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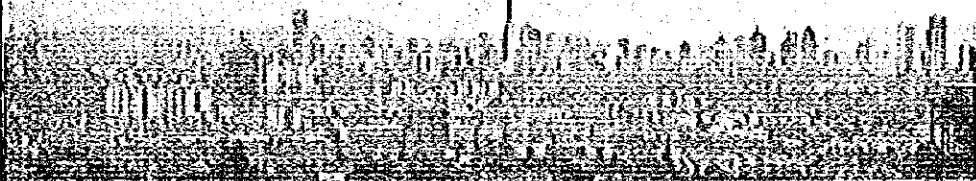
JAPAN INTERNATIONAL  
COOPERATION AGENCY

THE FEASIBILITY STUDY ON KUALA LUMPUR  
OUTER RING ROAD PROJECT IN MALAYSIA

FINAL REPORT

MAIN VOLUME

July, 1996



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ON  
KUALA LUMPUR  
OUTER RING ROAD PROJECT  
IN  
MALAYSIA

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FUKUYAMA CONSULTANTS  
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**Exchange Rates ( Equivalent in Malaysian Ringgit)**

Currency Unit	=	Ringgit Malaysia (RM)
RM 1.00	=	US\$ 0.40
RM 1.00	=	JY 39.37

(As of August 1995, Ministry of Finance)

## PREFACE

In response to a request from the Government of Malaysia, the Government of Japan decided to conduct a Feasibility Study on KUALA LUMPUR OUTER RING ROAD IN MALAYSIA and entrusted the study to Japan International Cooperation Agency (JICA).

JICA sent a study team to Malaysia between March 1995 and March 1996. The study team was headed by Mr. Hiroo Takeda and comprised members of Fukuyama Consultants International and Pacific Consultants International.

The team held discussions with the officials concerned of the Government of Malaysia and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

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

July 1996



Kimio FUJITA

President

Japan International Cooperation Agency

July 1996

Mr. Kimio FUJITA  
President  
Japan International Cooperation Agency  
Tokyo, Japan

Dear Mr. Fujita,

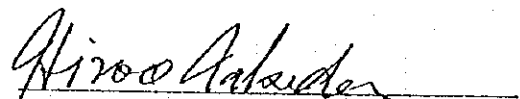
Letter of Transmittal

We are pleased to submit you the study report on the Feasibility Study on Kuala Lumpur Outer Ring Road Project in Malaysia. The report contains the advice and suggestions of the authorities concerned of the Government of Japan and your Agency as well as the formulation of the above mentioned project. Also included are comments made by the Economic Planning Unit (EPU) of the Prime Minister's department and the Highway Planning Unit (HPU) of Ministry of Works, Malaysia during technical discussions on the draft final report which were held in Kuala Lumpur.

This report presents a scheme for construction of the Kuala Lumpur Outer Ring Road and its possibility of privatization. In view of the urgency of the construction of the said road, we recommend that the Government of Malaysia implement this project as a top priority.

We wish to take this opportunity to express our sincere gratitude to your Agency and the Ministry of Foreign Affairs. We also wish to express our deep gratitude to the officials concerned of the EPU and the HPU of the Malaysian Government, the Japanese Embassy in Malaysia and Malaysia Office of your Agency for the close cooperation and assistance extended to us during our investigation and study.

Very truly yours,

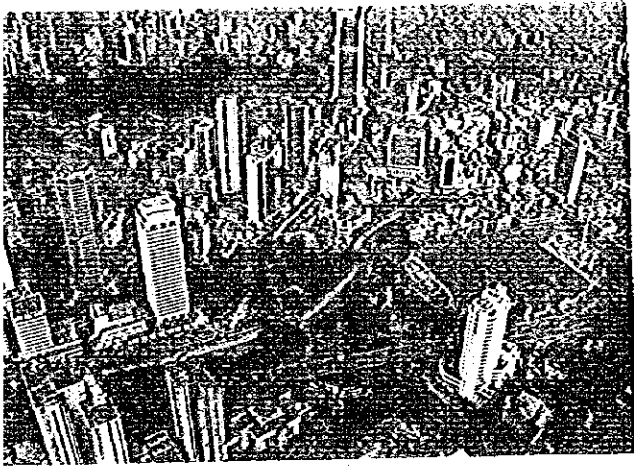


Hiroo Takeda

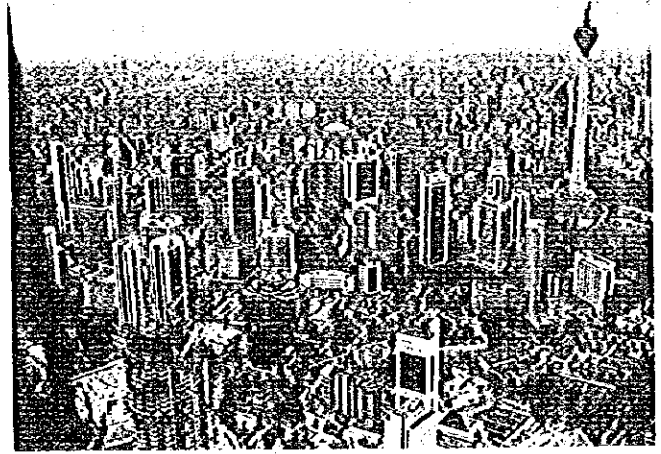
Team Leader

The Feasibility Study on Kuala Lumpur  
Outer Ring Road Project in Malaysia

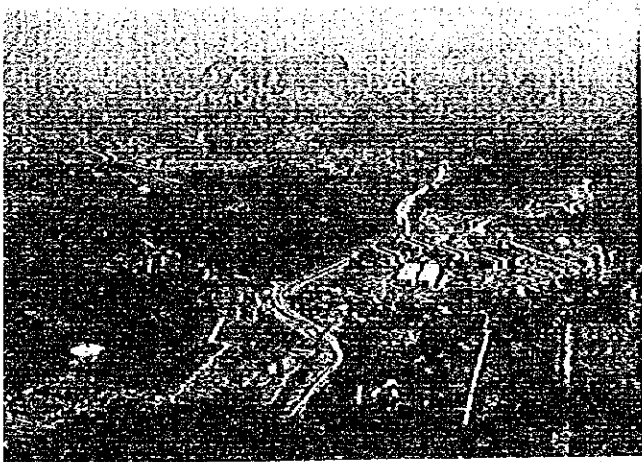




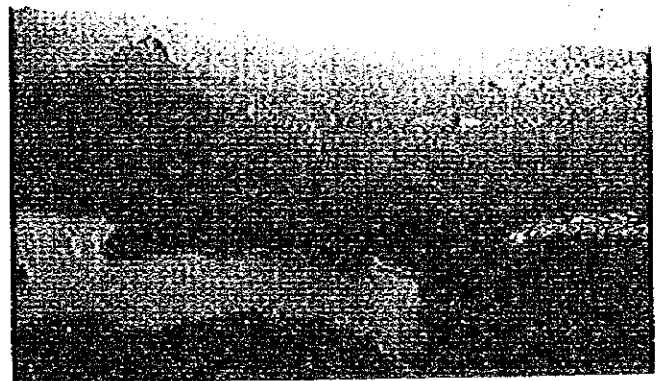
KUALA LUMPUR CENTRAL AREA (1),  
MERDEKA SQUARE ON THE RIGHT



KUALA LUMPUR CENTRAL AREA (2),  
KL TOWER ON THE RIGHT



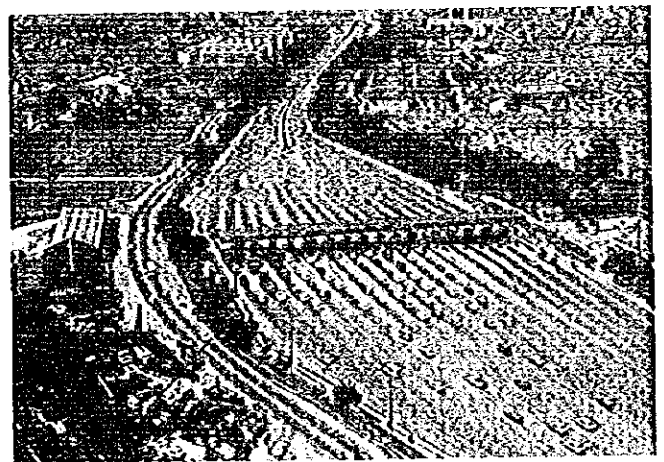
BATU CAVES ON THE FAR SIGHT  
AS SEEN FROM SENTUL



QUARTZ RIDGE AND KLANG GATE DAM



QUARTZ RIDGE AND KL - KARAK HIGHWAY



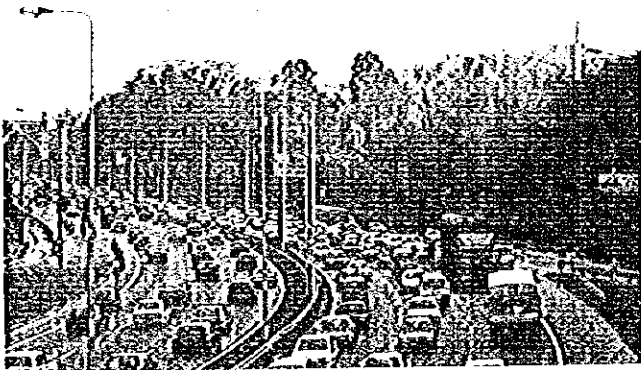
TOLL PLAZA AT JALAN IPOH,  
(FEDERAL ROAD 1)



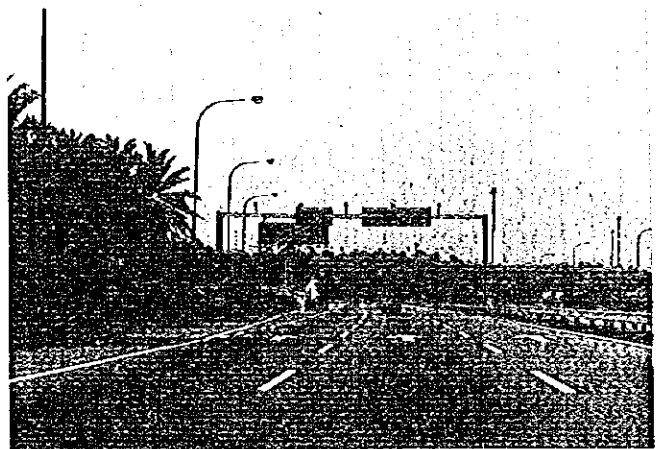
KANCHING FOREST RESERVE



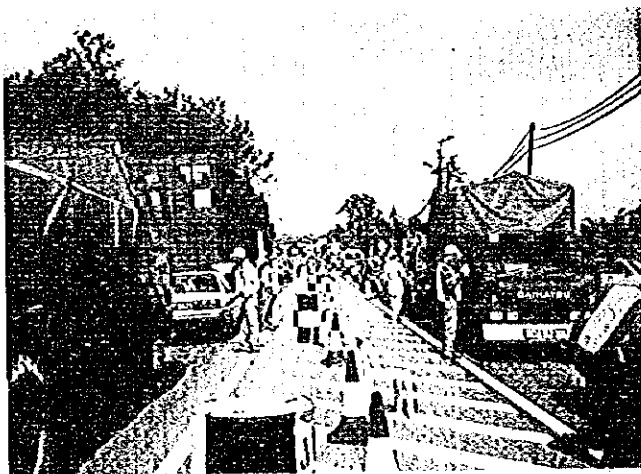
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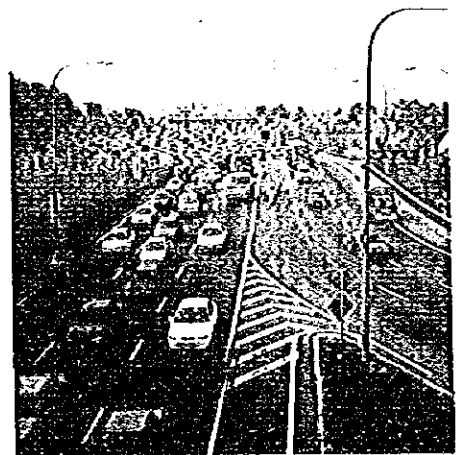
FEDERAL ROAD NO. - 2 NEAR THE BORDER OF PETALING JAYA AND KL



KL - SEREMBAN EXPRESSWAY



ROAD SIDE INTERVIEW SURVEY



DIVERGING POINT AT SALAK SELATAN

**THE FEASIBILITY STUDY ON  
KUALA LUMPUR OUTER RING ROAD IN MALAYSIA**

**FINAL REPORT  
TABLE OF CONTENTS  
(MAIN VOLUME)**

**EXECUTIVE SUMMARY**

		Page
<b>CHAPTER 1</b>	<b>INTRODUCTION</b>	
1.1	Study Background .....	1-1
1.2	Study Objectives .....	1-1
1.3	Study Area .....	1-2
1.4	Study Framework and Report Composition .....	1-2
1.5	Study Implementation .....	1-6
<b>CHAPTER 2</b>	<b>EXISTING ROAD NETWORK AND TRAFFIC CONDITION</b>	
2.1	Existing Road Network .....	2-1
	2.1.1 Introduction .....	2-1
	2.1.2 The Existing Road Network in Selangor State .....	2-1
	2.1.3 The Existing Road Network in Kuala Lumpur .....	2-5
2.2	Existing Traffic Condition .....	2-7
	2.2.1 Traffic Volume .....	2-7
	2.2.2 Traffic Composition by Vehicle Types .....	2-14
	2.2.3 Travel Time .....	2-14
2.3	Trip Characteristics .....	2-15
	2.3.1 Vehicle Occupancy Rate .....	2-15
	2.3.2 Trip Purpose .....	2-16
	2.3.3 Commodity .....	2-17
	2.3.4 Loading Condition .....	2-17
<b>CHAPTER 3</b>	<b>SOCIO-ECONOMIC FRAMEWORK</b>	
3.1	Objectives and Methodology .....	3-1
3.2	Existing Development Pattern .....	3-2
3.3	Future Development Pattern in Selangor .....	3-6
3.4	Macro Socio-Economic Framework .....	3-9
3.5	Micro Socio-Economic Indicators .....	3-12
<b>CHAPTER 4</b>	<b>TRAFFIC DEMAND ANALYSIS</b>	
4.1	Existing OD Traffic Demand .....	4-1
	4.1.1 Total Trip Generation .....	4-1
	4.1.2 Trip Distribution .....	4-5
	4.1.3 Network Model Validation .....	4-5
4.2	Future Traffic Demand .....	4-10
	4.2.1 Forecasting the Number of Registered Vehicles .....	4-10
	4.2.2 Future Total Trip Generation .....	4-13
	4.2.3 Future Trip Distribution .....	4-15
<b>CHAPTER 5</b>	<b>FORMULATION OF KLORR DEVELOPMENT CONCEPT</b>	
5.1	Review of HNBP Study .....	5-1
5.2	Development Trend and Issues .....	5-4
5.3	Development of Network Configuration .....	5-7
5.4	KLORR Development Concept .....	5-11

**CHAPTER 6 ENVIRONMENTAL ASSESSMENT FOR THE PROJECT CORRIDOR**

6.1	The Existing Environmental Conditions .....	6-1
6.2	Identification of Environmentally Sensitive Areas .....	6-5
6.3	Potential Environmental Impacts and Assessment .....	6-9
	6.3.1 Identification of Potential Environmental Impacts .....	6-9
	6.3.2 Potential Significant Impact .....	6-11
6.4	PEIA Report and DOE Comments .....	6-20

**CHAPTER 7 ALTERNATIVE ROUTE ALIGNMENT STUDY**

7.1	Procedure for Alternative Route Selection .....	7-1
7.2	Basic Consideration .....	7-3
7.3	Proposed Alternative Routes .....	7-5
	7.3.1 Examination of Alternative Routes .....	7-5
	7.3.2 Proposed Alternative Route Alignment .....	7-10
7.4	Evaluation of the Alternative Route Alignments .....	7-13
	7.4.1 Evaluation Criteria .....	7-13
	7.4.2 Evaluation of the Alternative Routes .....	7-15

**CHAPTER 8 PRELIMINARY ENGINEERING STUDY**

8.1	Engineering Key Issues .....	8-1
8.2	Design Standard .....	8-2
	8.2.1 Geometric Design Standard .....	8-2
	8.2.2 Bridge Design Standard .....	8-8
	8.2.3 Pavement Design Standard .....	8-13
8.3	Basic Design Policy .....	8-14
	8.3.1 Buffer Zone .....	8-14
	8.3.2 Harmonization with Natural Environment .....	8-18
	8.3.3 Traffic Safety .....	8-21
	8.3.4 Toll System .....	8-22
8.4	Design of the Plan and Profile .....	8-25
	8.4.1 Design of Alignment .....	8-25
	8.4.2 Horizontal Alignment .....	8-27
	8.4.3 Vertical Alignment .....	8-28
8.5	Design of Road Facilities .....	8-29
	8.5.1 Geological Condition in the Study Area .....	8-29
	8.5.2 Bridge .....	8-36
	8.5.3 Tunnel .....	8-41
	8.5.4 Pavement .....	8-47
	8.5.5 Embankment .....	8-48
	8.5.6 Excavation .....	8-48
	8.5.7 Other Facilities .....	8-51
8.6	Interchange Plan and Design .....	8-55
	8.6.1 Proposed Interchange on the KLORR .....	8-55
	8.6.2 Examination of Interchange Location and Configuration .....	8-55

**CHAPTER 9 PROVISIONS OF FUTURE ENVIRONMENT AND MONITORING**

9.1	Introduction .....	9-1
9.2	Major Environmental Impact and Mitigation for the Preferred Route Alignment .....	9-1
	9.2.1 Physical Environment .....	9-1
	9.2.2 Biological Environment .....	9-3
	9.2.3 Sociological Environment .....	9-4

	Page
9.3 Environmental Management Programme .....	9-5
9.3.1 Design, Construction, Operational Maintenance Guidelines .....	9-6
9.3.2 Environmental Monitoring Programme .....	9-7
9.4 Roadside Development for the Environmental Preservation .....	9-9
9.4.1 Provision of Favourable Land Use for Expressway .....	9-9
9.4.2 Urban Development Considerations Along Expressway .....	9-10
9.4.3 Case Study of Road Side Area Development for Environmental Preservation .....	9-10
 <b>CHAPTER 10 MAINTENANCE AND OPERATION PLAN</b>	
10.1 Operation Plan of the KLORR .....	10-1
10.2 Maintenance of Road .....	10-1
10.3 Traffic Control and Surveillance .....	10-4
10.4 Operation of the KLORR as a Toll Road .....	10-9
10.5 Improvement of Traffic Safety Environment .....	10-9
10.5.1 Improvement for Traffic Safety Environment in Mountain Side Section .....	10-10
10.5.2 Improvement of Traffic Information Dissemination to Road Users .....	10-13
 <b>CHAPTER 11 PROJECT COST ESTIMATES</b>	
11.1 Basis for Cost Estimates .....	11-1
11.2 Estimated Construction Cost .....	11-1
11.3 Road Maintenance and Operation Cost .....	11-3
 <b>CHAPTER 12 PROJECT EVALUATION</b>	
12.1 General .....	12-1
12.2 Economic Evaluation .....	12-1
12.2.1 Economic Cost .....	12-3
12.2.2 Economic Benefit .....	12-6
12.2.3 Results of Evaluation .....	12-12
12.3 Financial Analysis .....	12-13
12.3.1 General .....	12-13
12.3.2 Implementation Schedule .....	12-14
12.3.3 Toll Revenue .....	12-17
12.3.4 Basic Conditions for Financial Analysis .....	12-19
12.3.5 Evaluation Indices .....	12-22
12.3.6 Results of Analysis .....	12-23
12.3.7 Summary of Financial Analysis .....	12-31
12.3.8 Sensitivity Analysis .....	12-34
 <b>CHAPTER 13 IMPLEMENTATION PLAN</b>	
13.1 Examination of Development Funds .....	13-1
13.2 Implementation Schedule .....	13-3
13.3 Conditions for Privatization .....	13-6
 <b>CHAPTER 14 CONCLUSION AND RECOMMENDATION</b>	
14.1 Necessity of the Project Road .....	14-1
14.2 Conclusion .....	14-1
14.3 Evaluation of the Project .....	14-2
14.4 Recommendation .....	14-2
14.4.1 Implementation Plan .....	14-2
14.4.2 Recommended Actions .....	14-3

## LIST OF FIGURES

		Page
<b>Chapter 1</b>		
Figure 1-1	Study Corridor for the Kuala Lumpur Outer Ring Road .....	1-4
Figure 1-2	Overall Study Framework .....	1-5
Figure 1-3	Study Organization .....	1-9
<b>Chapter 2</b>		
Figure 2-1	Road Network in Selangor State .....	2-4
Figure 2-2	Road Network in Kuala Lumpur .....	2-6
Figure 2-3	Traffic Volume on Different Sections of Federal Road 1 .....	2-10
Figure 2-4	Traffic Volume on Different Sections of Federal Road 2 .....	2-10
Figure 2-5	Traffic Volume on KL-Karak Highway (Gombak Toll Plaza) .....	2-10
Figure 2-6	Daily Traffic Volume on North-South Expressway (Northern Section) .....	2-11
Figure 2-7	Daily Traffic Volume on North-South Expressway (KL-Seremban Section) .....	2-11
Figure 2-8	Daily Traffic Volume on Major Roads (Excluding Motorcycle) .....	2-13
Figure 2-9	Hourly Traffic Volume on Major Roads in the Study Area (Excluding Motorcycle) .....	2-13
Figure 2-10	Traffic Composition by Vehicle Types in the Study Area .....	2-14
Figure 2-11	Traffic Demand by Trip Purposed .....	2-16
Figure 2-12	Commodities Carried by Lorries .....	2-17
Figure 2-13	Loading Condition of Lorries in the Study Area .....	2-17
<b>Chapter 3</b>		
Figure 3-1	Basic Estimation and Forecasting Processes of Socio-Economic Indicators .....	3-3
Figure 3-2	Existing Scenario 1995 .....	3-5
Figure 3-3	Conceptual Spatial Development Strategy for Selangor .....	3-8
<b>Chapter 4</b>		
Figure 4-1	Trip Generation by District in 1995 .....	4-4
Figure 4-2	Comparative Analysis Between Model Results and Observed Flows .....	4-5
Figure 4-3	OD Distribution Pattern in 1995 .....	4-8
Figure 4-4	Assignment Result in 1995 .....	4-9
Figure 4-5	Passenger Car Ownership Model and its Rate in Selangor and Kuala Lumpur .....	4-12
Figure 4-6	Desirelines of OD Pattern in 2020 .....	4-16
<b>Chapter 5</b>		
Figure 5-1	Conceptual Future Highway Network in Peninsular Malaysia (By Functional Classification) .....	5-2
Figure 5-2	External Traffic Demand for Selangor State .....	5-3
Figure 5-3	Conceptual Regional Highway Configuration for Central Region in Peninsular Malaysia .....	5-3
Figure 5-4	Expansion of the Capital Region - Klang Valley .....	5-4
Figure 5-5	Growth of Domestic Product in Selangor .....	5-5
Figure 5-6	Population Growth in Selangor .....	5-6
Figure 5-7	Framework of Existing Urban Road Network .....	5-7
Figure 5-8	Expansion of Urbanization and Road Network .....	5-8
Figure 5-9	Result of the Traffic Assignment With and Without KLORR (Relative Difference In %) .....	5-9
Figure 5-10	Configuration Showing Linkage To Urban Road in Kuala Lumpur .....	5-10
Figure 5-11	Development Concept of KLORR .....	5-12
<b>Chapter 6</b>		
Figure 6-1	Landuse Pattern .....	6-4
Figure 6-2	Sensitive Sites In the Study Area .....	6-6
Figure 6-3	High-risk Erosion Areas Identified in the Study Area .....	6-13

	Page
<b>Chapter 7</b>	
Figure 7-1	Procedure for Route Selection ..... 7-2
Figure 7-2	Area Wide Control Points for Alternative Routes ..... 7-4
Figure 7-3	Location of the Three Alternative Routes ..... 7-12
<b>Chapter 8</b>	
Figure 8-1	Identification of Engineering Key Issues for the Preliminary Engineering Study ..... 8-1
Figure 8-2	Standard Cross Section ..... 8-5
Figure 8-3	Type HA Loading ..... 8-11
Figure 8-4	The HB Vehicle ..... 8-11
Figure 8-5	Influence Lines for 2-Span Continuous Structure ..... 8-12
Figure 8-6	Influence Lines for 4-Span Continuous Structure ..... 8-12
Figure 8-7	Types of the Buffer Zones ..... 8-15
Figure 8-8	Analysis Section for the Position of Buffer Zones ..... 8-17
Figure 8-9	Mitigation Measures for Wildlife ..... 8-20
Figure 8-10	Geological Map Around Site Area ..... 8-30
Figure 8-11	Geology of Hulu Kelang Area ..... 8-31
Figure 8-12	Ex-Tin Mining Areas and Mineral Resources Map Around Aelangor ..... 8-32
Figure 8-13	Viaduct of City Area ..... 8-37
Figure 8-14(a)	High Pier for Balanced Cantilever Bridge - Alternative 1 ..... 8-39
Figure 8-14(b)	Looped Girder Bridge ..... 8-40
Figure 8-15	Tunnel Cross Section ..... 8-44
Figure 8-16	Parallel Flow Ventilation System ..... 8-45
Figure 8-17	Lateral Flow Ventilation System ..... 8-46
Figure 8-18	Flexible Pavement Structure ..... 8-49
Figure 8-19	Proposed Typical Road Surface Drainage System ..... 8-54
Figure 8-55	Interchange Location and Configuration ..... 8-56
<b>Chapter 9</b>	
Figure 9-1	Location of the Environmental Monitoring ..... 9-8
Figure 9-2	Type of Urban Development Road Network Pattern Area ..... 9-11
Figure 9-3	Basic Consideration for the Road Side Development ..... 9-12
Figure 9-4	Case Study Area for the Road Side Area Development ..... 9-13
Figure 9-5	An Example for the Provision of the Buffer Zone and Block Formation ..... 9-14
Figure 9-6	Artist's Impression of the Road Side Area Development ..... 9-15
<b>Chapter 10</b>	
Figure 10-1	The types of Maintenance Works ..... 10-3
Figure 10-2	An Example of Traffic Control and Surveillance Plan for Site Equipments on the KLORR ..... 10-8
Figure 10-3	Land Slope Observation Equipment ..... 10-12
Figure 10-4	Streamer ..... 10-12
Figure 10-5	Tunnel Guide and Warning Sign ..... 10-15
Figure 10-6	Safety Gap Sign ..... 10-15
Figure 10-7	Changeable Worlds Message Sign ..... 10-16
Figure 10-8	Changeable Diametric Message Sign ..... 10-16
<b>Chapter 12</b>	
Figure 12-1	Evaluation Procedure ..... 12-2
Figure 12-2	Tentative Construction Schedule ..... 12-3
Figure 12-3	Segments of the KLORR ..... 12-16
Figure 12-4	Implementation Schedule for Base Case ..... 12-17
Figure 12-5	Staging Plan of Section ..... 12-25
Figure 12-6	Staging Plan of Road Width ..... 12-26
Figure 12-7	FIRR for Higher Toll Application ..... 12-30
Figure 12-8	FIRR Changes Due to Project Cost Change ..... 12-36
Figure 12-9	FIRR Changes Due to Traffic Volume Change ..... 12-37

	<b>Page</b>
<b>Chapter 13</b>	
<b>Figure 13-1 Proposed Implementaion Schedule .....</b>	<b>13-5</b>



## LIST OF TABLE

		Page
<b>Chapter 1</b>		
Table 1-1	Members of the Committees of the Malaysian Government .....	1-10
Table 1-2	Members of JICA Committee and the Study Team .....	1-11
<b>Chapter 2</b>		
Table 2-1	Categories of Roads by Road Administration .....	2-1
Table 2-2	Length of Roads in Selangor State .....	2-3
Table 2-3	Length of Roads in Kuala Lumpur .....	2-7
Table 2-4	Traffic Volume on Major Roads in Selangor State (16 Hrs Volume for Both Direction Including Motorcycle) .....	2-9
Table 2-5	Traffic Demand on North-South Expressway (Daily Traffic Volume) .....	2-11
Table 2-6	Daily Traffic Volume on Various Roads in the Study Area .....	2-12
Table 2-7	Average Travel Speed on Major Roads .....	2-15
Table 2-8	Average Vehicle Occupancy Rate .....	2-16
<b>Chapter 3</b>		
Table 3-1	Classification of Estimated and Projected Indicators by Observed / Measures Areas .....	3-2
Table 3-2	Forecast of GDP for Selangor State and Kuala Lumpur, 1995-2020 (Summary) .....	3-9
Table 3-3	Forecast of Employment on a Working Place Basis in Selangor State and Kuala Lumpur, 1995-2020 (Summary) .....	3-9
Table 3-4	Forecast of Population* of Selangor State and Kuala Lumpur, 1995-2020 (Summary) .....	3-10
Table 3-5	Forecast of Population, Labour Forces and Employment on Residential Area Basis of Selangor State and Kuala Lumpur, 1995-2020 .....	3-10
Table 3-6	Forecast of Total GDP for Districts in Neighbouring States, 1995-2020 (Summary) .....	3-11
Table 3-7	Forecast of Total Employment on a Working Place Basis at Districts in Neighbouring States, 1995-2020 (Summary) .....	3-11
Table 3-8	Forecast of Total Population of Districts in Neighbouring States, 1995 - 2020 (Summary) .....	3-12
Table 3-9	Forecast of Population, Labour Force and Employment on a Residential Area Basis of Districts in Neighbouring States, 1995 - 2020 .....	3-12
Table 3-10	Population by Mukim/Traffic Zone until the year 2020 (Summary) .....	3-15
Table 3-11	GDP by Mukim/Traffic Zone until the year 2020 (Summary) .....	3-17
Table 3-12	Forecasts of Employment at Working Place at Mukim/Traffic Zone until the year 2020 .....	3-19
<b>Chapter 4</b>		
Table 4-1	Trip Generation Models (Linear regression) .....	4-1
Table 4-2	Statistic of Number of Registered Vehicles in Selangor and Kuala Lumpur .....	4-2
Table 4-3	Average Daily Trip Production Rates by Vehicle Type by State in Malaysia .....	4-2
Table 4-4	Comparison of Total Trip Generation .....	4-3
Table 4-5	OD Matrix (All vehicles) in 1995 .....	4-6
Table 4-6	Linear Regression Model for Forecasting Number of Registered Vehicles .....	4-10
Table 4-7	Vehicle Ownership Forecasting Models .....	4-11
Table 4-8	Future Number of Registered Vehicle .....	4-12
Table 4-9	Comparisons of Vehicle Number Forecasting Models .....	4-13
Table 4-10	Future Trip Generation Rate .....	4-14
Table 4-11	Transport Modal Split .....	4-15
Table 4-12	Future Total Trip Generation after Adjustment .....	4-15
Table 4-13	OD Matrix (All Vehicles) in 2020 .....	4-17

	Page
<b>Chapter 6</b>	
Table 6-1	Landuse of the Study Area ..... 6-3
Table 6-2	Matrix of the Potential Impacts which may arise from the Project Development ..... 6-10
Table 6-3	Noise Pollution by Different Moving Vehicle ..... 6-14
Table 6-4	Estimated Daily $L_{eq}$ Levels During the Operational Phase ..... 6-15
Table 6-5	Affected Human Settlement in the Impact Area ..... 6-18
<b>Chapter 7</b>	
Table 7-1	Configuration of Alternative Routes by Section ..... 7-10
Table 7-2	Summary on Comparison of the Three Alternative Routes ..... 7-11
Table 7-3	Comparison of Alternative Routes ..... 7-16
Table 7-4	Scores of Evaluation of the Three Alternatives ..... 7-19
<b>Chapter 8</b>	
Table 8-1	Geometric Design Standard for the Outer Ring Road (Road Categories : Expressway) ..... 8-4
Table 8-2	Ramp Design Speed ..... 8-6
Table 8-3	Capacity of the KLORR ..... 8-7
Table 8-4(a)	Design Compressive Strength of Concrete ..... 8-10
Table 8-4(b)	Tensile Strength of Reinforcing Steel ..... 8-10
Table 8-5	Strength of Prestressing Steel (SWRP 7A T12-4 and SBPC 125) ..... 8-13
Table 8-6	Roadside Land Use and Buffer Zone Type ..... 8-14
Table 8-7	Roadside Conditions and Buffer Zones for the KLORR ..... 8-16
Table 8-8	Frequency of Radius ..... 8-28
Table 8-9	Frequency of Gradient ..... 8-28
Table 8-10	Rock Weathering Grade of Granite ..... 8-34
Table 8-11	Provisional Classification of Altered Granitic and metasedimentary Rocks ..... 8-35
Table 8-12	The Length of Proposed Tunnel at Section 1 ..... 8-43
Table 8-13	The Length of Proposed Tunnel at Section 2 ..... 8-43
Table 8-14	Selection of Type of Ventilation ..... 8-46
Table 8-15	Proposed Interchanges and their Classification ..... 8-55
<b>Chapter 9</b>	
Table 9-1	Design Criteria in Formulating the Design Guidelines ..... 9-6
Table 9-2	Principles in Formulating the Construction Guidelines ..... 9-6
Table 9-3	Environmental Monitoring Programme ..... 9-7
Table 9-4	Strategies for the Provision of Favourable Land use for Expressway ..... 9-9
Table 9-5	Application of the Road Width including Buffer Zone ..... 9-13
<b>Chapter 10</b>	
Table 11-1	Total Construction Cost ..... 11-1
Table 11-2	Construction Cost of Each Sections ..... 11-2
Table 11-3	Direct Construction Cost for Structures ..... 11-2
Table 11-4	Total Cost of Maintenance, Operation and Monitoring ..... 11-4
Table 11-5	Maintenance and Operation Cost of Each Section ..... 11-4
<b>Chapter 12</b>	
Table 12-1	Project Cost ..... 12-5
Table 12-2	Maintenance Cost ..... 12-5
Table 12-3	Vehicle Price and Characteristics ..... 12-6
Table 12-4	Fuel and Lubricant Cost ..... 12-7
Table 12-5	Tyre Cost ..... 12-7
Table 12-6	Parts Cost and Maintenance Labour Cost ..... 12-8
Table 12-7	Unit Running Cost ..... 12-8
Table 12-8	Unit Fixed Cost ..... 12-9
Table 12-9	Time Cost ..... 12-10
Table 12-10	Statistics of Casualties ..... 12-10

	Page
Table 12-11	Assumed Completion Year of Major Highway Projects ..... 12-11
Table 12-12	Estimated Economic Benefits ..... 12-12
Table 12-13	Evaluation Indicators for Whole Length ..... 12-12
Table 12-14	Economic Evaluation Indicators by Section ..... 12-13
Table 12-15	Evaluation Indicators for the Whole Length Based on Proposed Schedule ..... 12-13
Table 12-16	Project Cost ..... 12-15
Table 12-17	Current Toll Charge for North - South Expressway ..... 12-17
Table 12-18	Toll Rate of Project Road ..... 12-18
Table 12-19	Traffic Volume on the KLORR ..... 12-18
Table 12-20	Equity Loan Allocation ..... 12-20
Table 12-21	Long Term Loan Conditions ..... 12-20
Table 12-22	Financing Plan ..... 12-20
Table 12-23	Growth in Consumer Prices ..... 12-21
Table 12-24	Financial Evaluation Indicators for Base Case ..... 12-24
Table 12-25	Financial Situation of the Base Case During the Concession Period ..... 12-24
Table 12-26	Evaluation Indicators for Staging of Section ..... 12-26
Table 12-27	Construction Cost for the Staging Condition ..... 12-27
Table 12-28	Financial Evaluation Indicators for Staging of Road Width ..... 12-27
Table 12-29	Implementation Schedule for Reduced Length Case ..... 12-27
Table 12-30	Evaluation Indicators for Reduced Length ..... 12-28
Table 12-31	Indicators for Higher Toll Application ..... 12-29
Table 12-32	Traffic Volume on ORR for the Toll Application of 1.5 times Base Case ..... 12-30
Table 12-33	Case with Higher Profitability ..... 12-31
Table 12-34	Total Vehicle-km and Vehicle-time of ORR Users ..... 12-33
Table 12-35	Benefit received by the KLORR Users (RM) ..... 12-33
Table 12-36	FIRR Changes Due to Difference in GRDP Growth ..... 12-34
Table 12-37	Changes in FIRR due to Project Cost Changes ..... 12-35
Table 12-38	Changes in FIRR due to Traffic Volume Changes ..... 12-37
 Chapter 13	
Table 13-1	Past Development Expenditure of Federal Government ..... 13-1
Table 13-2	Estimation of Total Development Funds of Federal Government ..... 13-1
Table 13-3	Estimation of Development Allocation to Highways ..... 13-2
Table 13-4	Estimation of Development Allocation to Selangor in 1995 Price ..... 13-2
Table 13-5	Proposed Implementation Schedule ..... 13-4
 Chapter 14	
Table 14-1	Summary of the KLORR ..... 14-2
Table 14-2	Financial Plan ..... 14-3

## ABBREVIATION

EPU	Economic Planning Unit, Prime Minister's Department
HPU	Highway Planning Unit, Ministry of Works
JKR	Jabatan Kerja Raya (Public Works Department)
JPBD	Jabatan Perancang Bandar Dan Desa (Town and Country Planning Department)
DOE	Department of Environment
RM	Malaysian Ringgit
MC	Malaysian Cen
KLORR	Kuala Lumpur Outer Ring Road
N-SE	North-South Expressway
NKVE	New Klang Valley Expressway
SKVE	South Klang Valley Expressway
HNDP	Highway Network Development Plan
KL	Kuala Lumpur
KLIA	Kuala Lumpur International Airport
GDP	Gross Domestic Products
GRDP	Gross Regional Domestic Products
OD	Origin and Destination
ROW	Right of Way
VOC	Vehicle Operating Cost
LRT	Light Rail Transit
FMP	Fifth Malaysian Plan
SMP	Sixth Malaysian Plan
Jln.	Jalan
Bkt.	Bukit
Tj.	Tanjung
K.	Kuala
Kg.	Kampong

## EXECUTIVE SUMMARY

1. The objectives of the study are :
  - 1) To carry out the feasibility study on the Outer Ring Road for Kuala Lumpur (KLORR) including assessing the financial viability of tolling on this road.
  - 2) To assess the environmental impacts of the project which will constitute one of the criterions for the selection of preferable alignment.
2. Method of the Study  
The entire study is divided into three major interactive phases as follows:
  - 1) Stage I (Phase 1) : Formulation of the KLORR Development Concept
  - 2) Stage II (Phase 2) : Alternative Alignment Study
  - 3) Stage II (Phase 3) : Preliminary Engineering Study and Evaluation
3. Contents of the Study
  - 1) The main socio-economic Indicators of Selangor and Kuala Lumpur are found as below

Area	Year	GDP (Million RM at 1978 prices)	Population (x1,000)	Employment at Working Place (x1,000)
Selangor State	1995	24,275	2,669.2	929.4
	2000	37,694	3,262.8	1130.8
	2010	76,255	4,708.0	1640.0
	2020	131,751	5,937.4	2089.9
Kuala Lumpur	1995	15,595	1,329.3	683.9
	2000	22,703	1,590.6	818.3
	2010	38,760	2,021.6	1040.1
	2020	60,895	2,408.5	1239.1

- 2) Future Traffic Volume between interchanges are forecasted as below

Year	IC1-IC2	IC2-IC3	IC3-IC4	IC4-IC5	IC5-IC6	IC6-IC7	IC7-IC8	IC8-IC9	IC9-IC10	IC10-IC11	IC11-IC12	IC12-IC13
2000									11,400	10,900	10,900	10,900
2010	41,800	56,700	48,000	22,000	81,000	93,300	86,000	79,000	76,100	70,000	69,000	69,000
2020	65,600	80,900	71,100	50,600	90,000	11,900	100,900	92,300	93,500	80,800	84,700	84,700

- 3) Three alternative routes are established namely A, B and C.
  - (1) Alternative Route A : This is the outermost alignment which will provide good services for development projects in the outer area and will have the least social impact.
  - (2) Alternative Route B : This is the middle alignment which will have medium impact to both social and natural environments.
  - (3) Alternative Route C : This is the innermost alignment, same as route B in section 1. This will provide good services to the inner area with the least effect to natural environment.

On the basis of various analyses, the alternative route B is selected as the preferred alignment and preliminary design, cost estimates and economic evaluation are carried out for it.

- 4) Preliminary Design.  
The summary of the KLORR Project is as follows:

Section	Unit	Section 1	Section 2	Section 3	Total
Length (Cut and Embankment) (Bridges and Viaduct) (Tunnels)	m	22,830	37,580	26,500	88,910
	m	13,220	22,580	22,390	58,190
	m	6,950	9,270	6,110	21,430
	m	3,560	5,730	-	9,290
Number of Lanes	Lane	6	6	6	6

## EXECUTIVE SUMMARY

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	2000	22,703	1,590.6	818.3
	2010	38,780	2,021.6	1040.1
	2020	60,895	2,408.5	1239.1

- 2) Future Traffic Volume between interchanges are forecasted as below

Year	IC1-IC2	IC2-IC3	IC3-IC4	IC4-IC5	IC5-IC6	IC6-IC7	IC7-IC8	IC8-IC9	IC9-IC10	IC10-IC11	IC11-IC12	IC12-IC13
2000	-	-	-	-	-	-	-	-	11,400	10,900	10,900	10,900
2010	41,800	56,700	46,000	22,000	81,000	93,300	86,000	79,000	76,100	70,000	69,000	69,000
2020	66,600	80,900	71,100	50,600	90,000	11,900	100,900	92,300	93,500	80,800	84,700	84,700

- 3) Three alternative routes are established namely A, B and C.
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	m	13,220	22,580	22,390	58,190
	m	6,050	9,270	6,110	21,430
	m	3,560	5,730	-	9,290
Number of Lanes	Lane	6	6	6	6

5) Project Cost Estimation

The various costs of the project are found as follows:

Unit : Million RM

Section	Construction	Land Acquisition	Engineering	Environment	Total
1	1,207.4	99.2	60.4	12.1	1,379.1
2	1,647.9	226.6	82.4	16.5	1,973.4
3	1,089.3	138.7	54.5	10.9	1,293.4
Total	3,944.6	464.5	197.3	39.5	4,645.9

4. Project Evaluation

1) Economic Evaluation for the Whole Length

On the basis of the economic evaluation parameter for the whole length of the KLORR which are found as below, the project is highly economically feasible.

Benefit-cost Ratio (B/C)	3.05
Net Present Value (NPV) (RM Million)	5,498.5
Internal Rate of Return (IRR) (%)	22.7

2) Financial evaluation reveals that to make the project feasible some measures such as application of higher toll rate will be needed.

5. Conclusion and Recommendation

1) Necessity of the Project Road

The Klang Valley Region including Kuala Lumpur has played a significant role as the administrative and economic growth pole. Rapid economic expansion followed by the urbanization and motorization in the region justify the necessity of the KLORR expressway to form a favorable highway network configuration for both inter and intra region.

2) Implementation Schedule

The implementation schedule of the project is proposed as follows:

	Total Length (km)	No. of Lanes	Project Cost (RM million)	1997	1998	1999	2000	2001	2002	2003	2004	2005
				Section 3 Segment 2 North South Expressway at South-N-S Central Link	13.30	6	664.9	[Gantt chart bars for Section 3 Segment 2]				
Section 3 Segment 1 Federal Route 1 at South-North South Expressway	10.20	6	428.5	[Gantt chart bars for Section 3 Segment 1]								
Section 2 Segment 2 Hulu Langat Road-Federal Route 1 at South	14.58	6	684.3	[Gantt chart bars for Section 2 Segment 2]								
Section 1 Segment 1 and 2 North South Expressway at North-KL-Karak Highway	22.83	6	1,379.1	[Gantt chart bars for Section 1 Segment 1 and 2]								
Section 2 Segment 1 KL-Karak Highway-Hulu Langat Road	23.00	6	1,289.1	[Gantt chart bars for Section 2 Segment 1]								
TOTAL	83.91	6	4,645.9	120.3	445.2	807.0	643.1	537.0	546.2	845.1	351.0	351.0

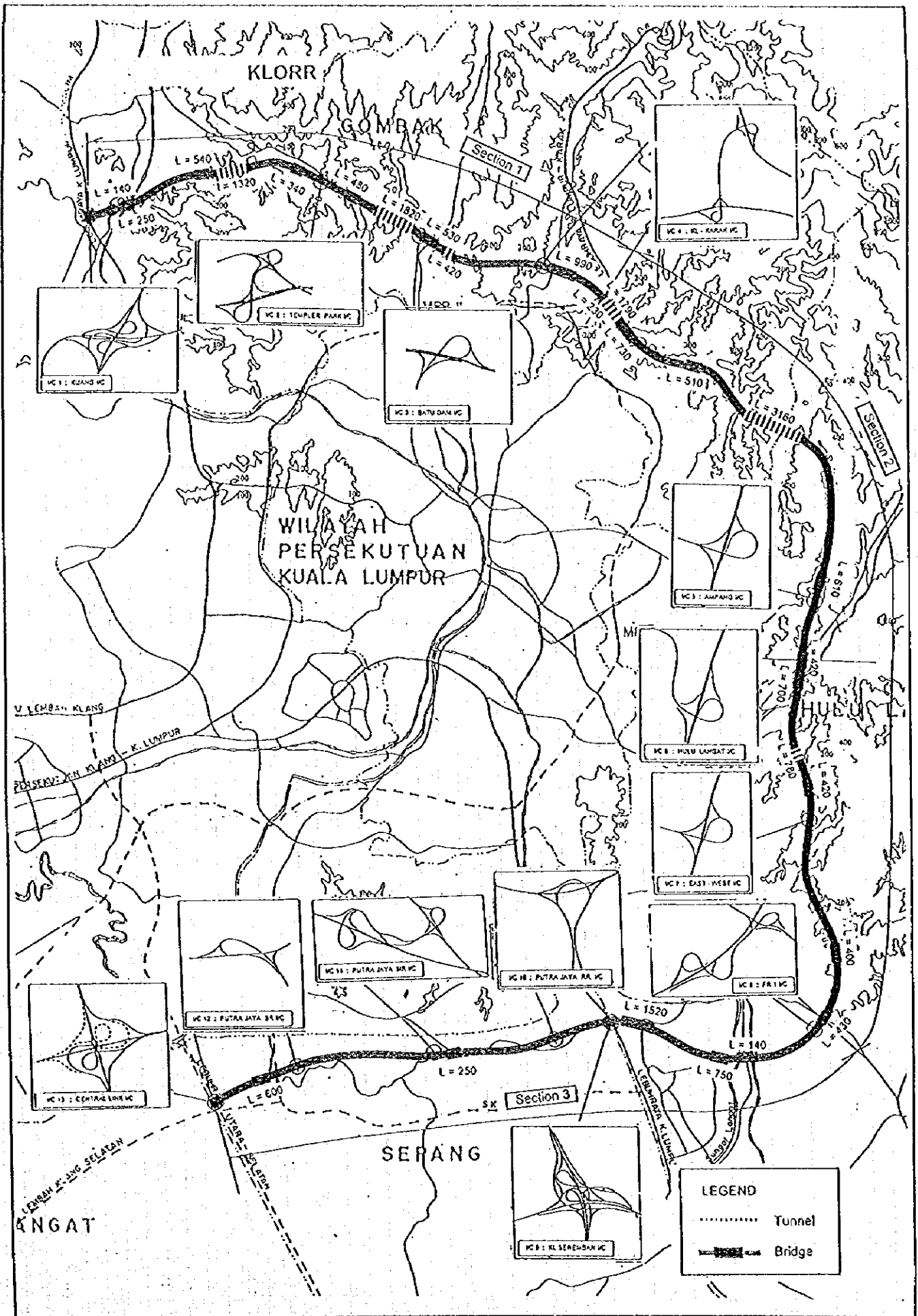
Note : E-W Link Extension is scheduled to be completed in 2001.  
Among Elevated Bypass is scheduled to be completed by 2005.

[Pattern] Detail Engineering  
[Pattern] Land Acquisition  
[Pattern] Construction

3) Financial Plan

Toll rate is proposed to be MC18.9/km with 6% increase per 10 years. The financial plan is proposed as follows:

Financing Resources	Share
Equity	20%
Commercial Loan	60%
Government Loan	20%
Total	100%





# Chapter **1**

## **INTRODUCTION**

## CHAPTER 1 INTRODUCTION

### 1.1 Study Background

Highway Planning Unit, Ministry of Works, Malaysia prepared the National Highway Network Development Plan (HNDP) as an outcome of the study held from May 1991 to February 1993 under the technical cooperation of Japan International Cooperation Agency (JICA). The National Highway Network Development Plan, adopted by the Government of Malaysia, is undoubtedly very important for the future development of highways and expressways in Malaysia. The well planned, timely development of highways and expressways within the transport sector will be one of the main thrusts promoting further economic, industrial and regional land development in Malaysia.

The National Highway Network Development Plan has recommended feasibility studies on several priority highway projects in Peninsular Malaysia, Sabah and Sarawak. One of such projects is the Kuala Lumpur Outer Ring Road (KLORR).

The Middle Ring Road 1 of Kuala Lumpur's present road network is now a heavily congested road dispersing CBD bound traffic. The Middle Ring Road II is intended to provide some relief to the saturated condition of the Middle Ring Road I and to directly disperse traffic from the suburban residential areas, such as Kepong (North-West), Petaling Jaya (West), Ampang (East), Cheras (South) and Melawati (North).

The KLORR is to cater Kuala Lumpur's through traffic such as the traffic not destined for the city centre. It is also planned to serve inter-urban traffic in the Klang Valley, for example, from Selayang to Bangi or Subang, without causing unnecessary interference to localized KL city traffic. The KLORR will also serve as a bypass around KL for inter-regional traffic from the KL - Karak Highway to other regions.

The KLORR corridor passes through some very difficult terrain, especially east of Kuala Lumpur. The plan also provides complex designs for access to the city's other major highways. Moreover, some sections of the corridor are currently undergoing intensive urban development. Early identification of the highway alignment and regulation for right of way areas along the alignment are very urgent.

The Ministry considered feasibility study of the highway was urgently needed, and the Government of Malaysia thus requested the continuous technical cooperation from the Japanese Government to conduct a preliminary engineering and economic/ financial feasibility study. In response to the request, the Government of Japan agreed to conduct "The Feasibility Study on Kuala Lumpur Outer Ring Road in Malaysia" through JICA, based on the Scope of Work signed by both parties on 20th December 1994.

### 1.2 Study Objectives

The objectives of the study are :

1. To carry out the feasibility study including assessing the financial viability of tolling on the KLORR ; and

2. To assess the environmental impact of the project which will constitute one of the criterion for the selection of the preferred alignment.

### 1.3 Study Area

The study area is indicated in Figure 1-1. The KLOOR is planned as an expressway encircling the Kuala Lumpur Metropolitan Area beyond the on-going Middle Ring Road II (MRII). This outer ring road will directly link the major radial arterials in the city such as Jalan Cheras, Jalan Ampang as well as the regional highways like the Kuala Lumpur - Karak Highway which will form Kuala Lumpur - Kuantan Expressway in future, the North-South Expressway and the on-going North-South Central Link Expressway.

The KLOOR is approximately 80 km in length from the interchange with the North-South Expressway near Rawang/Serendah to the North-South Central Link Expressway in a clockwise arc.

### 1.4 Study Framework and Report Composition

#### 1) Overall Study Framework

The overall Framework of the Study is shown in Figure 1-2. The study is implemented in two stages and three phases as follows :

#### Stage 1 (Phase 1) : Formulation of KLOOR Development Concept

This stage of the Study intends to formulate a preferable development concept for the KLOOR based on a review of the HNBP study, traffic demand, and the environmental impact on the proposed corridor.

The following major tasks were carried out.

- 1) Collection and review of data and relevant information
- 2) Traffic survey
- 3) Aerial photographic survey
- 4) Environmental survey I
- 5) Future socio-economic frame work
- 6) Future traffic demand forecast
- 7) Formulation of basic development concept of the KLOOR

#### Stage II (Phase 2) : Alternative Alignment Study

This phase was to determine an optimum route alignment for the KLOOR, as evaluated from the environmental, engineering and economic view points. A Preliminary Environmental Impact Assessment (PEIA) report was prepared.

Major Tasks :

- 1) Review of design standards
- 2) Formulation of alternative routes

- 3) Environmental survey II
- 4) Preparation of Preliminary Environmental Impact Assessment (PEIA) report
- 5) Selection of preferred route

**Stage II (Phase 3) : Preliminary Engineering Study and Evaluation**

A preliminary engineering study was conducted on the preferable route alignment using 1/5,000 topographic map, and the economic and financial viability of the project was evaluated. Implementation strategies and programmes, including privatization as an option, were also proposed.

**Major Tasks :**

- 1) Geological survey
- 2) Preparation of topographic map
- 3) Preliminary engineering design
- 4) Examination of environmental mitigation measures
- 5) Project cost estimation
- 6) Economic and financial analysis
- 7) Formulation of operation and maintenance plan
- 8) Formulation of optimum plan
- 9) Formulation of implementation plan
- 10) Project evaluation and recommendation

**2) Report Composition**

The results of the Study are embodied in the following reports :

- A. Summary Volume
- B. Main Volume
- C. Technical Volume
- D. Drawings

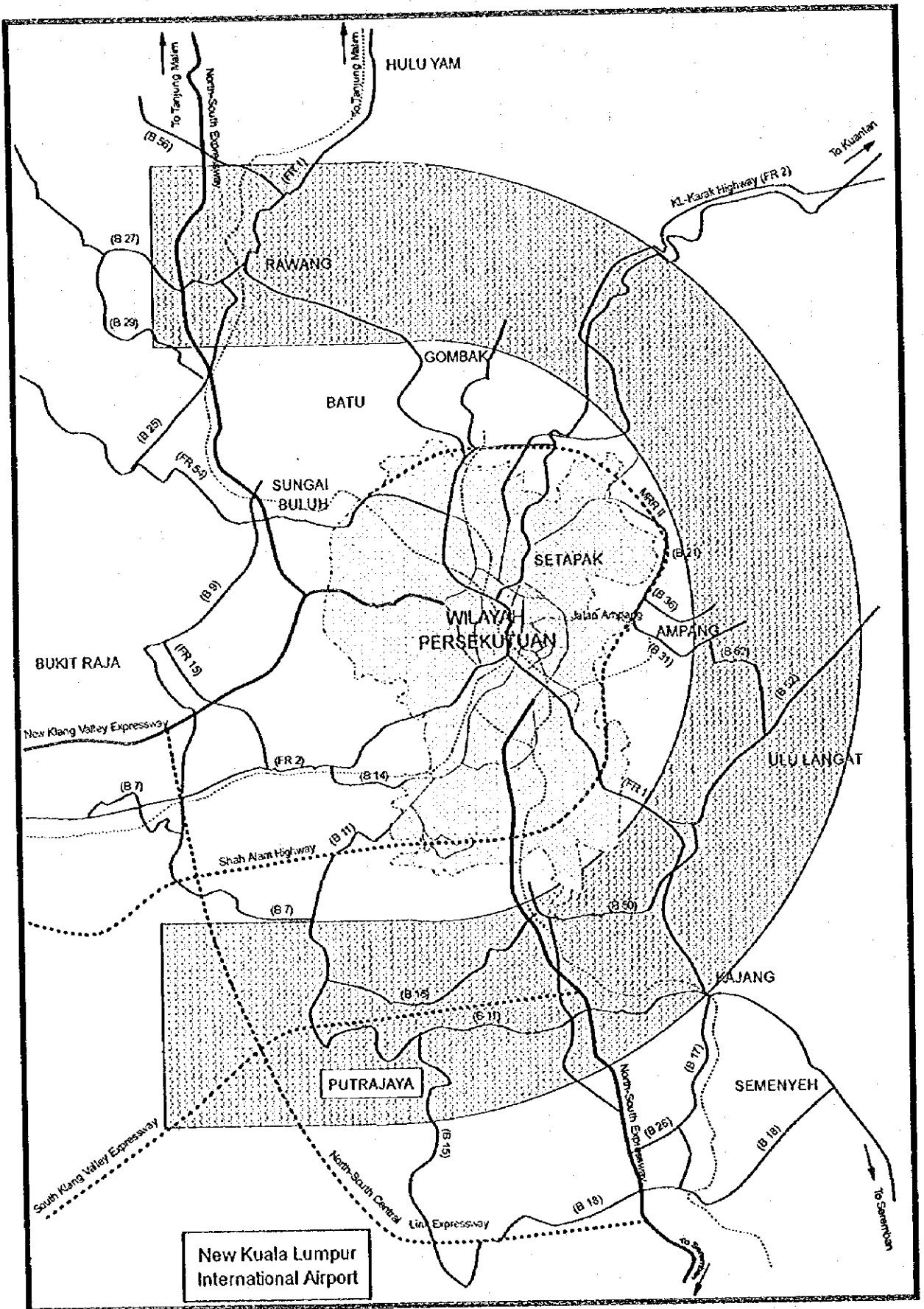
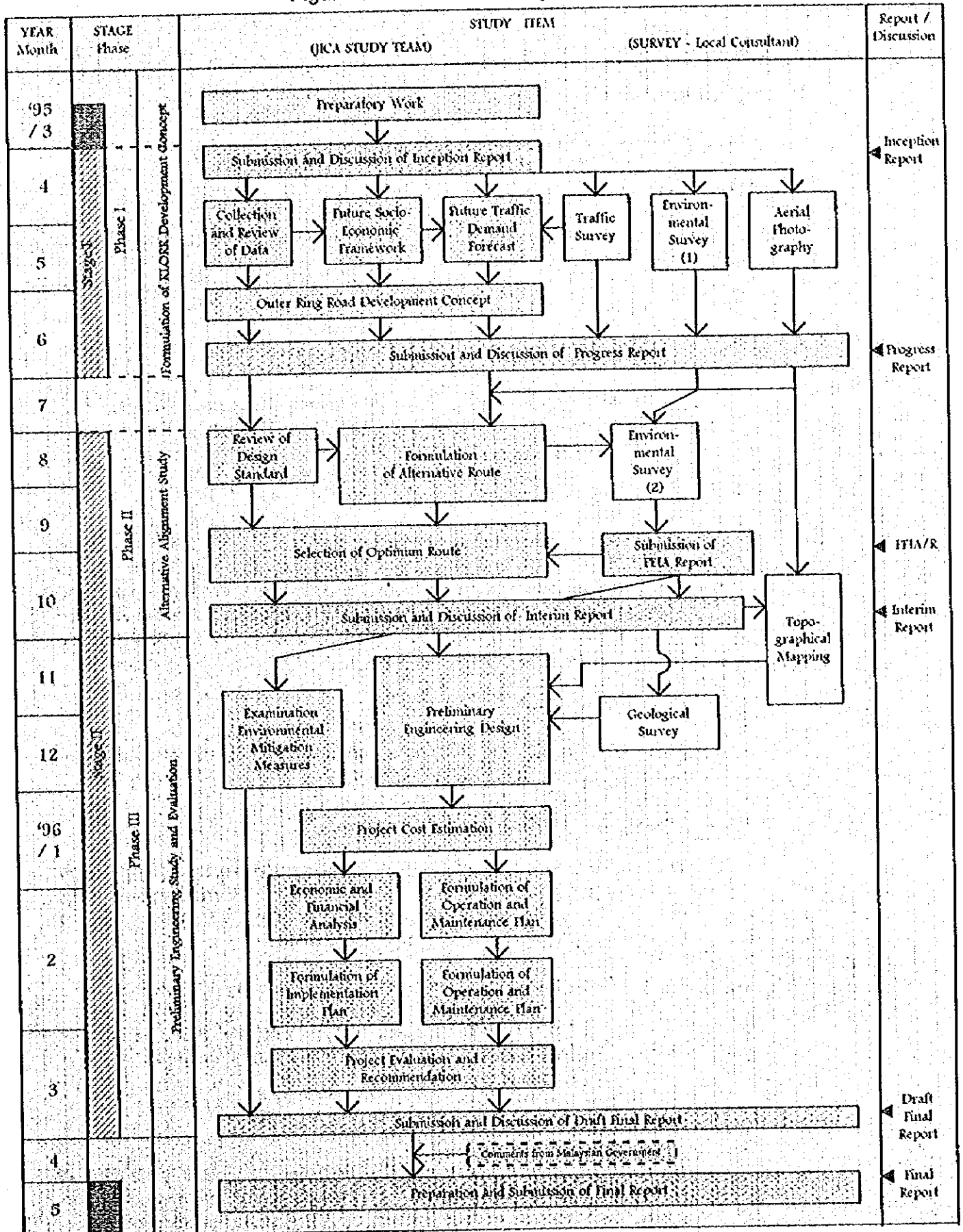




Figure 1-1 : Study Corridor for the Kuala Lumpur Outer Ring Road

Figure 1-2 : Overall Study Framework



Note : FEIA/R : Preliminary Environmental Impact Assessment Report

Legend :  Work in Japan  Work in Malaysia

## 1.5 Study Implementation

### 1) Major Activities Undertaken

Major activities undertaken by the study were as follows :

#### (1) Surveys

A number of important surveys were conducted to obtain necessary data and information. They were as follows :

#### (i) Traffic Survey

The following Traffic Surveys were conducted.

- (1) Traffic Count Survey : 30 Stations (16 hours, 24 hours)
- (2) Roadside Interview Survey : 10 Stations (16 hours)
- (3) Travel speed survey : 10 routes

#### (ii) Environmental Survey (1)

The PEIA (Preliminary Environmental Impact Assessment) study was divided into 2 phases. The objectives of Phase 1 was to describe the existing baseline condition and to highlight areas that are environmentally and ecologically sensitive in the Study Area. The phase 1 survey covered an area of approximately 165,000 ha and included the Districts of Hulu Selangor, Gombak, Petaling and Sepang.

#### (iii) Aerial Photography

Aerial photographs of the Study Area were taken and an uncontrolled photo-mosaic of scale 1:10,000 was prepared.

#### (iv) Environmental Survey (2)

The Phase 2 Environmental Survey identified and assessed all potential impact on the proposed alternative routes of KLORR and prepared PEIA report. The PEIA report was submitted to the DOE (Department of Environment) and accepted by the EIA committee.

#### (v) Topographical Mapping for the preliminary engineering design:

- 1:5,000 scale for the plan - Approximately 8,000 ha
- 1:2,500 scale for interchanges and major structures
- 6 locations, Approximately 1,200 ha

#### (vi) Geological Survey

The main purpose of the geotechnical investigation was to clarify the general and detailed geotechnical conditions for the design of major structures on the KLORR, such as bridges, slopes, etc. The geotechnical investigation included a reconnaissance survey, machine borings at 30 locations and

laboratory tests.

**(2) Study**

The major components of the study are briefly explained as follows :

**(i) Collection and Review of Data and Relevant Information**

Data and information were collected in the field of regional development, Socio-economic indices, natural and economic conditions and so on. The HNDR study report and relevant study reports were reviewed.

**(ii) Socio-economic Framework**

Socio-economic indicators such as Population, Employment and GDP by traffic group to the year 2020 were estimated for forecasting the traffic demand. The study followed the national economic development policy of the average annual growth rate of 7.0 % up to the year 2020.

**(iii) Future Traffic Demand**

Traffic demand on the proposed KLORR was forecasted up to the year 2020 based on the data from the traffic survey and the Socio-economic indicators mentioned above.

**(iv) Formulation of the Outer Ring Road Development Concept**

The development concept was examined in terms of future regional development, highway network configuration and traffic demand. In the concept it was proposed that the KLORR will play a significant role in the network system in the Greater Klang Valley Region.

**(v) Review of Design Standards**

Geometric design standards and typical cross sections for the KLORR were established based on the Malaysian Design Standard.

**(vi) Formulation of Alternative Routes**

Three alternative routes for the KLORR were formulated, taking into consideration of the engineering, environmental and geological aspects, as well as existing and proposed roads.

**(vii) Selection of the Optimum Route Alignment**

The three alternative routes were evaluated from the view points of engineering, environment, geology and economic analysis. On the basis of these evaluations, an optimum route alignment was selected for the KLORR out of three alternatives.



**(viii) Preliminary Engineering Study**

Preliminary Engineering Study was conducted on the 1/5000 topographic map for the Plan and Profile, and 1/2500 map for the major interchanges and structures.

**(ix) Provisions of Future Environment and Monitoring**

To provide better urban environmental conditions along the project corridor, environmental management programme, monitoring and roadside development concept were examined.

**(x) Maintenance and Operation**

To assure the smooth traffic flows, safety and users' comfort, maintenance and operation plans were prepared.

**(xi) Project Cost Estimation**

Based on the preliminary engineering design, the project cost including construction cost, land acquisition and compensation cost, maintenance and operation cost as well as environmental monitoring cost were estimated.

**(xii) Review of Existing Privatization Projects**

Based on the examination of the existing privatization projects, present problems and issues on the scheme were identified.

**(xiii) Project Evaluation**

The economic and financial analysis including the sensitivity analysis were conducted to examine the project viability, in terms of the socio-economic view point and business opportunity as a privatization project.

**(xiv) Implementation Plan**

Based on the analysis for determining the section priority and assessing the financial viability, the implementation schedule of the projects was proposed.

**(3) Technology Transfer**

**(i) Meeting With Counterpart Team**

Meetings were held between the JICA Study Team and Counterpart Team. Key issues related to the study were discussed. The main topics were as follows:

- Discussion of Inception Report, Progress Report, Interim Report and Draft Final Report
- Estimation of Socio-economic indicators
- PEIA Report
- Route Selection and Interchange Plan

Ir. Mohd Fozi Matori from Highway Planning Unit visited Japan for the JICA Counterpart Training from 20th November to 12th December in 1995 in the fields of highway and bridge engineering courses.

Similarly, Mr. See Ah Sing from the Economic Planning Unit visited Japan for the JICA Counterpart Training from 3rd June to 20th June in the field of project evaluation.

(iii) Workshop for Traffic demand forecasting with EMME/2 programme

The workshop was held for 6 days from 8th January to 13th January in 1996. Total 28 engineers and planners from HPU, Malay University and other organizations participated.

The major themes were as follows :

- Introduction to Transportation Modeling with EMME/2
- Demonstration and Basic Concepts of EMME/2
- Introduction to Graphics
- Building Base Network
- Function/Scenario Manipulation
- Matrices
- Assignment

(iv) Technical Reports

Detail methodologies, analysis and calculation process, etc. are indicated in the Technical Reports.

2) Study Organization

The study was jointly undertaken by the Study Team organized by JICA and the counterpart team organized by HPU. A Steering Committee and technical Committee, comprising of the representatives of relevant Government agencies were organized to provide adequate direction and to make necessary decisions for the smooth and effective implementation of the study. The advisory committee which was organized by JICA provides JICA with necessary advice on technical aspects of the study.

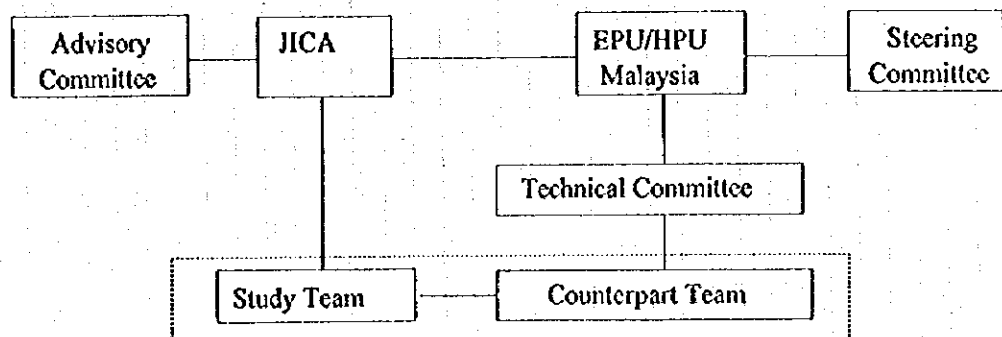


Figure 1-3: Study Organization

Table 1-1 : Members of the Committees of Malaysian Government

<u>Member of Steering Committee of Malaysian Government</u>	
<b>Chairman</b>	
Ms. Aida Boey Abdullah	: Director of Infrastructure and Utilities Section, Economic Planning Unit
Mr. Manann Abdul Rahim	: Economic Planning Unit
Ir. George George	: Director of Highway Planning Unit, Ministry of Works
Ir. Md. Amir Kassim	: Highway Planning Unit
Ir. Ooi Gin Hoay	: Highway Planning Unit
Ir. Mohd Fozi Matori	: Highway Planning Unit
Mr. Mohd Rosli Abdullah	: Development and Implementation Division, Ministry of Works
Ir. Adnan Mohd Hussin	: Road Section, JKR Headquarters
Mr. Safian Ali	: Klang Valley Planning Secretariat
Ms. Wee Huay Neo	: Town and Country Planning Department
Mr. Abdullah Hashim	: Malaysia Highway Authority
Ms. Kalsom Abdul Ghani	: Department of Environment
Mr. Zakaria Yaakob	: State Economic Planning Unit, Selangor
Mr. Jasni Jubli	: Land and Mine Department
<u>Members of Technical Committee of Malaysian Government</u>	
<b>Chairman</b>	
Ir. George George	: Director of Highway Planning Unit, Ministry of Works
Ir. Md. Amir Kassim	: Highway Planning Unit
Ir. Ooi Gin Hoay	: Highway Planning Unit
Ir. Soon Ho San	: Highway Planning Unit
Ir. Mohd Fozi Matori	: Highway Planning Unit
Ms. Lok Yin Ming	: Highway Planning Unit
Ms. Norliah Saidin	: Highway Planning Unit
Mr. See Ah Sing	: Economic Planning Unit
Ms. Siti Haslinda Ismail	: Public Works Department, Gombak
Mr. Mohd Khusaini Mohd Isa	: Road Branch, Public Work Department
Mr. Mohd Yusoff Abu Bakar	: Public Works Department, Selangor
Mr. Othman Jaafar	: PPAS (CBA)
Mr. Mohd Ridzuan Arshad	: Town and Country Planning Department, Selangor
Mr. Mohd Shukri Abd. Kadir	: Water Work Department (JBA), Selangor
Mr. Saffian Ali	: Klang Valley Planning Unit, Prime Minister Department
Mr. Nor Hissam Hj. Zaimarzuki	: Environmental Department, Selangor
Mr. Chia Chong Wing	: Drainage and Irrigation Department, Selangor
Mr. Abd. Kharar Abd. Khalid	: PTG, Selangor
Mr. Wan Mohd Nor Wan Yaacob	: Traffic and Public Work Department, Kuala Lumpur City Hall

Table 1-2: Members of JICA Committee and the Study Team

<u>Members of JICA Advisory Committee</u>	
Mr. Tetsuo Matsumura	: Leader
Mr. Shinichiro Itakura	: Member
Mr. Naofumi Yamamura	: JICA
Mr. Kojiro Matsumoto	: JICA, KL Office
Mr. Katsuhiko Mori	: Embassy of Japan, Malaysia
<u>Members of JICA Study Team</u>	
Mr. Hiroo Takeda	: Team Leader/Highway Planner
Mr. Michimasa Takagi	: Deputy Team Leader/ Transportation Planner/Demand Forecast
Mr. Yoshiteru Sunago	: Regional Development Expert
Mr. Toshisada Katsurada	: Transport Economist
Mr. Philipose Philips	: Regional Development Expert
Mr. Takeshi Harada	: Surveyor
Mr. Kentaro Usuda	: Surveyor
Mr. Takeo Shibatani	: Geologist
Mr. Yoshinobu Fujii	: Highway Designer
Mr. Atsushi Kumagami	: Structural Designer
Mr. Hiroyuki Takano	: Project Implementation Planner
Mr. Noboru Matsushima	: Environmental Expert
Mr. Tadamichi Hoshi	: Traffic Environmental Expert
Mr. Kenichi Namiki	: Roadside Development Expert
Mr. Chin Kar Keong	: Data/System Analyst
Mr. Deepak K. Shrestha	: Traffic Engineer
Mr. Toshio Miyoshi	: Coordinator

Chapter **2**

**EXISTING ROAD NETWORK AND  
TRAFFIC CONDITIONS**

## CHAPTER 2 EXISTING ROAD NETWORK AND TRAFFIC CONDITIONS

### 2.1 Existing Road Network

#### 2.1.1 Introduction

The existing transport system in Malaysia is dominated by road transport. This trend will also continue in the future, due to continued large investment in the road infrastructure. The roads are classified into five categories according to road administration as given in Table 2-1.

Table 2-1 : Categories of Roads by Road Administration

Category	Description
Federal Roads	Federal roads, gazetted under the Federal Road ordinance, usually link major cities, towns, different states and entrance/exit points to the country. Federal roads also include those leading to Land Development Schemes and Federal Institutions. These roads are constructed and maintained using funds from the Federal Government. They come under jurisdiction of Federal Public Works Department.
Toll Expressways and Highways	These are highways linking major cities and towns. They are constructed and maintained by the Malaysian Highway Authority as alternative routes to the Federal Roads. However, since November 1988, most of the Expressways and Highways have been privatized.
State Roads	These are roads built to improve intra state linkage and also to provide a road network within the states. The construction and maintenance of these roads is funded by the State Governments. These roads are under the jurisdiction of the State Public Works Department.
Municipal and Local Council Roads	These roads, located within the Municipal and Local Council areas, are constructed and maintained by the Municipal or the Local Authorities. These include the roads in residential estates constructed by developers which have been handed over to the local authorities or municipalities. The funds for construction and maintenance of these roads come from the Municipal and Local Council Budgets, but are subsidized by the Federal Government.
Other Roads	These are rural roads constructed and maintained by the District Office. The allocation of budget comes from the State Government.

#### 2.1.2 The Existing Road Network in Selangor State

The major roads forming the existing road network in Selangor State as shown in Figure 2-1 can be briefly explained as follows:

1) North-South Expressway

This is fully access controlled toll expressway which runs from Bukit (Bkt) Kayu Hitam, near the border of Malaysia and Thailand in the north, to Johor Baharu, near the border of Singapore in the south. The total length is 847.7 km. It is the backbone of the road network in the western corridor of Peninsular Malaysia. This road traverses the middle of Selangor State parallel to the Federal Road 1 from Tanjung (Tg) Malim in the north to Bangi in the south, linking Hulu Selangor, Gombak, Petaling, Klang, Hulu Langat and Sepang districts.

2) New Klang Valley Expressway (NKVE)

This is part of North-South Expressway which links Kuala Lumpur to Klang, traversing east-west through the central region of the state. The starting point is Jalan Duta Toll Plaza in Kuala Lumpur and the ending point is Bkt Raja Toll Plaza in Klang.

3) Kuala Lumpur - Seremban Expressway

This is the southern part of North-South Expressway which links Kuala Lumpur to Seremban. It continues further to the south in a north-south direction to Johor Baharu.

4) Federal Route 1 (FR 1)

This is a major highway traversing north - south in the state. It connects the major towns and cities in the eastern corridor. This Federal Route starts from Tg Malim in the north to Beranang in the south, linking the district centers and major towns such as Kuala Kubu Bharu, Serendah, Rawang, Cheras, Kajang, Semenyih and Beranang.

5) Federal Route 5 (FR 5)

This route traverses north - south along the west coast of the state. It is the most important road in the west corridor of the state. This route links all the districts in the western part of the state, connecting the cities, towns and district centers such as Sungai Besar, Kuala Selangor, Klang, Sepang, etc.

6) Federal Route 2 (FR 2)

This is the major artery connecting the Federal Routes 1 and 5 in the central part of the state. It links major cities like Klang, Shah Alam, Subang Jaya and Petaling Jaya to the capital Kuala Lumpur. This is a dual carriage 6-lane road and a very important part of the east-west road network in the central region of the state.

7) Kuala Lumpur - Karak Highway

This is a toll highway connecting Kuala Lumpur to Karak in Pahang State. It was constructed as a bypass of Federal Road 68. It starts at the Gombak Toll Plaza near

the border of Kuala Lumpur and Selangor. Due to increased traffic demand, it is being upgraded to a 4-lane dual carriage highway.

8) Federal Route 68 (FR 68)

This is an arterial road connecting Federal Route 1 to Bentong in Pahang State. It is parallel to the Kuala Lumpur - Karak Highway, serving the central corridor east of Federal Route 1.

9) Federal Route 54 (FR 54)

This is an arterial road between Federal Routes 1 and 5, connecting Sg. Buloh to Asam Jawa in the west coast.

10) Shah Alam Expressway

This expressway which is under construction, will connect Kuala Lumpur with Klang. It consists of two packages: package A (Sri Petaling - Subang West) and package B (Subang West - Langat). Package A is scheduled for completion in 1997 whereas package B in 1999.

Table 2-2 : Length of Roads in Selangor State

	Name of Road	Length (Km)	Remark
1	North-South Expressway Northern Section	59	Tg. Malim to Bukit Lanjan Interchange
2	New Klang Valley Expressway	33	Jln. Duta Toll to Bukit Raja
3	Kuala Lumpur - Seremban Expressway	25	Salak Selatan Interchange to Border of Selangor in Bangi
4	Federal Route 1	119	Tg. Malim to Beranang
5	Federal Route 5	208	Sabak to Sepang
6	Federal Route 2	42	Kuala Lumpur to Klang Port
7	Kuala Lumpur-Karak Highway	18	Gombak to Selangor and Pahang border
8	Federal Route 68	27	Kuala Lumpur - Selangor and Pahang border
9	Federal Route 54	52.6	Batu Caves to Asam Jawa
10	Shah Alam Expressway	18.5 16	Package A : Subang to Sg. Besi Package B : Hulu Langat to Subang
11	State Road B18	44.4	Telok Datok (FR 5) to Semenyih
12	State Road B16	13.6	Puchong to Serdang
13	State Road B50	7.6	Serdang to Cheras
14	State Road B52	21.6	Cheras Jaya to Hulu Langat
15	State Road B11	34.4	Kajang to Ladang Kinrara





**Figure 2 - 1 : Road Network In Selangor State**



**THE KUALA LUMPUR OUTER RING ROAD PROJECT**  
(Japan International Cooperation Agency)

## 11) Major State Roads

The major state roads which will be taken into consideration are B16, B18, B19, B50 and B52. B18 is an arterial road connecting Federal Routes 1 and 5. It links towns such as Banting, Bangi and Semenyih. This is an important road running east-west in the southern corridor.

B16, in conjunction with B11, connects Puchong and Serdang. B50 links Serdang to Cheras. B52 connects Cheras to Hulu Langat and traverses further north-east. B11 connects Puchong to Kajang.

The lengths of the above roads are shown in Table 2-2.

### 2.1.3 The Existing Road Network in Kuala Lumpur

The existing road network in the Federal Territory of Kuala Lumpur consists of mainly two types of roads. Firstly, the urban arterial roads such as Expressways, Highways and Federal Roads and secondly, the ring roads which are circumferential to the city. The road network in Kuala Lumpur shown in Figure 2-2 are explained as follows:

#### 1) Jalan Sultan Ismail

This is the inner ring road of Kuala Lumpur. This road encircles the central business district (CBD) of Kuala Lumpur.

#### 2) Jalan Tun Razak (Middle Ring Road I)

This is also known as Middle Ring Road I. This road encircles the central planning area of Kuala Lumpur.

#### 3) Middle Ring Road II

This road is under construction. But, some north-east sections are complete and open to traffic. This road, when completed, will encircle developed area, including the residential areas of Kuala Lumpur.

#### 4) Jalan Kuching

This is a major radial arterial road which connects the Federal Route 1 to the city center of Kuala Lumpur from the north.

#### 5) Jalan Duta

This is also an arterial radial road which connects the city center to the NKVE at Jalan Duta Toll Plaza.

#### 6) Jalan Sentul

This road, which runs radially in the north, connects the city to the Kuala Lumpur-

Karak Highway.

7) Jalan Ampang

This is a radial arterial road traversing east-west from the city center outwards. It connects the three ring roads mentioned above.

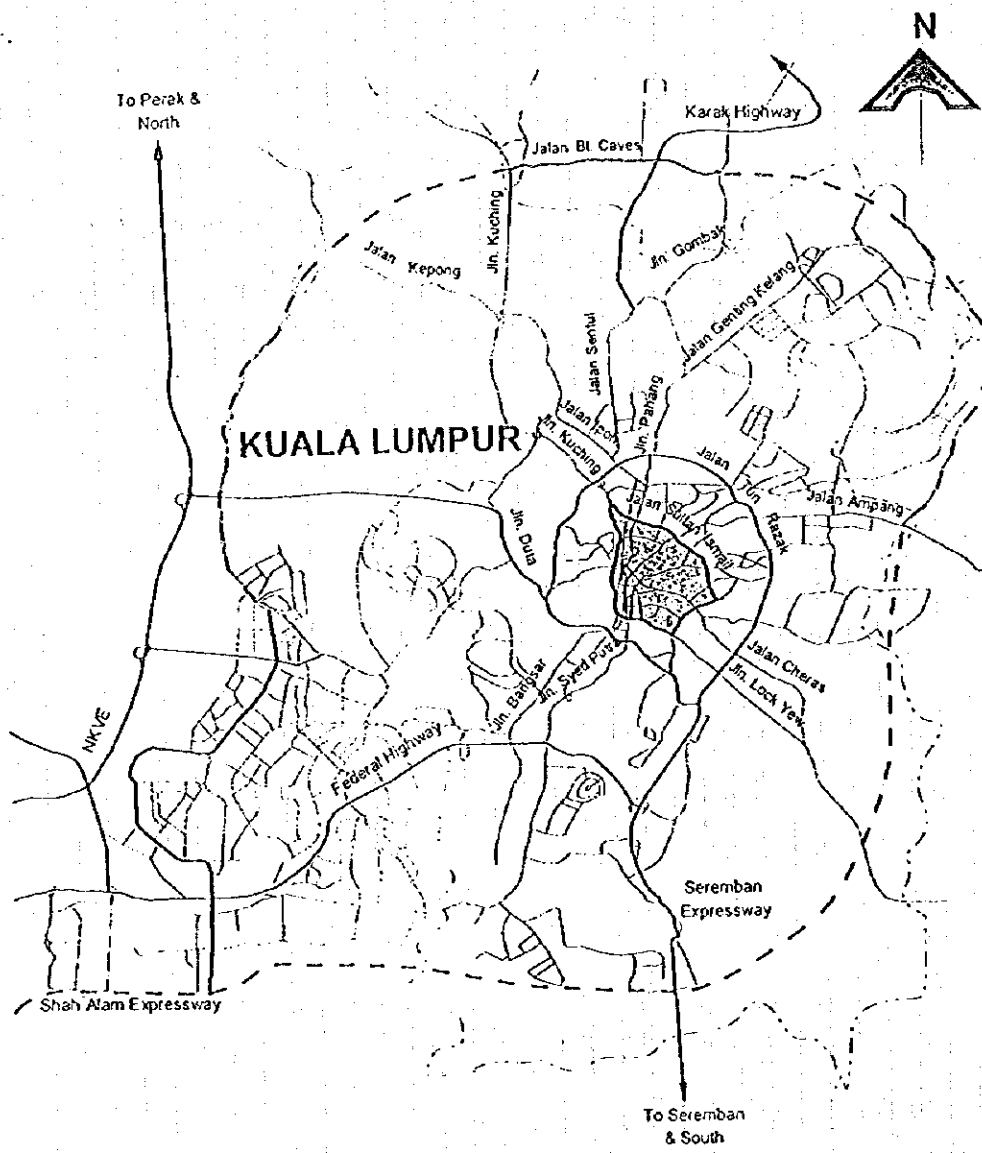


Figure 2-2 : Road Network in Kuala Lumpur

## 8) Jalan Cheras

This arterial road also runs radially from the city center towards the south. It eventually merges with Federal Route 1 and to the southern regions from Kuala Lumpur.

The network of above roads is shown in Figure 2-2 and the lengths of them are shown in Table 2-3.

Table 2-3 : Lengths of Roads in Kuala Lumpur

	Name of Road	Length (Km)	Remark
1	Jalan Sultan Ismail	3.27	Jalan Kuching to Jalan Imbi
2	Jalan Tun Razak	7.48	Jalan Cheras to Jalan Ipoh
3	Middle Ring Road II	51.15	Only 19 Km are complete by now
4	Jalan Kuching	7.68	Jalan Ipoh to Jalan Sentul Sehaluan
5	Jalan Duta	5.69	Jalan Kuching to Lebuhraya Mahameru
6	Jalan Sentul	2.35	Jalan Ipoh to Jalan Sentul Sehaluan
7	Jalan Ampang	8.10	Jalan Gereja to Kuala Lumpur Boundary
8	Jalan Cheras	3.74	Jalan Tun Razak to Kuala Lumpur Boundary

## 2.2 Existing Traffic Condition

### 2.2.1 Traffic Volume

#### 1) Analysis of Existing Data

The traffic volume on major roads in Selangor State from 1985 to 1994 is examined from the publications of Highway Planning Unit as shown in Table 2-4. The annual growing trends of traffic volume on major roads is shown in Figures 2-3, 2-4 and 2-5. The highest traffic volume of 355,704 veh /16 hr(vehicles per 16 hours) was observed on the Kuala Lumpur - Petaling Jaya section of Federal Route 2, with an average annual growth of 6%. The traffic volume on the Federal Route 2 is very high from Kuala Lumpur to Klang and is at increasing trend.

Although traffic volume was very low at 9,634 veh/16 hrs in 1994, the highest annual growth rate of 22% is found on State Road B48 between Kuala Lumpur and Sepang. The traffic volume on Federal Route 1, between Tg. Malim and Kuala Lumpur, decreased from 1992 to 1993, which might be explained by the opening of the North-South Expressway in 1993. The average annual growth of traffic volume on major roads is 6.5%.

Since the opening of the North-South Expressway in 1993, the traffic volume on this road has increased tremendously. The daily traffic volumes on various sections are

shown in Table 2-5 and the comparisons of volumes are shown in Figure 2-6 and 2-7. The highest daily traffic volume in the northern section was counted on the Damansara - Subang section. It was 70,228 veh/day in 1994, 32% up from the 1993 volume. On the contrary, traffic volume on the Subang - Bukit Raja section decreased in 1994 by 14% from the previous year to 19,609 veh/day. This might be caused by the widening of Federal Route 2 in these section to 6-lane divided highway. On the Kuala Lumpur - Seremban Expressway, the highest traffic volume of 72,343 veh/day in 1994 was observed at the UPM - Kajang section.

## 2) Analysis of Traffic Survey Data

The traffic survey was conducted as a part of this study in April and May 1995. Roadside Traffic Count, Roadside Interview and Travel Time Survey were conducted. The daily traffic volumes at the survey stations, for Passenger Cars, Buses and Lorries are shown in Table 2-6.

The traffic survey was conducted to realize the traffic demand on cordon lines for Kuala Lumpur as well as the Klang Valley. The traffic volume inbound to Kuala Lumpur was 587,042 veh/day, whereas, the outbound volume was 621,125 veh/day. The traffic volume inbound to Klang Valley was 92,300 veh./day, whereas, the outbound volume was 97,122 veh/day.

The highest traffic volume observed on Federal Route 2 between Kuala Lumpur and Petaling Jaya was 448,931 veh/day, followed by 138,532 veh/day on Damansara Road near the stadium. The daily traffic volume on major roads is shown in Figure 2-8.

The daily traffic volume on Jalan Duta Toll Plaza on the North - South Expressway was 76,335 veh/day, which is 67% up from 1994. Similarly, the daily traffic volume on Sungai Besi Toll Plaza on the Kuala Lumpur - Seremban Expressway was 85,578 veh/day, with an increase of 28% from 1994.

The hourly traffic volume on major roads is shown in Figure 2-9. The highest volume was on Federal Route 2, between 8 and 9 AM, with 33,200 veh/hr, which is 7.3% of the daily volume. The average peak hour volume in the study area was 8.5% of the daily volume.

Table 2-4: Traffic Volume on Major Roads in Selangor State  
16 Hrs Volume for both direction including Motorcycle

Station	Route No.	From - To	Year													Av. Annual Growth
			1,985	1,986	1,987	1,988	1,989	1,990	1,991	1,992	1,993	1,994				
BR 005	SR B48	KL - Salak-Sepang	2,120	3,171	3,984	6,527	4,699	5,689	6,407	5,994	6,124	9,634	21.97%			
BR 702	FR 1	Tg. Malim - K.K. Baharu	8,556	8,805	9,126	9,432	9,842	10,614	11,491	9,080	6,574	7,271	-0.83%			
BR 701	FR 1	K.K. Baharu - Batang Kali	9,676	8,868	10,351	10,706	10,707	10,249	10,831	7,507	4,880	5,240	-5.01%			
BR 901	FR 1	Rawang - Batu Caves	21,502	28,927	22,030	19,943	19,570	24,573	29,226	22,464	21,567	22,512	2.34%			
WR 102	FR 1	Batu Caves - KL	49,239	53,422	53,962	58,155	58,403	73,084	80,814	85,202	75,461	93,103	7.87%			
BR 603	FR 1	KL - Cheras	34,741	33,178	38,758	42,358	44,923	53,077	63,434	65,721	71,543	107,380	14.21%			
BR 604	FR 1	Cheras - Kajang	23,973	24,669	26,538	31,554	32,009	31,952	35,132	39,812	41,039	42,971	6.86%			
BR 605	FR 1	Kajang - Seremban	6,866	6,571	7,215	7,895	7,438	7,421	7,975	9,075	10,052	10,112	4.93%			
BR 807	FR 2	KL - Petaling Jaya	216,959	225,165	251,454	241,571	223,613	275,573	310,309	332,294	355,593	355,704	6.01%			
BR 806	FR 2	P. J. - Subang Jaya	134,370	156,410	139,648	132,650	195,049	192,132	173,211	197,510	186,835	310,707	12.37%			
BR 805	FR 2	Subang Jaya - Shah Alam	82,950	74,628	83,352	101,451	92,415	108,233	111,844	104,791	119,725	142,289	6.86%			
BR 101	FR 2	Shah Alam - Klang	49,979	36,593	29,854	42,445	33,300	52,586	69,226	68,378	75,674	101,291	12.03%			
BR 102	FR 2	Klang - Klang Pot	40,682	31,627	32,826	29,173	25,253	34,206	22,997	24,785	21,999	19,076	-6.34%			
BR 502	FR 5	KL - Sabak	4,092	5,904	6,479	6,278	7,010	6,814	7,814	8,379	9,029	7,929	8.58%			
BR 006	FR 5	Klang - Sepang	5,014	5,047	4,654	4,705	4,854	4,968	5,777	5,885	6,519	6,491	3.11%			
BR 902	FR 2	KL - Karak Highway	9,511	10,428	10,428	12,194	12,234	14,263	15,204	15,940	15,613	17,986	7.56%			
		Total	10,676	11,976	13,110	15,959	14,341	16,303	17,898	15,074	12,698	16,905	6.48%			

(Source: Road Traffic Volume, Malaysia by HPU)

FR - Federal Route  
SR - State Road

### Traffic Volume on Some Major Roads

Figure 2-3 : Traffic Volume on Different Sections of Federal Route 1

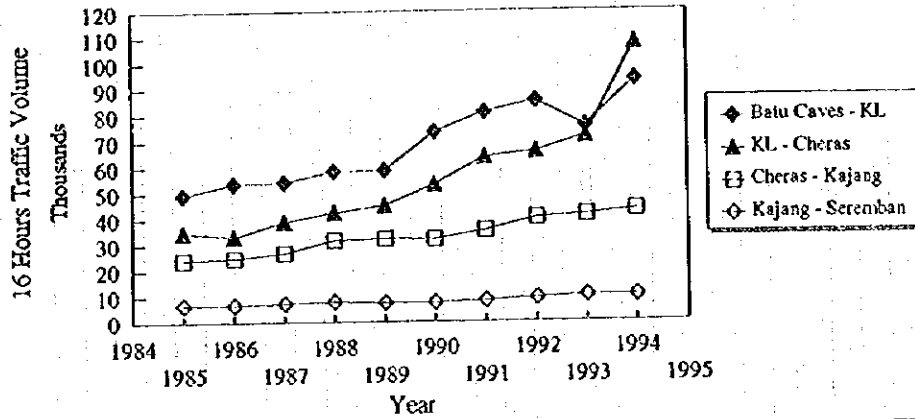


Figure 2-4 : Traffic Volume on Different Sections of Federal Route 2

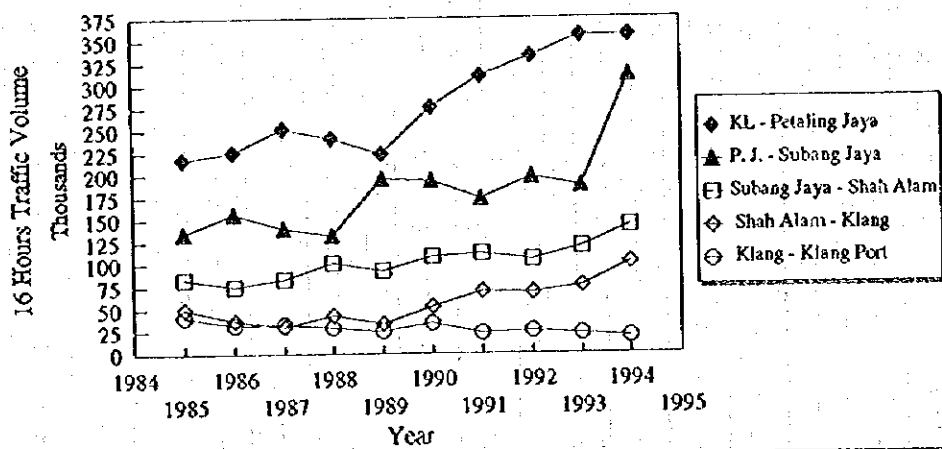
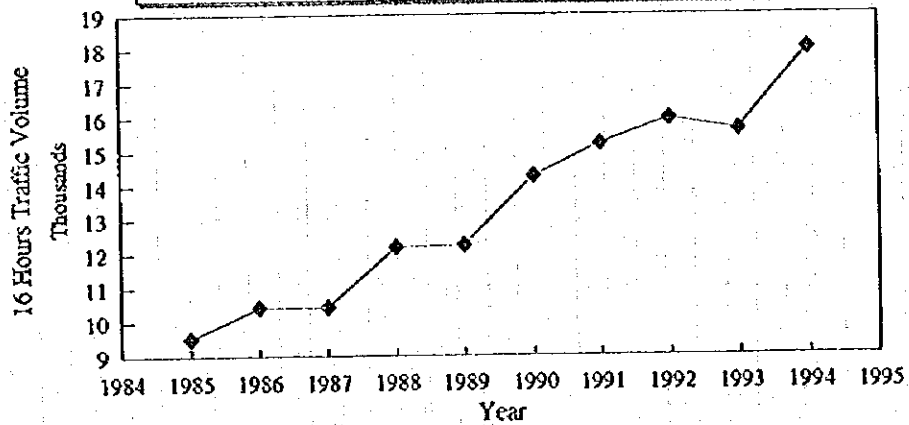


Figure 2-5 : Traffic Volume on KL - Karak Highway Gombak Toll Plaza

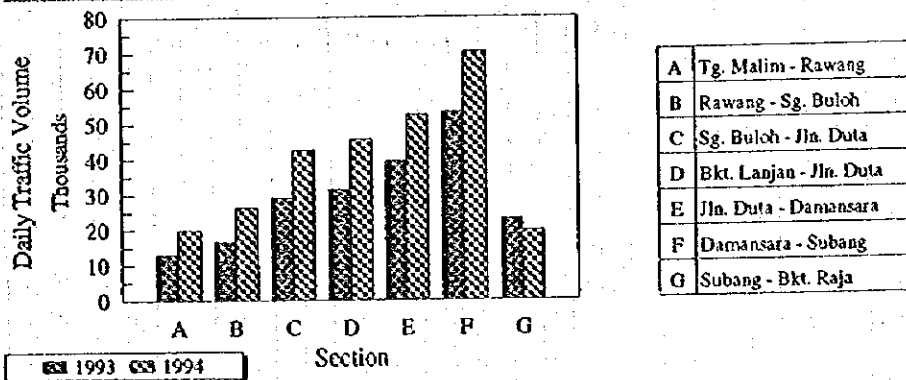


(Source : Road Traffic Volume, Malaysia by HPU)

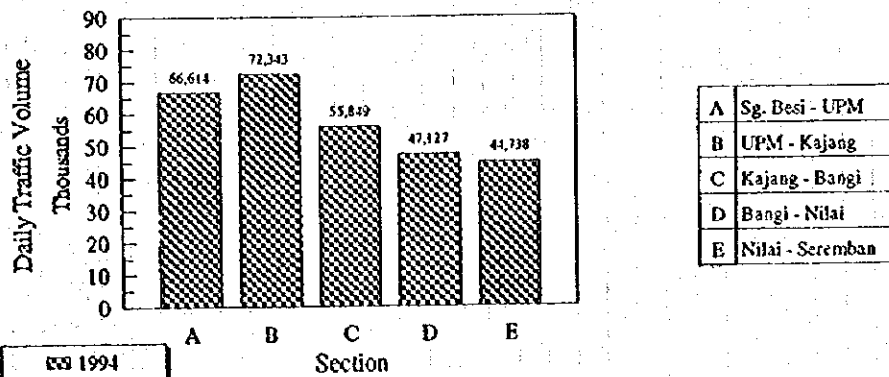
**Table 2-5: Traffic Demand on North-South Expressway**  
Daily Traffic Volume

Section	Year		Annual Growth
	1993	1994	
<i>Northern Section</i>			
Tg. Malim - Rawang	12,980	19,907	53.37%
Rawang - Sg. Buloh	16,639	26,368	58.47%
Sg. Buloh - Jln. Duta	29,028	42,617	46.81%
Bkt. Lanjan - Jln. Duta	31,351	45,547	45.28%
Jln. Duta - Damansara	39,198	52,342	33.53%
Damansara - Subang	53,281	70,228	31.81%
Subang - Bkt. Raja	22,799	19,609	-13.99%
<i>KL - Seremban Section</i>			
Sg. Besi - UPM		66,614	
UPM - Kajang		72,343	
Kajang - Bangi		55,849	
Bangi - Nilai		47,127	
Nilai - Seremban		44,738	

**Figure 2-6: Daily Traffic Volume on North-South Expressway**  
Northern Section



**Figure 2-7: Daily Traffic Volume on North-South Expressway**  
KL - Seremban Section



(Source: Road Traffic Volume, Malaysia by IPU)



Table 2-6 : Daily Traffic Volume on Various Roads in the Study Area

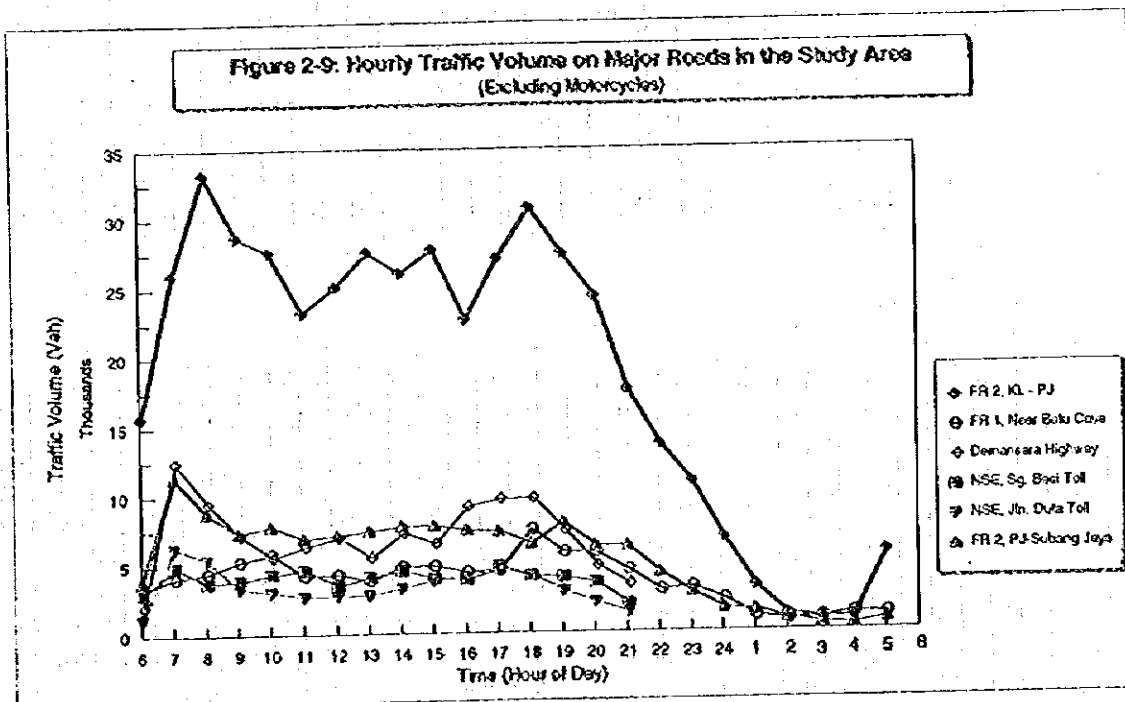
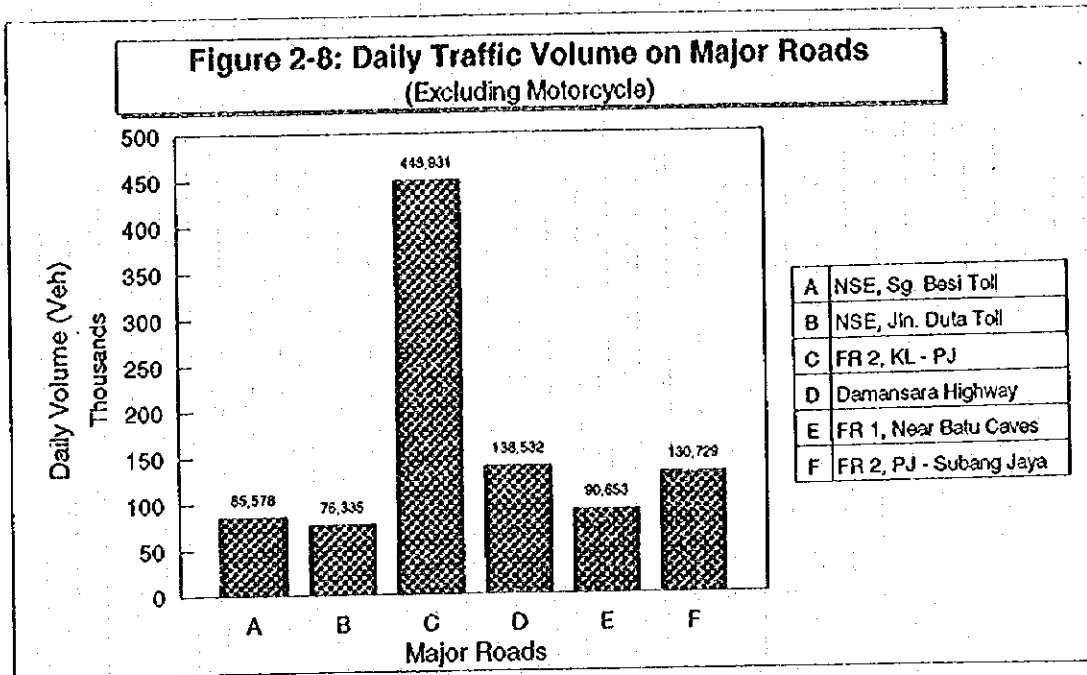
Stn. No.	Name of Road	Location	Traffic Volume		
			Dir. 1	Dir. 2	Total
<b>Stations along KL Federal Territory Cordon Line</b>					
F4	FR - 2	Boundary of F.T. and Petaling Jaya	214,669	234,262	448,931
F5	Damansara Road	Near Stadium	67,872	70,660	138,532
F8	FR - 1	Near Batu Cave	45,221	45,432	90,653
F1	KL-Seremban EW	Sungai Besi Toll Plaza	43,981	41,597	85,578
F11	FR - 1	Near Junct. of FR-1 & SR B-52	41,524	40,591	82,115
F3	SR - B14	Near Junction of SR B11 and B14	39,163	38,025	77,188
F7	FR - 54	East of Sg. Buloh	26,620	27,647	54,267
F6B	North Klang Valley EW	BT. Lanjan I.C., Location B	27,685	17,336	45,021
F10	SR - B21	Near Junct. of SR B-21 & B-36	19,105	25,620	44,725
F6A	North Klang Valley EW	BT. Lanjan I.C., Location A	12,815	27,768	40,583
F12	SR - B13	Near Junct. of SR B-13 & B-16	15,998	15,676	31,674
F6C	North Klang Valley EW	BT. Lanjan I.C., Location C	13,815	17,401	31,216
F9	KL - Karak Highway	Gombak Toll Plaza	9,793	11,025	20,818
F2	SR - B11	Lombong Bijih Timah Kucai	8,781	8,085	16,866
<i>Sub-Total</i>			587,042	621,125	1,208,167
<b>Stations along Klang Valley Cordon Line</b>					
12	KL - Seremban EW	South of Bangi I.C.	28,909	30,598	59,507
3	North - South EW	Near Ladang K. Garing	9,897	10,515	20,412
16	FR - 5	Pandamaran	9,586	10,680	20,266
4	FR - 1	Near Bt. Rawang Jaya Housing	9,358	9,653	19,011
1	FR - 5	Near Kg. Tambak Jawa	8,671	8,801	17,472
7	KL - Karak Highway	Border of Selangor	6,230	7,419	13,649
14	SR - B11	West of B11 & B13 Junction	5,015	5,032	10,047
2	FR - 54	Kg. Merban Sempak	4,874	4,803	9,677
11	FR - 1	Beranang	4,365	5,013	9,378
13	SR - B18	Near KL-Seremban EW	3,798	3,363	7,161
6	SR - B23	Hulu Gombak	1,208	888	2,096
8	SR - B32	Genting Peres	389	357	746
<i>Sub-Total</i>			92,300	97,122	189,422
<b>Other Stations</b>					
17	FR - 2	Subang Jaya	73,919	56,810	130,729
F13	North Klang Valley EW	Jln. Duta Toll Plaza	41,723	34,612	76,335
10	FR - 1	Cheras	19,556	27,394	46,950
5	SR - B27	East of Rawang IC	12,033	13,617	25,650
15	SR - B11/16	Near Selangor Garden Center	9,528	9,285	18,813
9	SR - B62	Hulu Langat	2,561	1,704	4,265
<i>Sub-Total</i>			159,320	143,422	302,742
<i>Grand Total</i>			838,662	861,669	1,700,331

Note:

EW - Expressway  
FR - Federal Route

SR - State Road  
IC - Interchange

(Source : Traffic Survey, 1995)  
Dir. 1 - Towards Kuala Lumpur  
Dir. 2 - Away from Kuala Lumpur



(Source : Traffic Survey, 1995)

### 2.2.2 Traffic Composition by Vehicle Types

The traffic in Kuala Lumpur is composed of 90% Passenger Cars, 8.5% Lorries and 1.5% Buses, whereas, traffic in the Klang Valley is composed of 73.2% Passenger Cars, 23% Lorries and 3.8% Buses. This shows that Kuala Lumpur is more auto dependent. The low percentage of buses might be attributed due to an inadequate number of buses or insufficient demand for them.

The total traffic in the study area is composed of 87% Passenger Cars, 11% Lorries and 2% Buses as shown in Figure 2-10.

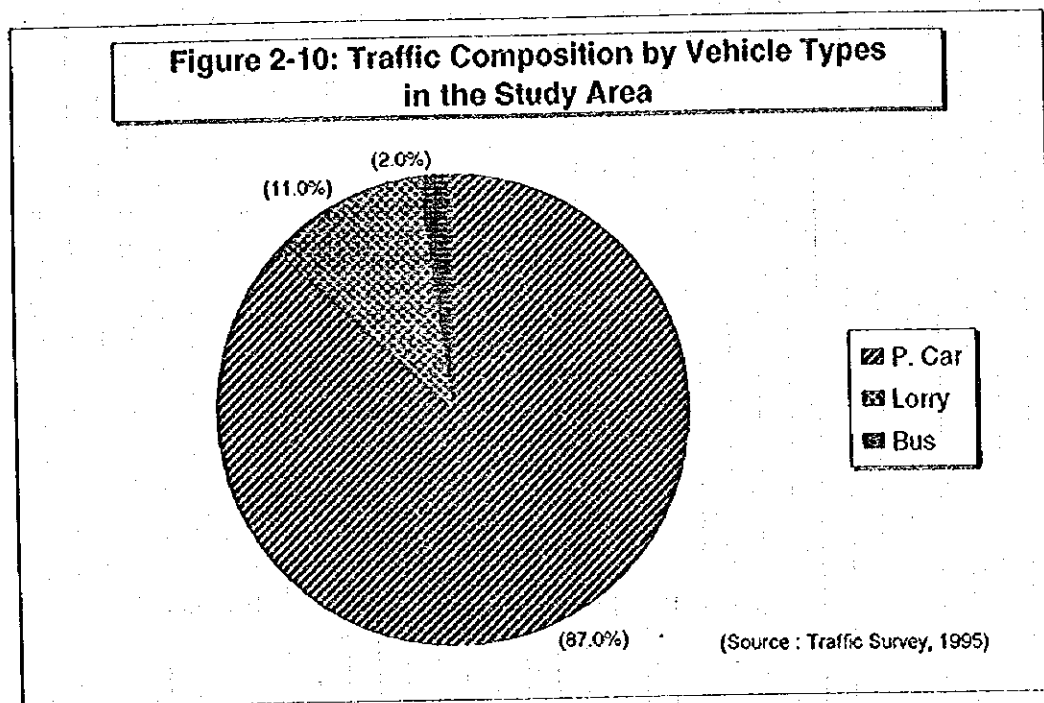


Figure 2-10 : Traffic Composition by Vehicle Types in the Study Area

### 2.2.3 Travel Time

Travel time survey was conducted by the floating car method. Test cars were driven floating on the specified several roads at assumed average speed. By this survey the following results were observed.

Smooth traffic flows were observed in both northern and southern sections of the North-South Expressway. Slight congestion was observed on the Federal Road 1 between Rawang and Kuala Lumpur at peak hours and congestion was also observed on the Federal Road 2 between Kuala Lumpur and Klang at peak hours. Jalan Ampang was very congested at peak hours, with an average speed of only 17 km/hr. The average travel speeds of major roads are shown in Table 2-7.

Table 2-7: Average Travel Speed on Major Roads

Route No	Name	Start Point	End Point	Average Speed (Km/Hr)		
				MP	OP	EP
1	North - South Expressway	Jalan Duta Toll Plaza Rawang Toll Plaza	Rawang Toll Plaza Jalan Duta Toll Plaza	79.1	80.8	77.3
				81.7	82.6	74.6
2	Federal Route 1	Bank Negara Rawang	Rawang Bank Negara	55.1	57.4	52.7
				43.0	57.6	54.0
3	Kuala Lumpur - Karak Highway	Jalan Sultan Ismail Gombak/Bentong Border	Gombak/Bentong Border Jalan Sultan Ismail	51.4	50.0	45.7
				49.1	50.6	44.6
4	MRR II	Jalan Ampang Batu Caves	Batu Caves Jalan Ampang	35.6	38.6	34.7
				38.5	40.0	29.1
5	Jalan Ampang	Jalan Sultan Ismail Jalan Bukit Belachan	Jalan Bukit Belachan Jalan Sultan Ismail	15.3	26.8	18.8
				19.0	23.4	15.5
6	Bank Negara - Puchong (Jalan Klang & State Road B11)	Bank Negara Puchong Batu Dua Belas	Puchong Batu Dua Belas Bank Negara	22.6	36.4	23.0
				24.0	32.4	36.7
7	Puchong - Kajang (State Road B11)	Puchong Kajang	Kajang Puchong	61.4	69.6	60.7
				68.6	69.9	62.3
8	Kuala Lumpur - Seremban Expressway	Bank Negara Kajang	Kajang Bank Negara	47.4	47.5	42.7
				33.2	58.6	39.4
9	Federal Route 1	Bank Negara Kajang	Kajang Bank Negara	46.5	41.0	28.1
				30.3	41.4	38.9
10	State Road B52 & B62	Cheras Ampang	Ampang Cheras	48.2	48.9	46.5
				47.9	47.3	48.2

Note: MP - Morning Peak Period,  
OP - Off Peak Period,  
EP - Evening Peak Period

## 2.3 Trip Characteristics

### 2.3.1 Vehicle Occupancy Rate

The average vehicle occupancy rate for Passenger Cars was 1.7 person per vehicle whereas for buses it was 21.5. Table 2-8 shows the average vehicle occupancy rate for all the survey stations. The average vehicle occupancy rate for Passenger Cars traveling on the North-South Expressway was 1.1 which indicates that most of them are commuters.

Table 2-8 : Average Vehicle Occupancy Rate

Station No.	Location	Vehicle Occupancy Rate	
		P. Car	Bus
2	FR 54, Kg. Merban Sempak	2.1	21.11
4	FR 1, Rawang	1.9	19.16
5	SR B27, Rawang	1.6	21.08
9	SR B62, Hulu Langat	1.72	20.85
10	FR 1, Cheras	1.45	27
15	SR B11/16, Near Selangor Garden	1.94	18
16	FR 5, Pandamaran	2.1	20.4
F1	NSE, Sg. Besi Toll Plaza	1.05	21.56
F9	Kuala Lumpur - Karak Highway, Gombak Toll Plaza	1.9	25.8
F13	NSE, Jin. Duta Toll Plaza	1.15	19.69
Average		1.69	21.49

Note: FR - Federal Road, NSE - North-South Expressway, SR - State Road  
 (Source : Traffic Survey, 1995)

2.3.2 Trip Purpose

The results of the survey are shown in Figure 2-11. 34.5% of total trips were to work trip. 16.4% were "Business/Official" trips and 30.9% were home bound trips. About 16,500 veh/day were to work trips towards Kuala Lumpur through both of Sungai Besi Toll Plaza and Jalan Duta Toll Plaza on the North - South Expressway. Similarly at these Toll Plazas 14,500 veh/day and 11,200 veh/day, respectively, were home bound trip traveling away from Kuala Lumpur. This indicates that large numbers of road users at these sections are commuters.

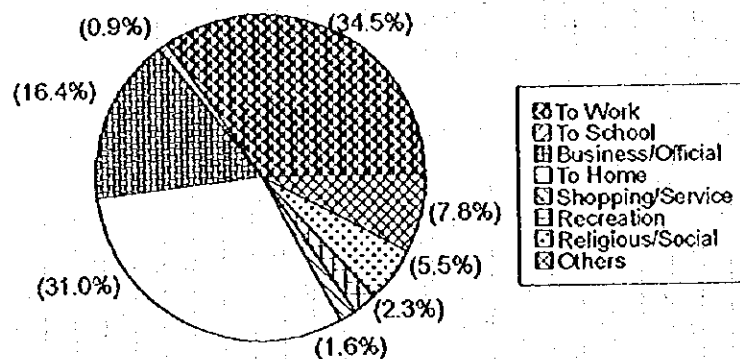
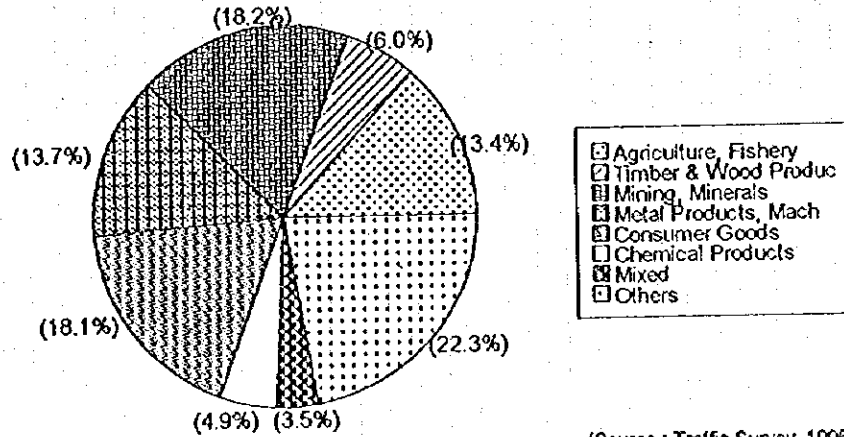


Figure 2-11 : Traffic Demand by Trip Purposes

2.3.3 Commodity

The types of commodities carried by Lorries in the study area were examined. Both Consumer Goods and Mining/Minerals comprised 18%, whereas, each of Agriculture, Fishery & Livestock Products and Metal Products/Machineries comprised 13%. The shares of commodities are Figure 2-12.

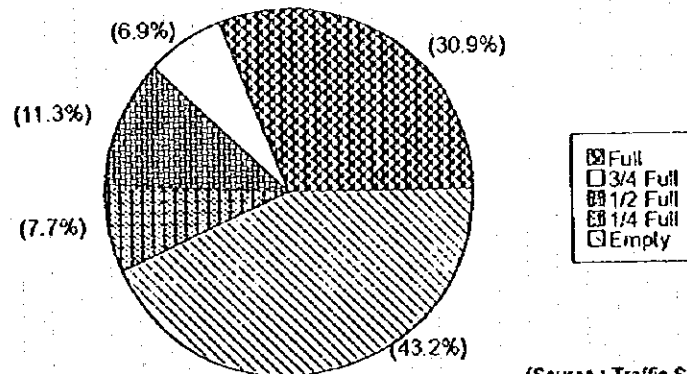


(Source : Traffic Survey, 1995)

Figure 2-12 : Commodities Carried by Lorries

2.3.4 Loading Condition

More than half of the lorries, that is 57%, were loaded. As for the loading condition, 31% were fully loaded, 7% were three quarters loaded, 11% were half loaded and 8% were a quarter loaded as shown in Figure 2-13.



(Source : Traffic Survey, 1995)

Figure 2-13 : Loading Condition of Lorries

Chapter **3**

**SOCIO-ECONOMIC FRAMEWORK**

## CHAPTER 3 SOCIO-ECONOMIC FRAMEWORK

### 3.1 Objectives and Methodology

The objectives of the Socio-economic study for the KLORR project are :-

- i) examination of the future development trend in the study area and
- ii) estimation and forecast of the socio-economic indicators for traffic demand forecasting.

The future development trend are necessary to formulate a development plan for the KLORR, and also they provide essential information when forecasting socio-economic indicators, especially for traffic zones.

The development area to be studied covers the whole area of Selangor State and Kuala Lumpur (KL), Districts of Bentong in Pahang State, Seremban in Negeri Sembilan and Batang Padang in Perak. The development trend consists of the following two issues:

- Subjects to be solved/mitigated by means of the development.
- Foreseeable population distribution and industrial activities within the Study Area.

The above issues are approached from the following viewpoints:

- Conditions for the continuation of human-life.
- World wide socio-economic situation until the year 2050.
- Roles which the study area should play in achieving the Malaysian national development goals.

Directions and limitations of future socio-economic development in the Study Area, understood from former issues, are reflected in the latter issues of existing development plans. The directions and limitations are summarized in form of "Requirements for establishing the Socio-Economic Development Plan in the Study Area" which are described in the Technical Report.

The kind of socio-economic indicators required for traffic demand forecasting are much dependent upon the availability and reliability of the indicators, which enable to meet a traffic zoning system.

For estimating and forecasting traffic demand by traffic zones, two types of explanatory variables are required : variables which represent existing and future activities of people and commodities at generation areas of traffic ("Residential Place Base"), and variables which represent its activities at attraction areas of traffic ("Working Place Base").

Based on the availability of indicators and the above requirements, the following indicators with observed/measured area are shown in Table 3-1.



Table 3-1: Classification of Estimated and Projected Indicators by Observed/Measures Areas

Estimated/Projected Indicators	Observed/Measured Areas
Population	- Residential Place
Labour Force <sup>1</sup>	- Residential Place
GDP	- Working Place
Employment <sup>2</sup>	- Working and Residential Places

Note: \*1: It is an intermediate indicator for estimating and projecting the Employment at Residential Place Basis.  
 \*2: In the 1991 Population Census, Employment at Residential Place Basis, but not Working Place Basis, was surveyed.

Traffic zones adopted for the KLORR project are Mukim level or smaller. The available socio-economic indicators in the study area are mainly state level; limited data and information are available at Mukim level, except for population and the number of households and houses. These can be obtained from the population census of 1991.

The methodology for forecasting socio-economic indicators, therefore, employs a Break Down Method using the higher level's value as a Control Total with the assumptions shown in Figure 3-1.

Detailed explanation on backgrounds, methodologies and results; fundamental and intermediate data related to this chapter are presented in the Technical Report.

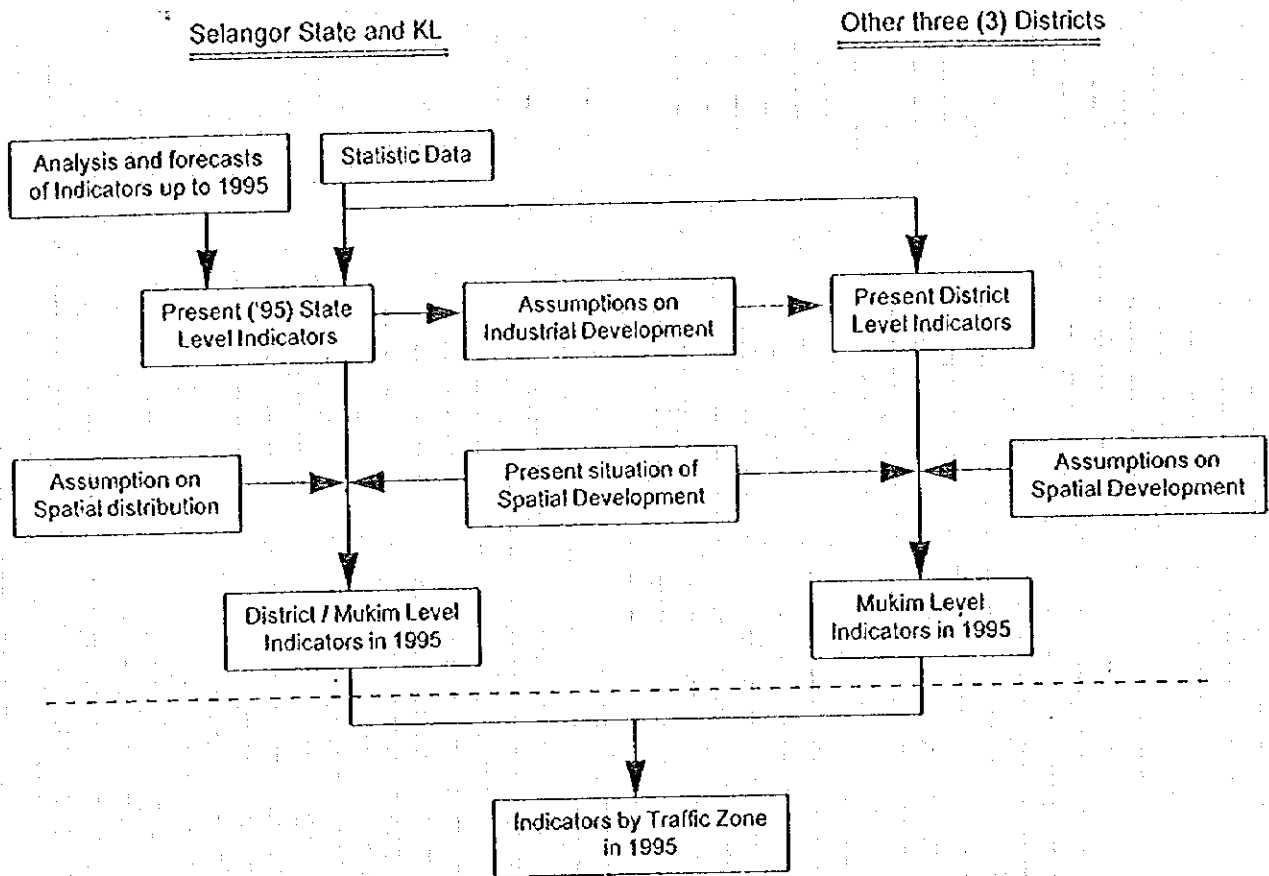
### 3.2 Existing Development Pattern

The results of the discussion in this section are mainly used to estimate the Socio-Economic Indicators by Mukim in 1995.

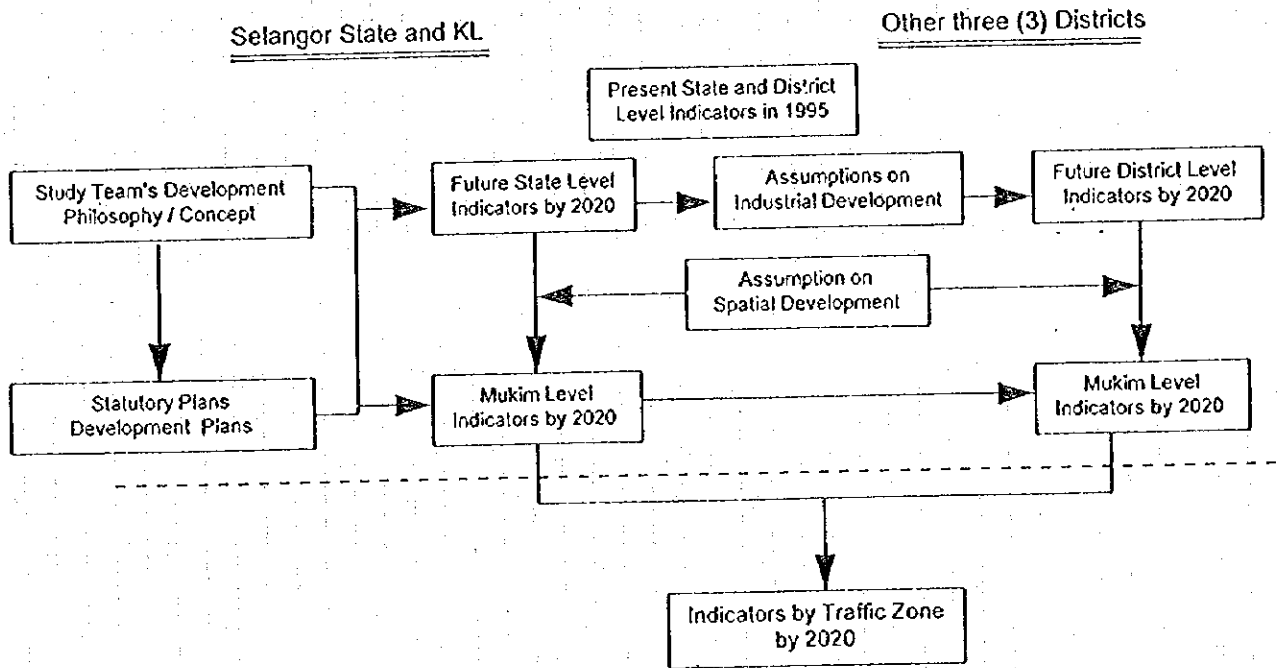
The existing pattern of development in the study area is shown in Figure 3-2. Most urban development is concentrated in the Klang Valley Region, stretching from Kuala Lumpur to Klang.

The strategy in the Klang Valley Perspective Plan (Review) to disperse development to the newly growing areas of Sg. Buloh, Bandar Baru Selayang and Bangi is slowly gaining momentum. This was essentially precipitated by rising development costs in the urbanized area and the completion of the Expressway Network.

Most of the other urban centers outside the Klang Valley are local centers serving the commercial and service needs of the local residents. Many of them are unable to provide higher order goods and services, comparing the polarized Klang Valley Urban Metropolitan Area. Even district capitals such as Kuala Selangor, Sabak Bernam, Kuala Kubu Baru, Banting and Salak Tinggi are merely small towns serving the needs of agricultural communities.



A. Mukim / Traffic Zone Level Indicators in 1995



B. Mukim / Traffic Zone Level Indicators by 2020

Figure 3-1 : Basic Estimation and Forecasting Processes of Socio-Economic Indicators

The lack of employment opportunities and the low returns of the agricultural sector compelled many people to seek employment in the Klang Valley Urban Metropolitan Region. This is reflected in the population census, which shows that the population of the Klang Valley (excluding Kuala Lumpur) grew from 0.99 million (1980) to 1.81 million (1991) at a rate of 5.6% p.a. Meanwhile, the districts in the Bernam Valley Region (Sabak Bernam, Ulu Selangor and Kuala Selangor) grew 0.3% p.a. during the period, while the Sepang/ Kuala Langat region grew 1.7% p.a. during the period, thus indicating out migration from the districts. Both Hulu Selangor and Sabak Bernam declined while Kuala Selangor grew at 1% p.a. during the period.

The rapid migration from the peripheral districts has led to a serious labour shortage in the agricultural sector. Small holdings were left idle while the estate sector had to employ foreign labour.

The government's action in creating new employment opportunities was to set up Industrial Estates in the District Capitals. Some of these Industrial Estates, such as in Bangi, Telok Panglima Garang and Kuala Selangor, were able to attract large multi-national companies, while others in Sekinchan and Sg. Besar had difficulty in attracting such industry. The situation was just as bad in Bentong, which registered a growth of 1.31% (1980-1991), and Balang Padang at 1.25% for the period. The district of Seremban did better at 2.4%, indicating the emergence of urbanized activities in the Seremban District.

It is difficult to counteract the forces that polarized development to the Klang Valley Region. The rest of Selangor was actually living in the shadows of the Klang Valley Region. This trend is about to change dramatically with the establishment of the KLIA new International Airport and the Putra Jaya, Administrative Center in Sepang.

As most of the Regional Development Plans will end by 2005, it is imperative that Selangor prepare a State Development Plan to provide guidelines for future development.

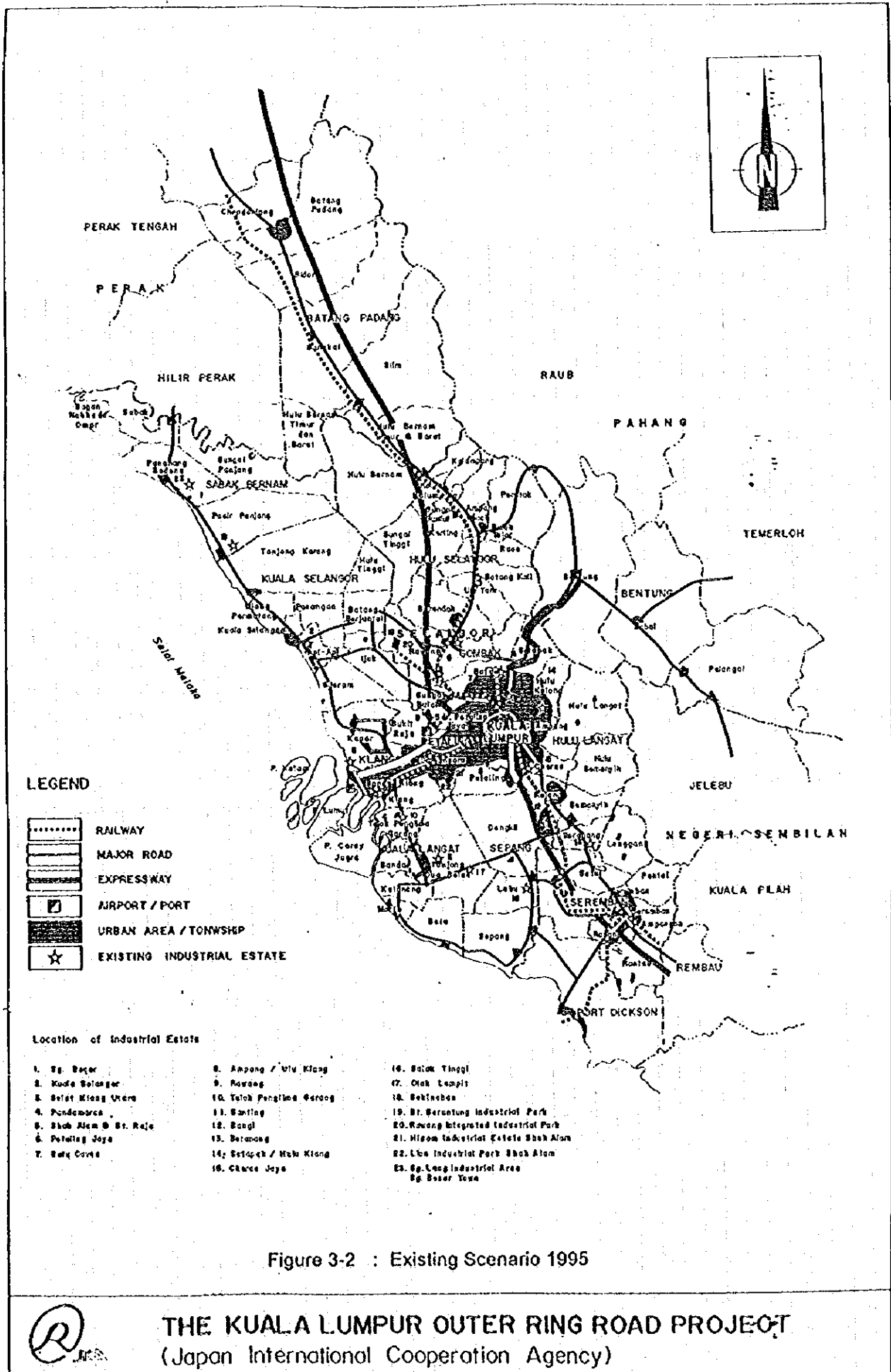


Figure 3-2 : Existing Scenario 1995



**THE KUALA LUMPUR OUTER RING ROAD PROJECT**  
(Japan International Cooperation Agency)

### 3.3 Future Development Pattern in Selangor

The Study has reviewed and examined the existing socio-economic development plans, such as OPP2, Malaysia Plan, Selangor State Development Strategy, Structure Plans and so on. Future development patterns are summarized as follows.

By 2010, it is predicted that Selangor will have achieved developed state status. Urbanization levels will rise with increased establishment of urban growth centers. The urbanization level, which was 34.2% in 1980, increased sharply to 75.3% in 1991 and is expected to exceed 80% by 2010.

As outlined in The State Development Strategy, a functional hierarchy of centers will be established, with most of the urban development to occur outside The Klang Valley Region.

Much of the urban development will occur in Putra Jaya and KLIA Region (Sepang- Kuala Langat). It is expected that both Putra Jaya and KLIA will be operational by then. Population concentration will mainly occur in :-

- (i) Putra Jaya area, which may be declared as a Local Authority Area.
- (ii) Salak Tinggi - Nilai Airport City
- (iii) Bt. Changgang - Banting - Telok Panglima Garang Development Area

Other population concentrations will be in the needy subregional centers of Batu Laut, Telok Merbau, Sg. Pelek and Pulau Carey. However, many of these urbanization strategies depend on the completion of the major infrastructure projects in the region, such as the KLIA, the Port facilities at Batu Laut and Pulau Lumut, the North South Link and the Electric Train Link to the KLIA.

It is also predicted that industrial development in the next decade will be promoted along Industrial Corridors, as opposed to dispersed industrial estates as the current strategy. The main industrial focus will be in -

- (i) Shah Alam - Petaling Corridor
- (ii) Telok Panglima Garang - Banting - Bt. Changgang Corridor
- (ii) Pajam - Mantin Area
- (iv) Specialized Industries and Hi Tech Industries in Salak Tinggi and Telok Merbau

When trying to strike a balance between urban development and the loss of 'green areas' the State should:

- (i) Gazette and conserve all existing Forest Reserve and Swamp Forest areas.
- (ii) Only promote urban development within the development area of the towns shown in the Structure / Local Plans. Urban development should not be allowed to frog leap, as is currently the practice.
- (iii) Prepare local plans for all major towns in Selangor.
- (iv) Convert estate land for urban development not indiscriminately, unless they fall within the growth area identified in the Development Plans.

Urban spillover will also occur in the Hulu Selangor District with the completion of major

township developments at Lembah Beringin, Bt. Beruntung and Sg. Buaya, which have all developed along the North South Expressway. It is recommended that controlled access to these townships from the Expressway be extended to Batang Kali and Kerling.

Industrial development will be promoted along the following Industrial Corridors:

- (i) Rawang - Kuala Kubu Baru including the existing 2nd National Car Project site at Serendah
- (ii) Kuang - Kundang - Batu Arang Area stretching up to Batang Berjuntai - Ijok
- (iii) Kajang - Kuala Selangor Stretch

The Kuala Lumpur Outer Ring Road, which is expected to meet the North South Expressway at Rawang, will be completed within this time frame.

A major portion of North - West Selangor, including the districts of Kuala Selangor and Sabak Bernam, is food growing area or under Swamp Forest. Inland Swamp Forest plays an important role in the ecological balance of the region. It is also likely that the presence of Swamp Forest is important for sustainable paddy growing. Hence, it is strongly recommended that the swamp forest be preserved for posterity for the people of Selangor. Small scale compatible developments, such as local service centers, eco - tourism projects like building of chalets may be allowed.

The major towns in the region such as Tg. Karang, Sekinchan, Sg. Besar and Sabak will serve as important distribution and manufacturing centers for food, including sea produce. Industrial Zones will be developed close to these centers for Food Processing Factories.

With the massive urban development project in the KLIA region, North-West Selangor should remain the showpiece for effective natural resource management and rural development. The Figure 3-3 shows a conceptual Development Strategy for Selangor State.

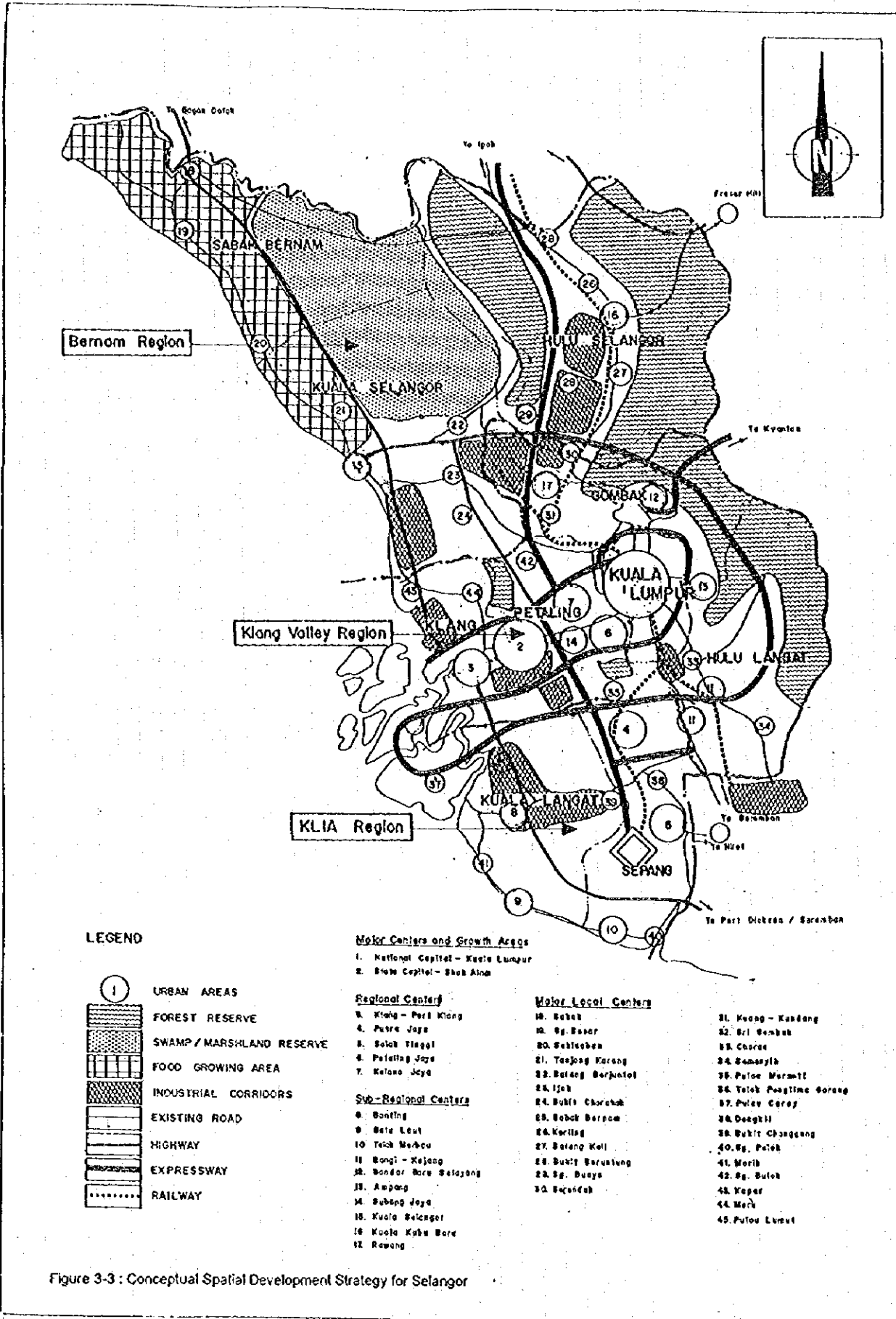


Figure 3-3 : Conceptual Spatial Development Strategy for Selangor

### 3.4 Macro Socio-Economic Framework

#### 1) Forecast of Socio-Economic Framework of Selangor State and Kuala Lumpur until the year 2020

The forecasts of GDP, Employment on Working Place Basis and Population at the State level are presented hereinafter. Two cases of the macro socio-economic framework were examined. One is based upon the existing economic trend whereas the other is based upon the national economic development policy. The forecasts satisfy not only the requirements for establishing the macro framework but also guidelines on the framework which was presented by the Regional Economic Division of EPU. Along with the forecasts, another set of framework were examined for Economic Evaluation of the Project in Chapter 12.

Table 3-2 : Forecast of GDP for Selangor State and Kuala Lumpur, 1995-2020 (Summary)

#### 1. Total GDP before adjustment by Imputed Bank Services Charge and Import Duty (Unit : Million RM, at 1978 prices)

	1995	2000	2010	2020
Selangor State	24,275	37,694	76,255	131,751
Kuala Lumpur	15,595	22,703	38,780	60,895

#### 2. Annual Average Growth Rates

(Unit : % / annum)

	1995 - 2000	2000 - 2010	2010 - 2020	1995 - 2020
Selangor State	9.0	7.3	5.6	7.0
Kuala Lumpur	7.8	5.5	4.6	5.6

Table 3-3 : Forecast of Employment on Working Place Basis in Selangor State and Kuala Lumpur, 1995 - 2020 (Summary)

#### 1. Total Employment on Working Place Basis \*

(Unit : 1000 Employees)

	1995	2000	2010	2020
Selangor State	929.4	1,130.8	1,640.0	2,089.9
Kuala Lumpur	683.9	818.3	1,040.1	1,239.1

#### 2. Annual Average Increasing Rates

(Unit : % / annum)

	1995 - 2000	2000 - 2010	2010 - 2020	1995 - 2020
Selangor State	4.0	3.8	2.5	3.3
Kuala Lumpur	3.7	2.4	1.8	2.4

Note : \* Forecast after adjustment through which the total Employment on Working Place Basis of the two States



becomes equal to the total Employment on Residential Area Basis of the two States. As a result, there is an estimation error of about one percent between the area and those which are calculated based on the total GDP and Improvement rates of Labour Productivity (see the Technical Report).

**Table 3-4 : Forecasts of Population\* of Selangor State and Kuala Lumpur, 1995 - 2020 (Summary)**

**1. Total Population**

(Unit : Person)

	1995	2000	2010	2020
Selangor State	2,698,220	3,282,800	4,708,010	5,937,440
Kuala Lumpur	1,329,300	1,590,560	2,021,630	2,408,490

**2. Annual Average Increasing Rates**

(Unit : % / annum)

	1995 - 2000	2000 - 2010	2010 - 2020	1995 - 2020
Selangor State	4.0	3.7	2.3	3.2
Kuala Lumpur	3.7	2.4	1.8	2.4

Note : \* - This is required to realize the future Economic Growth in Selangor State and Kuala Lumpur. In Appendix VI-2 of the Technical Report, forecasting methodology and introduced assumptions are presented.

**Table 3-5 : Forecast of Population, Labour Forces and Employment on Residential Area Basis of Selangor State and Kuala Lumpur, 1995-2020**

(Unit : Person)

		(1) Population	(2) Labour Forecast	Employment on Residential Place Basis	(2) / (1) (%)	Unemploy- ment Ratio (%)
Selangor State	1995	2,698,220	1,085,280	1,054,890	40.2	2.8
	2000	3,282,800	1,319,690	1,282,740	40.2	2.8
	2010	4,708,010	1,892,220	1,839,240	40.2	2.8
	2020	5,937,440	2,386,850	2,320,020	40.2	2.8
Kuala Lumpur	1995	1,329,300	572,410	556,380	43.1	2.8
	2000	1,590,560	685,530	666,340	43.1	2.8
	2010	2,021,630	871,320	846,930	43.1	2.8
	2020	2,408,490	1,038,060	1,008,990	43.1	2.8

**2) Forecasts of Socio - Economic Framework of Districts in Neighbouring States**

Unlike the case of Selangor State and Kuala Lumpur, there is no information / data on the Socio - Economic Growth Rates until the year 2020. Hence, the future Industrial Structures are decided based on those present in 1995, as well as the Growth Rates of GDP by Industry in Selangor State and Kuala Lumpur for the period 1995-2020. The forecasting methodology of Employment and Working Place Basis,

Population, Labour Forces and Employment at Residential Area Basis is almost the same as applied in the case of Selangor State and Kuala Lumpur.

Table 3-6 to 3-8 show the Socio-economic Frameworks of the Districts in the Neighbouring States until the year 2020.

**Table 3-6 : Forecast of total GDP of Districts in Neighbouring States, 1995-2020  
(Summary)**

**1 Total GDP before adjustment by Imputed Bank Services Charge and Import Duty**

(Unit: Million RM, at 1978 prices)

	1995	2000	2010	2020
Seremban	2,644.3	3,594.3	6,689.8	12,549.9
Batang Padang	982.1	1,256.8	2,084.3	3,502.3
Bentong	618.8	778.6	1,243.8	2,011.1

**2. Average Annual Growth Rates**

(Unit: % annum)

	1995 - 2000	2000 - 2010	2010 - 2020	1995 - 2020
Seremban	6.3	6.4	6.5	6.4
Batang Padang	5.1	5.2	5.3	5.2
Bentong	4.7	4.8	4.9	4.8

**Table 3-7 : Forecast of Total Employment on Working Place Basis at Districts in Neighbouring States, 1995 - 2020 (Summary)**

**1. Total Employment on Working Place Basis**

(Unit: Employee)

	1995	2000	2010	2020
Seremban	102,8002	116,760	151,550	197,980
Batang Padang	44,480	49,390	60,510	74,690
Bentong	30,290	32,370	37,380	43,810

**2. Annual Average Changing Rates**

(Unit: % annum)

	1995 - 2000	2000 - 2010	2010 - 2020	1995 - 2020
Seremban	2.6	2.6	2.7	2.7
Batang Padang	2.1	2.1	2.1	2.1
Bentong	1.3	1.4	1.6	1.5

**Table 3-8: Forecast of Total Population of Districts in Neighbouring States, 1995-2020 (Summary)**

**1. Total Population\***

(Unit: Person)

	1995	2000	2010	2020
Seremban	289,490	328,130	424,670	553,980
Batang Padang	169,420	186,120	227,450	281,640
Bentong	88,2850	95,040	109,740	128,240

**2. Annual Average Increasing Rates**

(Unit: % annum)

	1995 - 2000	2000 - 2010	2010 - 2020	1995 - 2020
Seremban	2.5	2.6	2.6	2.6
Batang Padang	1.9	2.0	2.2	2.1
Bentong	1.4	1.4	1.6	1.5

- Note: \*
- Population is to realize the future Economic growth at the Districts in the Neighbouring States.
  - In Appendix VI-2 of the Technical Report, forecasting methodology is presented.
  - The following Annual Average Improvement Rates of Labour Productivity are adopted instead of those entered in the Appendix VI-2:

Seremban	: 3.7 % / annum, 1995 - 2020
Batang Padang	: 3.1 % / annum, 1995 - 2020
Bentong	: 3.3 % / annum, 1995 - 2020

**Table 3-9: Forecast of Population, Labour Force and Employment on Residential Place Basis of Districts in Neighbouring States, 1995-2020**

(Unit: Person)

		① Population	② Labour Force	Employment at Residential Place Basis	②/① %	Unemployment Ratio (%)
Seremban	1995	289,490	117,250	113,870	40.5	2.9
	2000	328,130	132,890	129,040	40.5	2.9
	2010	424,670	171,990	167,000	40.5	2.9
	2020	553,980	224,360	217,860	40.5	2.9
Batang Padang	1995	169,420	63,550	61,350	37.5	3.5
	2000	186,120	69,800	67,350	37.5	3.5
	2010	227,450	85,290	82,310	37.5	3.5
	2020	281,640	105,620	101,920	37.5	3.5
Bentong	1995	88,850	32,160	31,000	36.2	3.6
	2000	95,040	34,400	33,170	36.2	3.6
	2010	109,740	39,730	38,300	36.2	3.6
	2020	128,240	46,420	44,750	36.2	3.6