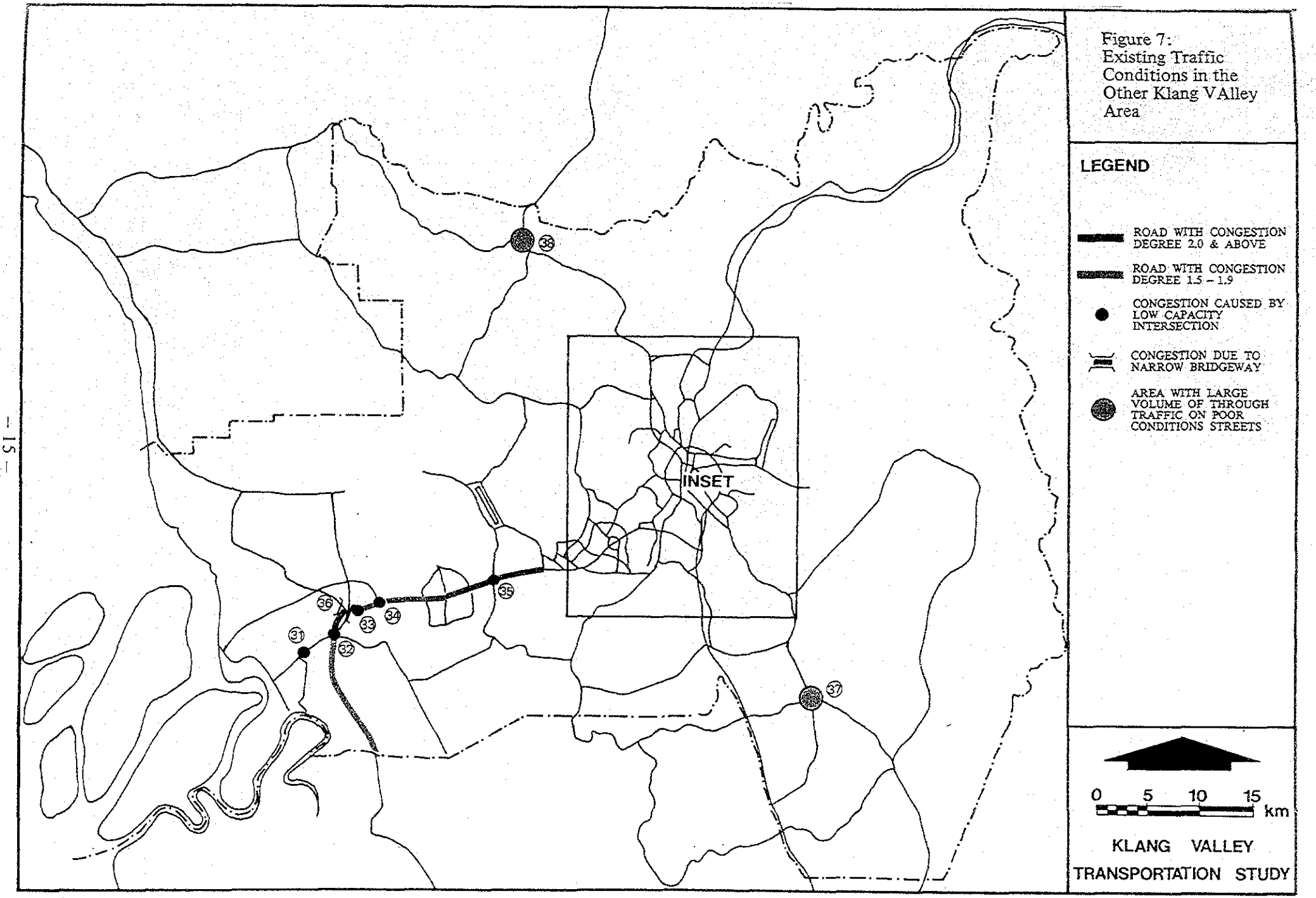


Figure 7:
Existing Traffic Conditions in the Other Klang VAlley Area

(2) Public Transport

(a) Inadequate Bus Route Network

There is no town bus service within Shah Alam. The other areas lacking bus services are new residential estates in Petaling Jaya, Ampang-Ulu Langat, Selayang and Setapak-Wangsa Maju areas.

(b) Low Frequency of Bus Services

Bus schedules approved by the authority are seldom followed strictly. Among the bus routes surveyed, 73% were operating below the approved scheduled frequencies.

(c) Long Bus Travel Time

Little priority of road space exists for bus transport. Buses have to compete with other road users and this has resulted in their inefficient service and low travel speed at about 18 kph at peak hour. Other measures like one way street and no right turning have also caused an increase in travel time. Delay in travel time is particularly large along Cheras-Kuala Lumpur corridor, Jalan Sungei Besi and Jalan Pahang/ Genting Klang.

(d) Overloading of Passengers in Buses

Passenger traffic on bus transport always exceeds its capacity during peak periods. During the rush hours, the average occupancy on stage bus is about 70 passengers while that of the minibus is about 40 passengers.

(e) Others

The other public transport problems identified are : –

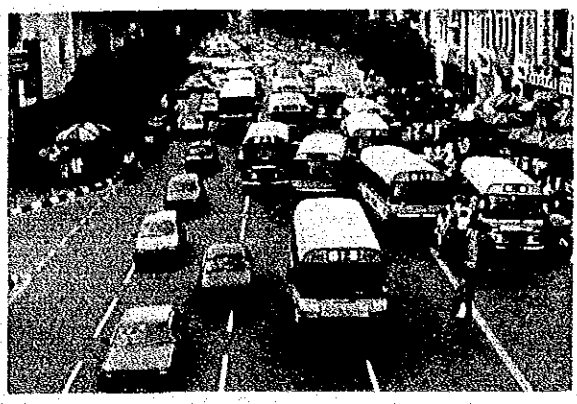
- Poor Terminal Facilities
- Lack of Bus Monitoring Systems
- Lack of Bus Service Information system
- Absence of Rail Commuter Service

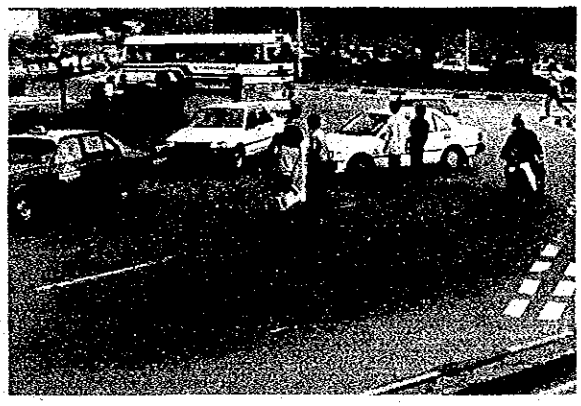
(3) Other Transport Facilities

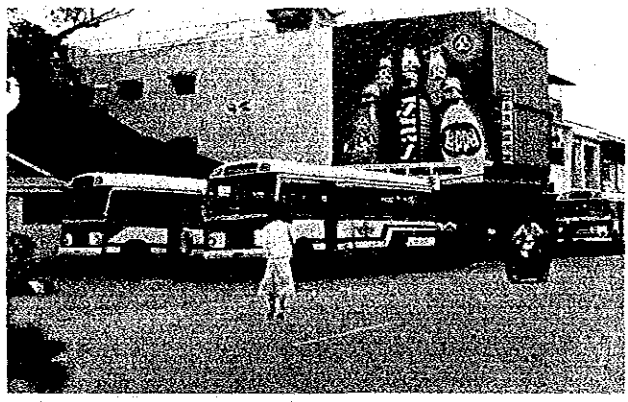
(a) Operation of the Central Area Traffic Control System (ATC) in Kuala Lumpur is not always satisfactory. The cycle lengths of signal changes (Jalan Sultan Ismail, Jalan Klang Lama and Jalan Kepong) are excessive causing unnecessary long delays.

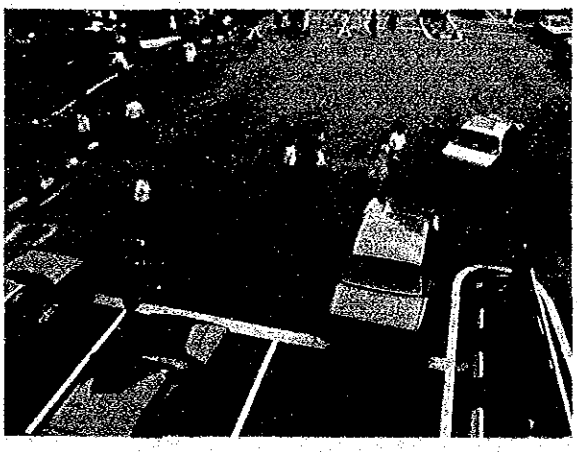
(b) Traffic control devices are outdated, not properly installed or inadequate in the other urban centres like Klang or Shah Alam.

(c) Pedestrian facilities such as side-walks and pedestrian crossings are not sufficient or conducive to use, even in areas like shopping complexes, office buildings and school zones. There is no well defined pedestrian path network in the city centre.









7	8
9	
10	11
12	

7. Jamming of Mini Buses hindering the flow of traffic at Chowkit Shopping area in the evening.
8. Overcrowding of passengers in stage buses where passengers have to ride precariously on the steps.
9. Overcrowding of passengers at bus stop which lack proper shelter and bus information at Lebuh Ampang.
10. Braving the heavy traffic to get to the Pudu bus terminal.
11. Poor bus terminal facility at Rawang.
12. Widespread jay walking in central shopping areas due to the lack of proper pedestrian signals and crossing provisions.

(d) Disorderly parking and on-street parking often cause traffic congestion in the urban areas.

(4) Implementation Authority

The responsibility and authority to plan, implement, license, monitor and manage the operation of transport facilities and systems in Klang Valley rest in the hands of too many agencies which make effective coordination a difficult task.

2.2 Foreseeable Future Transport Problems

With the present population expected to increase by 1.6 times by 1995 and more than double by 2005, employment and vehicle ownerships are also expected to increase proportionally in the coming two decades. Consequently the daily number of person trips in Klang Valley is expected to grow from 6.4 million in 1985 to 10.2 million trips by 1995 and 14.6 million trips by 2005.

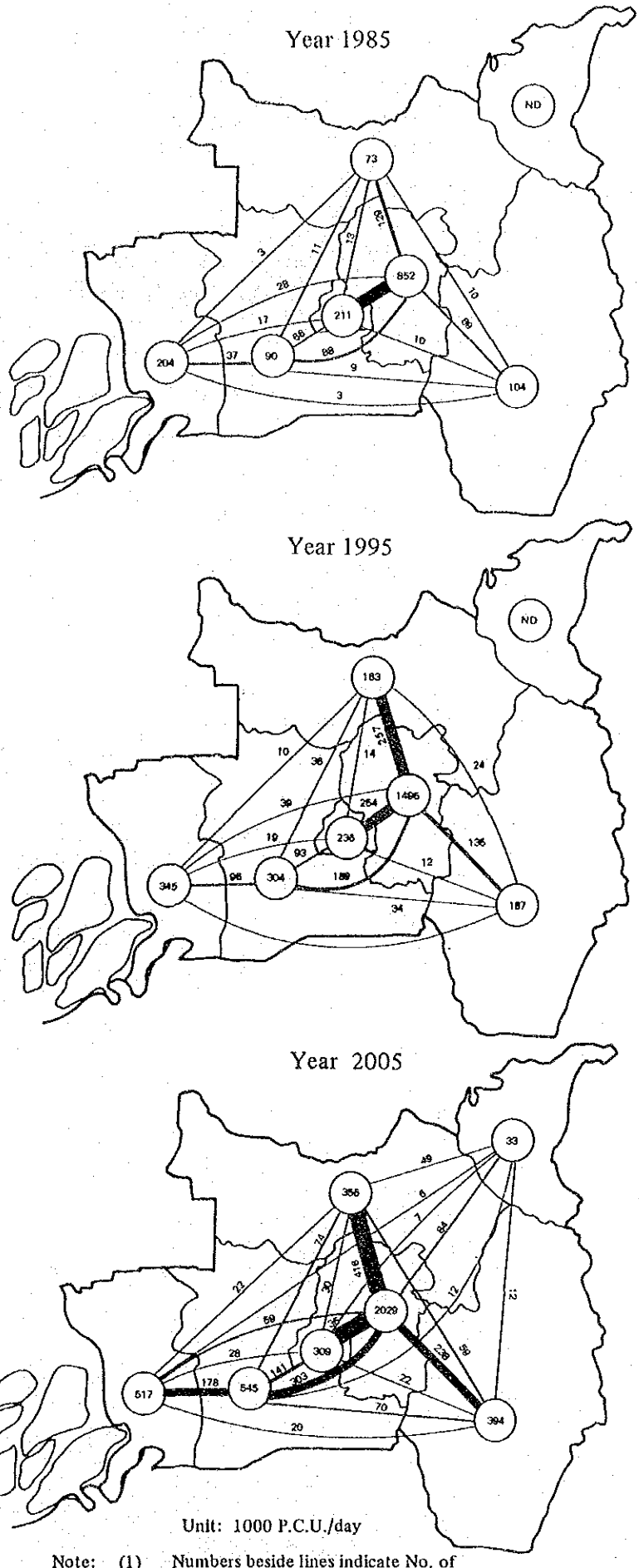
Table 8 : Daily Person Trip Production, Klang Valley, 1985 – 2005

Trip Purpose	1985	1995	2005	Average Annual Growth Rate (%)	
	(In Person Trips/Day)			1985 – 1995	1995 – 2005
To Work	936,500 (14.6%)	1,493,300 (14.7%)	2,136,400 (14.7%)	4.8	3.6
To School	678,200 (10.6%)	1,098,600 (10.8%)	1,548,900 (10.6%)	4.9	3.5
Business	402,900 (6.3%)	676,100 (6.7%)	1,066,300 (7.3%)	5.3	4.7
Private	1,701,200 (26.5%)	2,690,000 (26,5%)	3,867,000 (26.5%)	4.7	3.7
To Home	2,706,700 (42.0%)	4,208,100 (41.3%)	6,013,100 (40.9%)	4.5	3.6
Total	6,425,500 (100%)	10,166,100 (100%)	14,571,700 (100%)	4.7	3.7

The traffic volume between Kuala Lumpur and Shah Alam would increase 3.8 times from 88,000 passenger car unit (PCU) a day in 1985 to 383,000 PCU a day in 2005.

The traffic volume between Kuala Lumpur and Petaling Jaya would have increased by 1.6 times from 226,000 PCU a day in 1985 to 354,000 PCU a day by 2005.

Traffic on the Kuala Lumpur-Gombak corridor will increase by 3.2 times by 2005 and it will be 3.4 times for the Kuala Lumpur-Bangi Corridor, 4.8 times between Shah Alam and Klang (Figure 8).



Note: (1) Numbers beside lines indicate No. of Inter Zonal vehicle trip movements in thousands

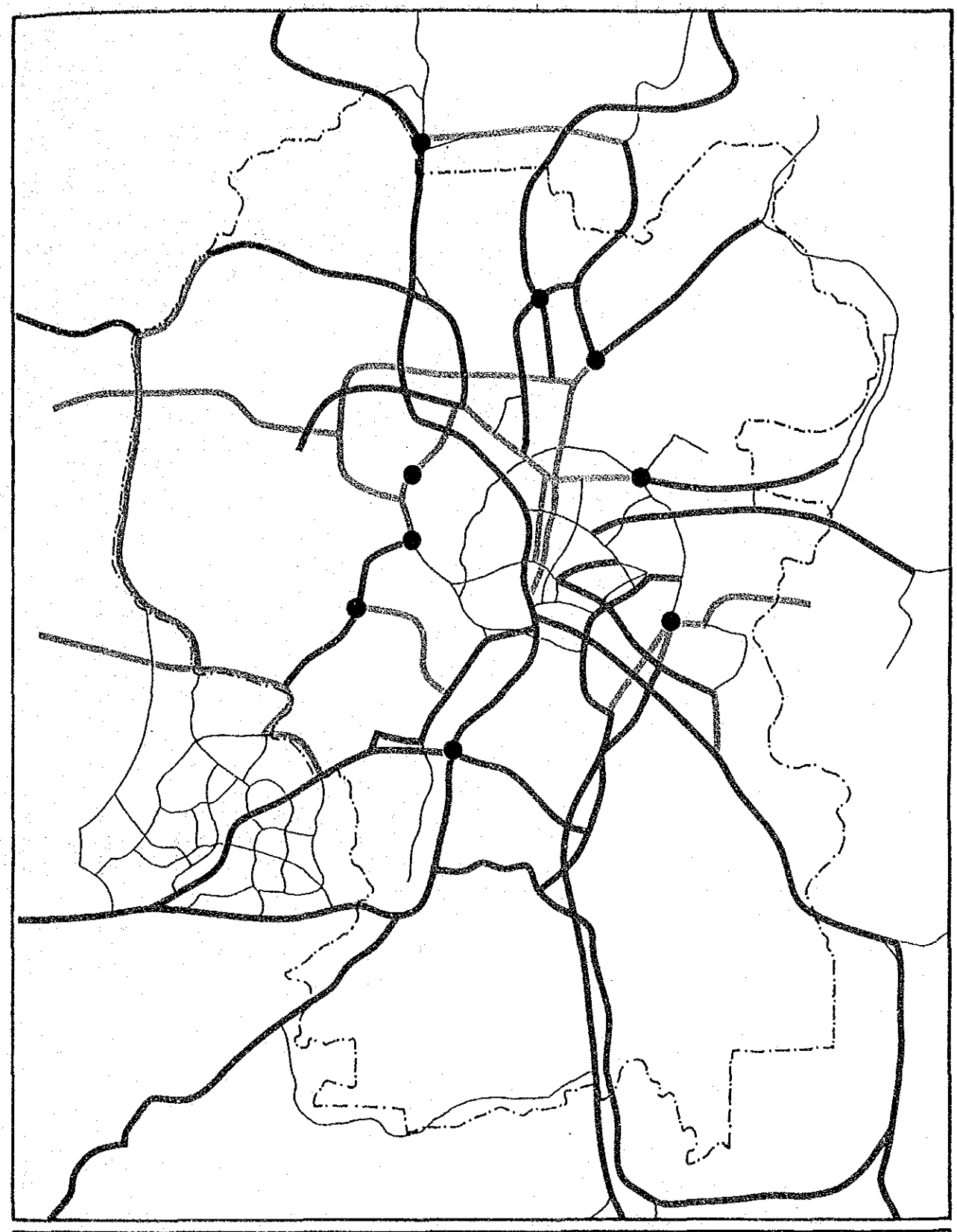
(11) Numbers inside circles indicate No. of Intra Zonal vehicle trip movements in thousands

Figure 8: Desire Line of Vehicular Trips by All Purpose, Klang Valley, 1985-2005

(a) Deterioration of Traffic Congestion

In the Klang Valley the amount of road traffic measured by vehicle kilometer is expected to grow from 24.9 million passenger car unit.km (PCU.km) in 1985 to 48.9 million PCU.km in 1995 and 87.0 million PCU.km in 2005. Under the "do-nothing" case this rapid increase in road traffic demand will cause the congestion degree of 0.98 in 1985 to worsen to 1.83 in 1995 and 3.26 in 2005.

In the Federal Territory of Kuala Lumpur, the congestion degree will worsen from the present 1.1 to 2.86 in 2005. The Kepong area, Cheras area and Damansara area will be the regions most severely affected by traffic congestion (Figure 9).



LEGEND

ROAD WITH CONGESTION DEGREE 2.0 & ABOVE

ROAD WITH CONGESTION DEGREE 1.5 - 1.9

CONGESTION CAUSED BY LOW CAPACITY INTERSECTION

Figure 9:
Future Traffic Conditions Under 'Do-Nothing' Case in Kuala Lumpur Conurbation, 2005

0 1 2 3 4 5 km

KLANG VALLEY TRANSPORTATION STUDY

In the rest of Klang Valley, the present congestion degree of 0.9 will worsen to 3.52 by 2005. In Petaling Jaya, the congestion degree will worsen from 0.8 to 2.0 by 2005. Traffic flow along the Federal Highway II will likely be paralysed by the tremendous demand. Other areas such as Gombak West (Selayang), Klang Central (Klang Old Town and South Port Area) and Petaling Jaya will also be severely affected under the "do-nothing" case (Figure 10).

(b) Worsening of Public Transport Services

The total number of public transportation trip is expected to increase from 1.6 million trips in 1985 to 3.5 million trips by 2005. It is doubtful that under the "do-nothing" situation the expected future public transportation demand can be handled satisfactorily by the existing public transportation system both in terms of service level and transport capacity.

(c) Future Conditions tend to encourage the use of private over public transport

Without any deterrent towards private vehicle usage, the private mode share is expected to form 70% of mode choice for interzonal trips while the public transportation's share will be reduced to 30% by 2005. Lack of any policy to encourage the use of public transportation will cause its mode share to decrease while private vehicles will continue to create massive congestion in the road network system.

(d) Longer Travel Distances

Under the "do-nothing" situation, the average trip length per person trip in Klang Valley is expected to increase from 12.2 km in 1985 to 15.2 km in 2005. It is anticipated that further urbanization of the region in the coming two decades will cause travel distance to increase thereby increasing road traffic demand.

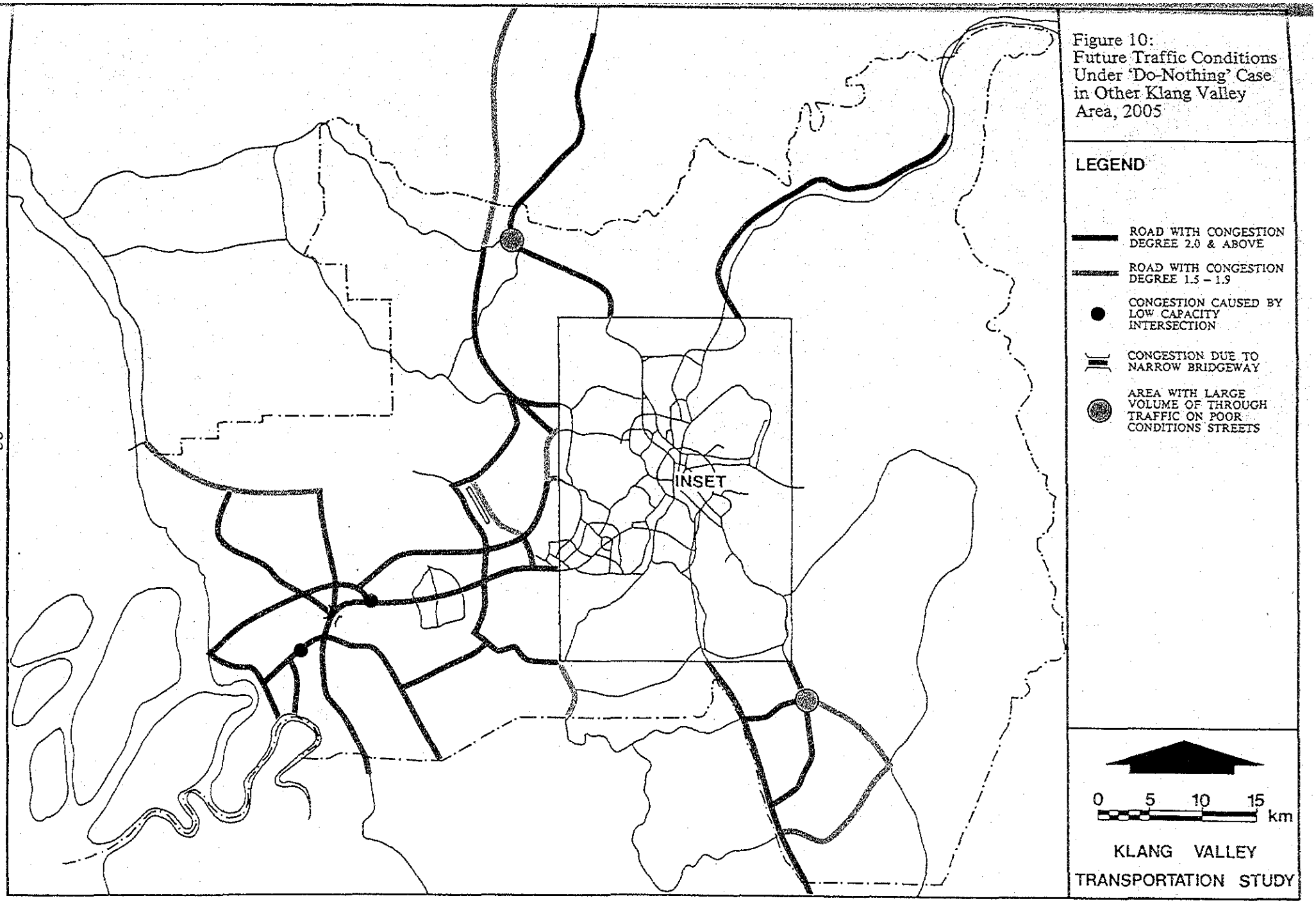


Figure 10:
Future Traffic Conditions Under 'Do-Nothing' Case in Other Klang Valley Area, 2005

3. EVALUATION OF ALTERNATIVE PLANS

3.1 Alternative Plans

A total of seven alternative plans were generated by different combinations of the transportation improvement strategies of road improvement/construction, bus system improvement and the introduction of Public Mass Transit System.

(1) 'Do-Nothing' Case: No further improvement to the existing transportation system is assumed in this case which represents the worst possible outcome in the future. This alternative functions as a control or bench-mark against which the other alternatives are evaluated.

(2) Alternative Plan 1-1: This alternative comprises of an effective road network proposed for the Klang Valley together with improvement to the existing bus system.

(3) Alternative Plan 1-2: This alternative is similar to Plan 1-1 except for a lesser road network for the Bangi area while better linkages are planned for the Sg. Buluh area.

(4) Alternative Plan 2-1: In addition to those proposed in Plan 1-2 this alternative includes an extensive mass transit network consisting of four(4) MRT and seven(7) LRT lines.

(5) Alternative Plan 2-2: This alternative comprises of Plan 1-2 together with a more realistic transit network of four(4) MRT and three(3) LRT lines.

(6) Alternative Plan 2-3: In addition to Plan 1-2 this alternative proposes an MRT only transit plan.

(7) Alternative Plan 2-4: This alternative comprises of Plan 1-2 and LRT only system plan.

At a later stage in the evaluation process, the traffic management measure option of vehicle restraint in the CPA of Kuala Lumpur is applied to these alternatives as Plan 1-1-w, 1-2-w, 2-1-w, 2-2-w, 2-3-w and 2-4-w to measure its added benefits to the overall plans.

3.2 Evaluation Criteria

The evaluation criteria used in the evaluation of alternative transportation plans are:-

(a) Functional Suitability of Transportation Systems

(b) Financial Analysis of Private and/or Public Enterprises

(c) Economic Evaluation

3.3 Functional Suitability

The functional suitability evaluation is done on the alternative plans using the following indicators,

(a) Volume/Capacity Ratio (Congestion Degree)

(b) Travel Speed

(c) Trip Length

(d) Travel Time

(e) Balance in Private/Public Mode Share

In terms of the functional suitability, although Plans 1-1 and 1-2 are capable of alleviating the level of traffic congestion that would occur in the case of 'Do-Nothing' alternative, the introduction of transit system to Plans 2-1, 2-2, 2-3 and 2-4 is found to perform better with a further reduction of traffic congestion degree and a more balanced mode share.

Table 9: Comparison of Service Level on Road by Alternative Plan, Klang Valley, 2005

Indicators	Base Plan (Do-Nothing)	Plan 1-1	Plan 1-2	Plan 2-1	Plan 2-2	Plan 2-3	Plan 2-4
Total Road Length (km)	819	1,199	1,228	1,228	1,228	1,228	1,228
Average Travel Speed (Kph)	11	22	24	27	27	27	26
Average Trip Length (km/trip)	15.2	13.1	12.6	12.4	12.4	12.4	12.6
Average Travel Time (min/trip)	79	36	31	27	27	28	29
Congestion Degree	3.26	1.16	1.09	1.00	1.01	1.01	1.04

3.4 Financial Analysis

Financial analysis is carried out on the alternative transit introduction plans with and without the traffic restraint measures in Kuala Lumpur.

The results of the financial analysis are shown in Table 10.

Table 10: Financial Rate of Return for Alternative Mass Transit Introduction Plans

Alternative Plans	Year of Opening	
	1991	2005
Plan 2-1	5.9	9.1
Plan 2-2	8.9	11.6
Plan 2-3	12.3	16.7
Plan 2-4	1.7	4.2
Plan 2-1-W	6.1	9.3
Plan 2-2-W	9.2	11.9
Plan 2-3-W	12.7	17.5
Plan 2-4-W	2.0	4.4

The financial rate of return (FRR) for Plan 2-3 is 12.3% (if the MRT is opened in 1991) or 16.7% (if opened in 2000). Plan 2-3-w could increase the FRR by about 0.4% to 0.8%. This plan is found to be the most financially feasible plan among the alternatives.

Furthermore, the FRR of Plan 2-3 is found to increase to 13.9% and Plan 2-3-w to 14.4% if a phasing plan for the proposed MRT system is adopted. A sensitivity analysis conducted on the alternatives shows that even with a 50% reduction of passengers or revenues, the FRR of Plan 2-3 with a phasing plan is able to maintain at 4% (without Cordon pricing) and 4.7% (with cordon pricing) compared to the FRR of Plans 2-1 and 2-4 which fell to 0% and Plan 2-2 to 1.7%.

3.5 Economic Evaluation

The three major strategies of road network proposals, mass transit system network proposals and transport management policy measures are evaluated for their economic feasibility.

Both the alternative road proposals in Plans 1-1 and 1-2 are found to be economically feasible with B/C ratio of 11.6 and 12.2 respectively. Plan 1-2 is therefore more superior than Plan 1-1.

Table 11: Single Year Benefit-Cost Ratio by Road Network Plans in Klang Valley, 2005

Items	Plan 1-1	Plan 1-2
Cost of Roads (M$million)	4,080	4,330
Annualized Cost at 12% (M$million)	546	580
Annual Benefit (M$million)	6,361	7,095
B/C Ratio	11.6	12.2

Among the transit introduction plans, Plan 2-3 is found to have the highest B/C ratio of 3.8. With the Cordon Pricing Scheme, the B/C Ratio of this plan is able to increase to 4.1% (Table 12).

Table 12: Single Year Benefit-Cost Ratio by Mass Transit System Introduction Plans With and Without Cordon Pricing in Klang Valley, 2005

Plans	Project Cost (M$million)	Annualized Cost (M$million)	Annual Benefit (M$million)	B/C Ratio
Plan 2-1	3514	473	751	1.6
Plan 2-1-w	3516	470	806	1.7
Plan 2-2	2141	287	724	2.5
Plan 2-2-w	2143	287	777	2.7
Plan 2-3	1384	185	705	3.8
Plan 2-3-w	1386	185	761	4.1
Plan 2-4	1920	257	581	2.3
Plan 2-4-w	1922	257	648	2.5

Note: Annualized Cost is discounted at 12%.

4. PROPOSED TRANSPORTATION MASTERPLAN

4.1 Goals and Objectives for Transportation Development in the Klang Valley Region

The goals and objectives for transportation development in Klang Valley are formulated within the broad framework of the National Development Policy, in particular the New Economic Policy (NEP) and the regional development objectives spelled out in the Klang Valley Perspective Plan.

TG-1 To meet and promote economic and regional development of the Klang Valley

* Provision of an effective transportation system compatible with the national and regional economic development plan
* Improvement of access to the six(6) growth centres namely Kuala Lumpur, Shah Alam, Petaling Jaya, Klang, Bangi and Selayang with Bukit Tinggi Twin City and the existing urban and rural development areas
* Provision of access to the newly developed areas
* Provision of an economical and efficient transportation system

TG-2 To provide maximum mobility for people and goods

* Reduction of traffic congestion by increase in traffic capacity, dispersing traffic away from the congested roads and promotion of modal shift
* Provision of good quality and affordable public transport systems
* Introduction of alternative route or more efficient mode

TG-3 To provide a safer, pleasant and more efficient transportation system

* Reduction of the occurrence of traffic accidents
* Minimization of severity of traffic accidents
* Provision of safer facilities for pedestrians and motor cyclists

TG-4 To minimize resource consumption of the transportation system

* Conservation of energy by promoting the use of public mass transport
* Effective utilization of land space especially in the urbanised area

TG-5 To enhance environmental and community quality

* Minimization of negative environmental impacts including noise, vibration, emission, etc.
* Minimization of community disruption and displacement
* Provision of an adequate transportation system compatible with land-use plan

4.2 Proposed Overall Transport Policies

To achieve the goals and objectives mentioned above, the following overall transport policies are proposed.-

TP-1 Encouraging the development of mass transit system and improvement of the conventional bus transport system so as to prevent a totally motorized society. Hence the plan describing a balanced transport system is the most preferable.

TP-2 To attain the future development pattern consisting of an urban system of six(6) growth centres with Bukit Tinggi Twin City with their respective planned targets, an effective regional transportation network consisting of a hierarchial road network system and a mass transit railway system shall be established.

TP-3 The existing transportation facilities shall be effectively utilized as much as possible so as to obtain maximum effects with minimum social and capital costs.

TP4 The transportation development shall meet the varied transport demands both for the movement of people and goods taking into account specific needs to have the transport modes comprised of both innovative and conventional forms.

TP-5 To achieve efficiency on transport development, both infrastructure augmentation measures and the policy measures such as the traffic limitation programmes shall be considered.

TP-6 The road network to be provided shall be free from symptoms of the transport diseconomies such as bottleneck and stopshorts.

TP-7 Efforts should be directed to establish a road system based on functions to carry and accommodate different types of traffic including the provision of cycle path and pedestrian walks in residential zones in ensuring the possibility of maintaining a safe and conductive living environment.

TP-8 Efforts should be given to monitor traffic and hence reduce the occurrence of traffic accidents by the use of various traffic management methods.

4.3 Proposed Transportation Masterplan to Year 2005

The transportation masterplan which is the most efficient and likely to achieve the identified objectives in line with the identified overall transport policies is proposed and illustrated in Figure 11 and its major components described below:-

(1) Mass Transit Railway System

A Mass Transit Railway System is to be introduced as the major infrastructure of the public transportation system in the major corridors in the Klang Valley and viewed as a strategy for promoting urban and regional development. The proposed Mass Transit Railway Network consists of five(5) lines totalling 137 kilometers in length, i.e.:-

MR-1 Port Klang Line from Kuala Lumpur to Port Klang
MR-2 Northern Line from Kuala Lumpur to Rawang
MR-3 Batu Caves Line from Kuala Lumpur to Selayang
MR-4 Southern Line from Kuala Lumpur to Bangi New Town
MR-5 Ampang Line from Kuala Lumpur to Ampang

This system can be accomplished with comparatively lower investment costs by maximizing the utilization of the existing KTM (Malayan Railway) track reserves and facilities.

(2) Road Network Plan

The proposed six(6) urban centres with Bukit Tinggi will be interlinked by expressways and/or primary roads. The road network proposed for the Kuala Lumpur Conurbation shall be fully developed as a radial and circumferential road network in line with the urban development structure of a polycentric city with four(4) sub-centres at Damansara, Wangsa Maju. Bandar Tun Razak and Bukit Jalil.

The road network proposed for the Kuala Lumpur-Klang Corridor shall be developed into a multilinear ladder pattern following the east-west axis urban development concept and that for the other corridors in the Klang Valley shall be developed as a simple or multiple linear ladder pattern.

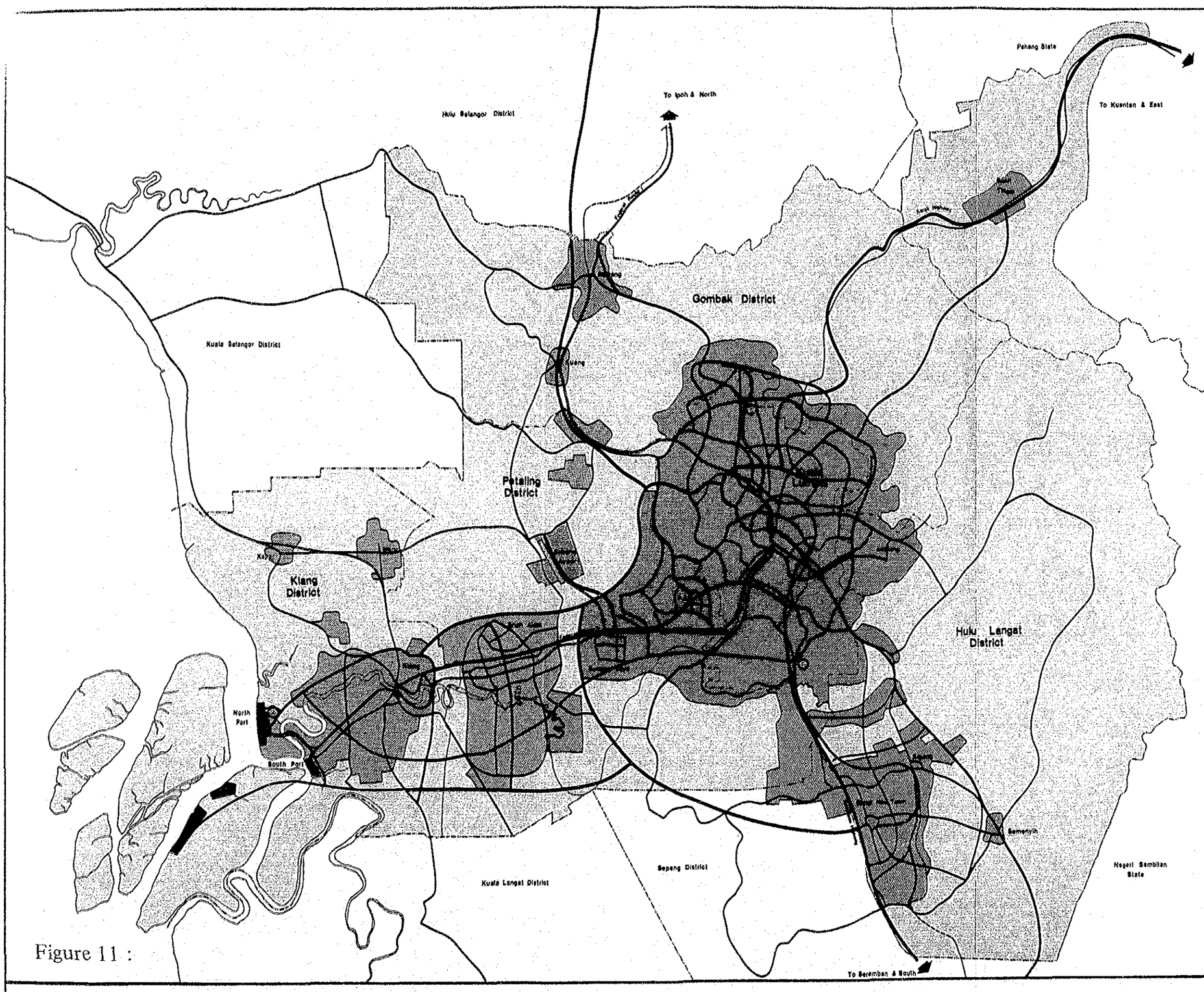
(3) Monitoring System

The situation of transport demands vary accordingly to the social, economic and landuse conditions. Since the future transport demands are predicted on the basis of assumptions made on the future landuse and socio-economic condition, it follows that the future traffic demands should be carefully monitored in relation to the proposed transportation systems. The Study Team, therefore, proposes:-

(a) to strengthen the monitoring system on the traffic demands and the transportation systems.

(b) that the Klang Valley Planning Secretariat in the Prime Minister's Department should constantly monitor and analyse the transport situations in Klang Valley so as to prepare proper countermeasures and coordination whenever any problem should arise in future.

(c) to review the transport study every five(5) years.



KLANG VALLEY TRANSPORTATION STUDY

LEGEND

- Mass Rapid Transit Railway
- Expressway
- Primary Distributor
- District Distributor
- Existing Railway
- Urbanised Area
- Agricultural & Forest Area
- Port
- Freight Terminal
- Airport
- Klang Valley Boundary
- District Boundary
- State Boundary

Figure 11 :

PROPOSED TRANSPORTATION MASTER PLAN IN 2005

Scale : 0 1 3 5 10 15 Km

4.4 Public Transportation Plan

4.4.1 Mass Transit Railway Introduction Plan

(1) The System

The proposed System would be the Mass Rapid Transit Railway (MRT) System which can be seen in some major cities in the world. The proposed MRT System would have the following system characteristics.

Train Composition	:	2 vehicles to 6 vehicles
Vehicle length	:	20 metres
Vehicle Capacity	:	250 pass/veh
Seated	:	54 pass/veh
Standing	:	196 pass/veh
Maximum Speed	:	85 km/h
Operating Speed	:	40 – 60 km/h
Capacity	:	10,000 – 30,000 pass/hr/direction

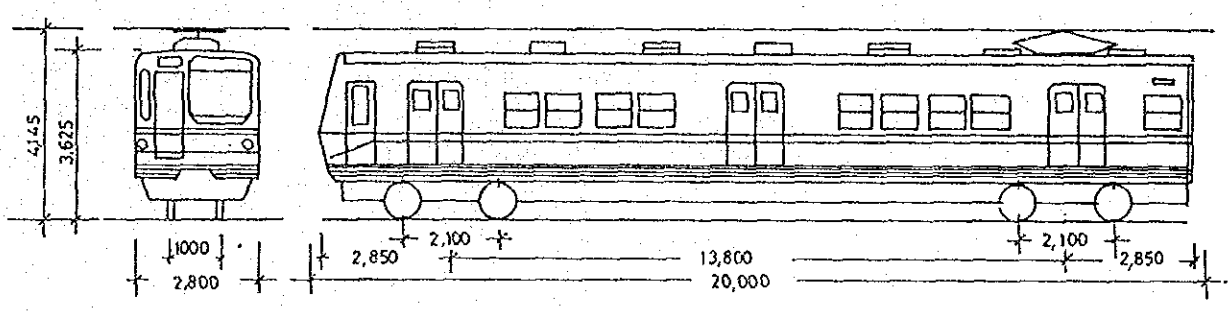


Figure 12 : The Proposed MRT Train

(2) The Network

The proposed MRT Network which make up the five(5) lines, i.e. Port Klang Line including Airport Branch line, Northern Line, Batu Caves Line, Southern Line and Ampang Line has a total length of approximately 137 kilometers (Table 13). The proposed network utilizes mostly the existing KTM (Malayan Railway) track reserves and facilities with the construction of some missing links and some extensions. The whole system is estimated to cost about M$1384 million.

Table 13: Proposed Mass Rapid Transit (MRT) Railway System for Klang Valley

Line Name	Origin	Destination	Total Length (km)	Total Project Cost (M$million)
MR-1 Port Klang Line	Kuala Lumpur	Port Klang	49.3	360
MR-2 Northern Line	Kuala Lumpur	Rawang	31.8	288
MR-3 Batu Caves Line	Kuala Lumpur	Selayang	17.3	213
MR-4 Southern Line	Kuala Lumpur	Bangi New Town	31.6	302
MR-5 Ampang Line	Kuala Lumpur	Ampang	11.4	221
Total			141.4*	1384

Note: * Actual track length is only about 137 km because of overlapping of routes.

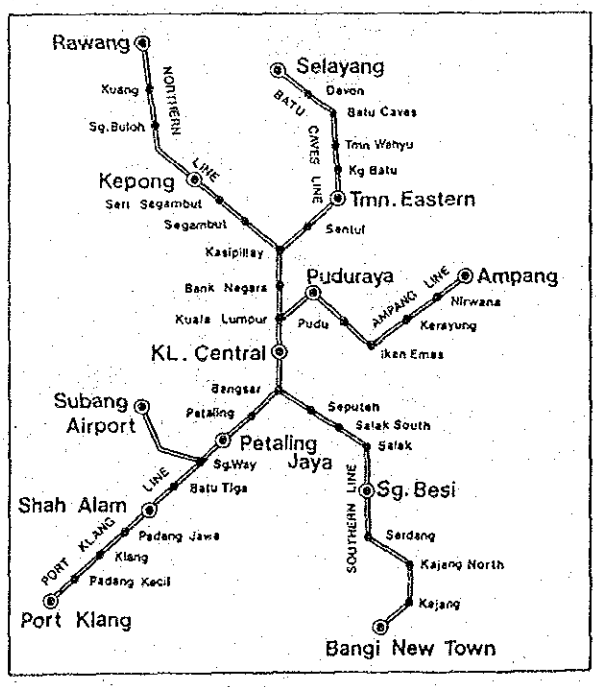


Figure 13 : The Proposed MRT Network in Klang Valley

(3) MRT System Development Plan

The MRT System is proposed to be developed with the following features:-

(a) Double Tracking and Meter Gauge

(b) Electrification using the overhead trolley and feeder line system

(c) Centralized Traffi c Control Devices (CTC) and Controlled Automatic Train Stop Devices (ATS)

(d) Provision of related facilities like bus feeder to the MRT stations, station plaza and landuse control along MRT lines

(e) Phasing of the MRT System

The following phasing plan is proposed.

Phase	Target Opening Year	Section or line of the MRT System
1	1991	* Taman Eastern - Kuala Lumpur * Kepong - Shah Alam
2	1996	* Kuala Lumpur Central-Ampang * Selayang - Taman Eastern * Shah Alam - Port Klang * Sungei Way - Subang Airport
3	2000	* Kepong - Rawang * Kuala Lumpur Central-Bangi New Town

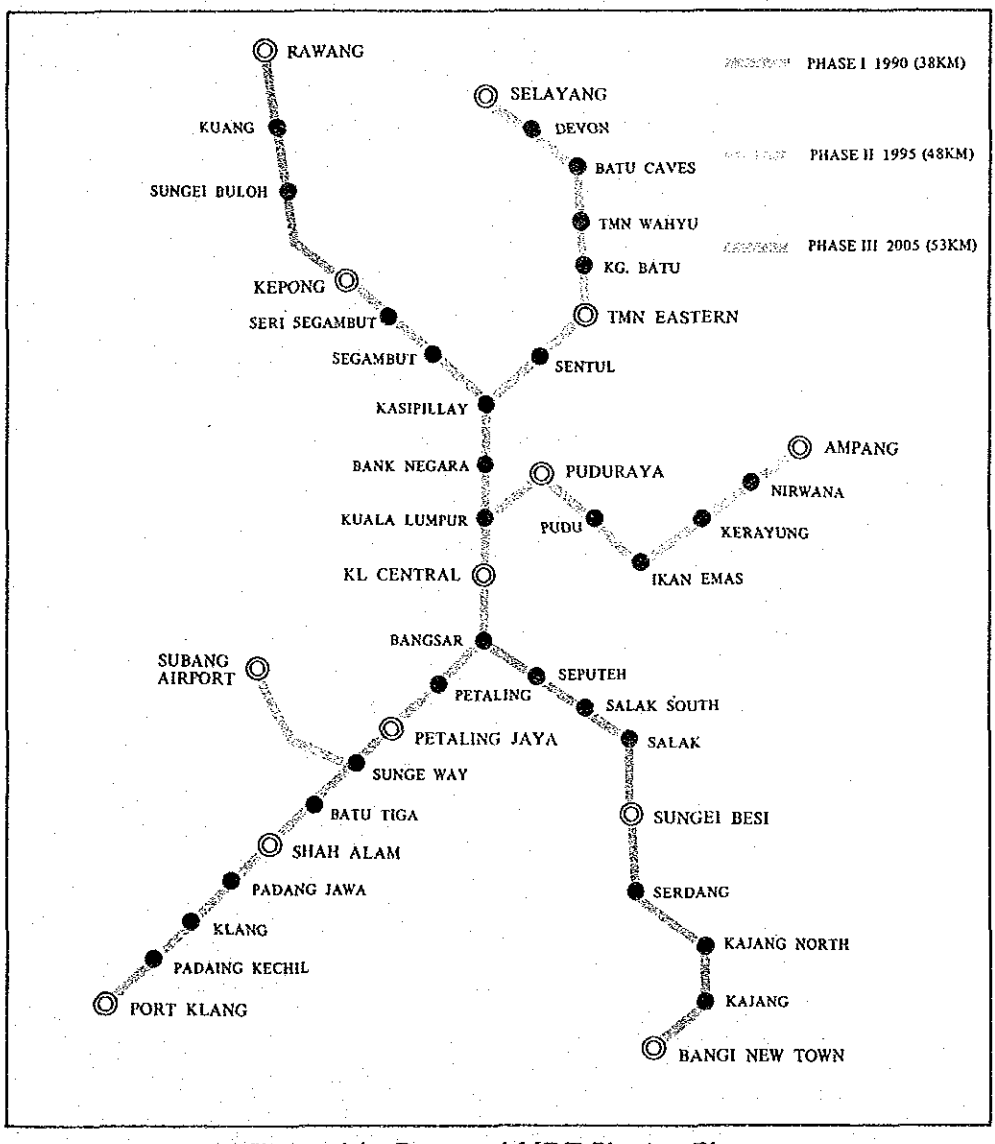


Figure 14: Proposed MRT Phasing Plan