

3. EVALUATION OF ALTERNATIVE PLANS

3.1 Alternative Plans

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

- (1) 'Do-Nothing' Case: No further improvement to the existing transportation system is assumed in this case which represents the worst possible outcome in the future. This alternative functions as a control or bench-mark against which the other alternatives are evaluated.
- (2) Alternative Plan 1-1: This alternative comprises of an effective road network proposed for the Klang Valley together with improvement to the existing bus system.
- (3) Alternative Plan 1-2: This alternative is similar to Plan 1-1 except for a lesser road network for the Bangi area while better linkages are planned for the Sg. Buluh area.
- (4) Alternative Plan 2-1: In addition to those proposed in Plan 1-2 this alternative includes an extensive mass transit network consisting of four(4) MRT and seven(7) LRT lines.
- (5) Alternative Plan 2-2: This alternative comprises of Plan 1-2 together with a more realistic transit network of four(4) MRT and three(3) LRT lines.
- (6) Alternative Plan 2-3: In addition to Plan 1-2 this alternative proposes an MRT only transit plan.
- (7) Alternative Plan 2-4: This alternative comprises of Plan 1-2 and LRT only system plan.

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

3.2 Evaluation Criteria

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

- (a) Functional Suitability of Transportation Systems
- (b) Financial Analysis of Private and/or Public Enterprises
- (c) Economic Evaluation

3.3 Functional Suitability

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

- (a) Volume/Capacity Ratio (Congestion Degree)
- (b) Travel Speed
- (c) Trip Length
- (d) Travel Time
- (e) Balance in Private/Public Mode Share

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

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

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

3.4 Financial Analysis

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

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

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

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

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

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

3.5 Economic Evaluation

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

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

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

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

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

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

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

Note: Annualized Cost is discounted at 12%.

4. PROPOSED TRANSPORTATION MASTERPLAN

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

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

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

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

TG-2 To provide maximum mobility for people and goods

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

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

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

TG-4 To minimize resource consumption of the transportation system

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

TG-5 To enhance environmental and community quality

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

4.2 Proposed Overall Transport Policies

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

- TP-1 Encouraging the development of mass transit system and improvement of the conventional bus transport system so as to prevent a totally motorized society. Hence the plan describing a balanced transport system is the most preferable.
- TP-2 To attain the future development pattern consisting of an urban system of six(6) growth centres with Bukit Tinggi Twin City with their respective planned targets, an effective regional transportation network consisting of a hierarchial road network system and a mass transit railway system shall be established.
- TP-3 The existing transportation facilities shall be effectively utilized as much as possible so as to obtain maximum effects with minimum social and capital costs.
- TP4 The transportation development shall meet the varied transport demands both for the movement of people and goods taking into account specific needs to have the transport modes comprised of both innovative and conventional forms.
- TP-5 To achieve efficiency on transport development, both infrastructure augmentation measures and the policy measures such as the traffic limitation programmes shall be considered.
- TP-6 The road network to be provided shall be free from symptoms of the transport diseconomies such as bottleneck and stopshorts.
- TP-7 Efforts should be directed to establish a road system based on functions to carry and accommodate different types of traffic including the provision of cycle path and pedestrian walks in residential zones in ensuring the possibility of maintaining a safe and conducive living environment.
- TP-8 Efforts should be given to monitor traffic and hence reduce the occurrence of traffic accidents by the use of various traffic management methods.

4.3 Proposed Transportation Masterplan to Year 2005

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

(1) Mass Transit Railway System

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

MR-1 Port Klang Line from Kuala Lumpur to Port Klang

MR-2 Northern Line from Kuala Lumpur to Rawang

MR-3 Batu Caves Line from Kuala Lumpur to Selayang

MR-4 Southern Line from Kuala Lumpur to Bangi New Town

MR-5 Ampang Line from Kuala Lumpur to Ampang

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

(2) Road Network Plan

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

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














(3) Monitoring System

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

- (a) to strengthen the monitoring system on the traffic demands and the transportation systems.
- (b) that the Klang Valley Planning Secretariat in the Prime Minister's Department should constantly monitor and analyse the transport situations in Klang Valley so as to prepare proper countermeasures and coordination whenever any problem should arise in future.
- (c) to review the transport study every five(5) years.

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LEGEND

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

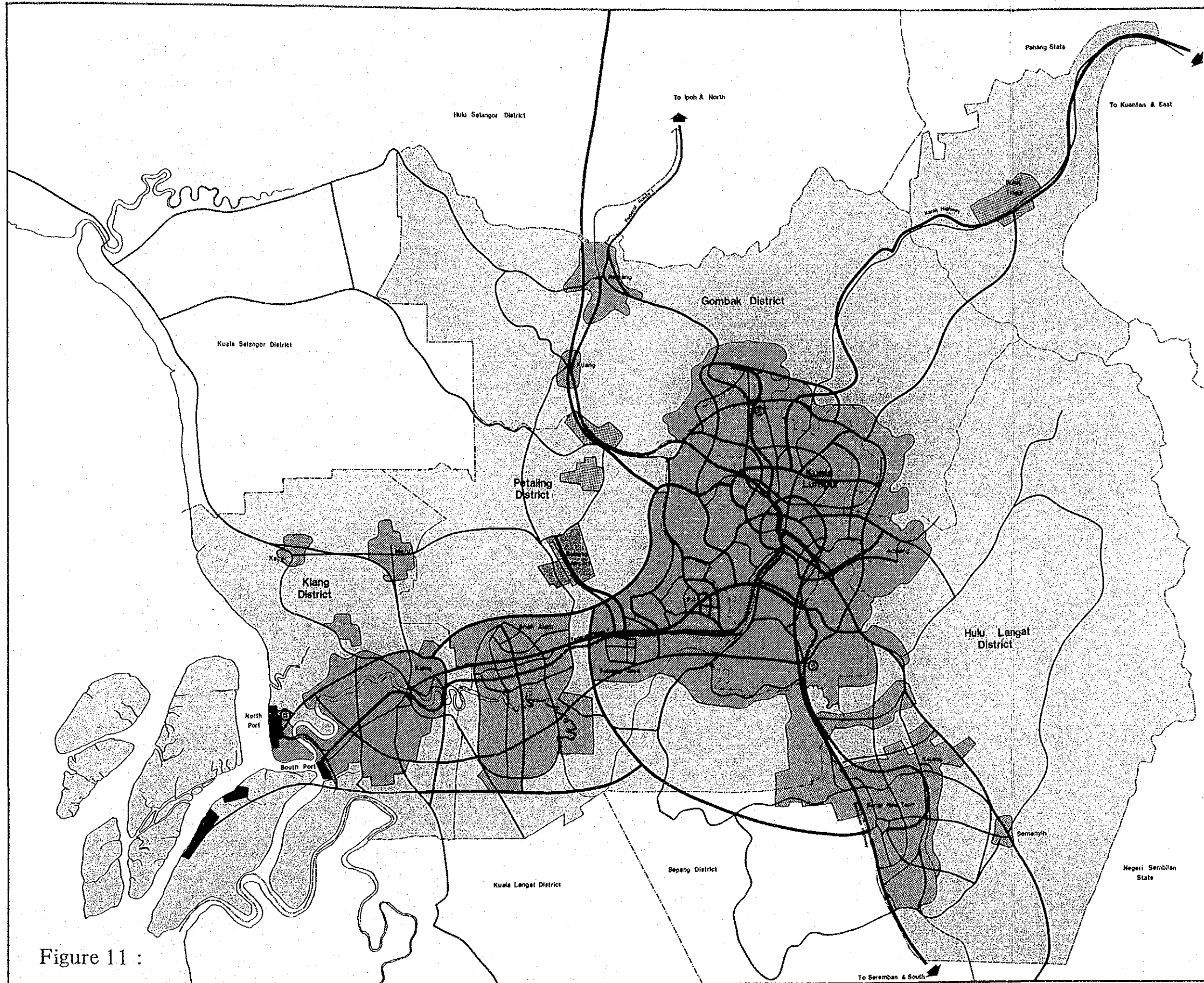
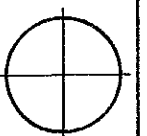


Figure 11 :

PROPOSED TRANSPORTATION MASTER PLAN IN 2005



4.4 Public Transportation Plan

4.4.1 Mass Transit Railway Introduction Plan

(1) The System

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

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

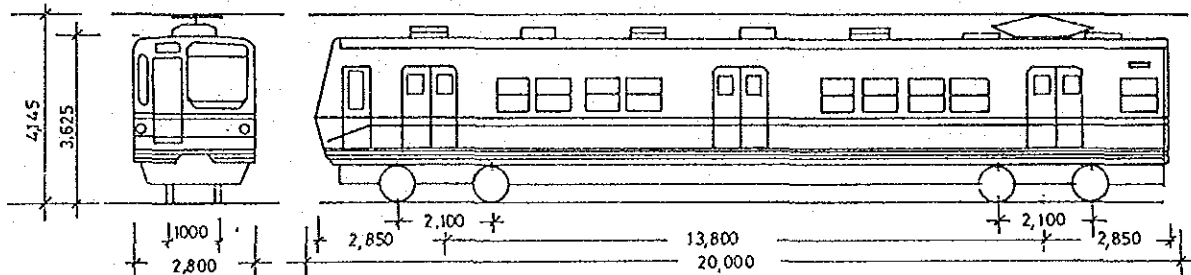


Figure 12 : The Proposed MRT Train

(2) The Network

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

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

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

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

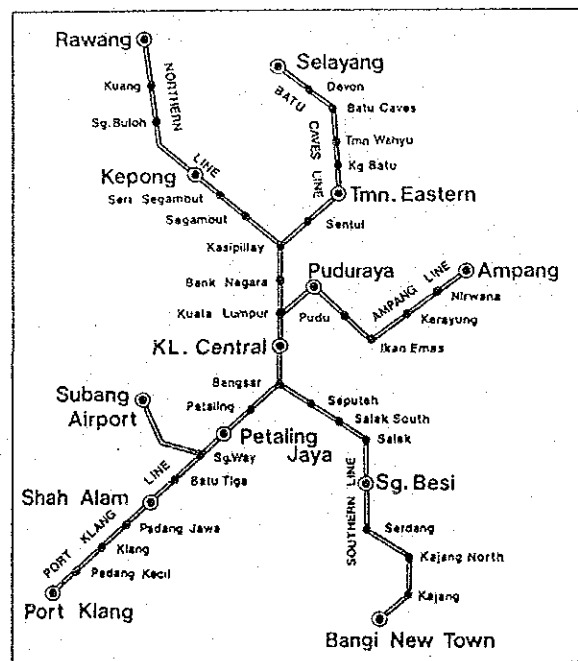


Figure 13 : The Proposed MRT Network in Klang Valley

(3) MRT System Development Plan

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

- (a) Double Tracking and Meter Gauge
- (b) Electrification using the overhead trolley and feeder line system
- (c) Centralized Traffic Control Devices (CTC) and Controlled Automatic Train Stop Devices (ATS)
- (d) Provision of related facilities like bus feeder to the MRT stations, station plaza and landuse control along MRT lines

(e) Phasing of the MRT System

The following phasing plan is proposed.

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

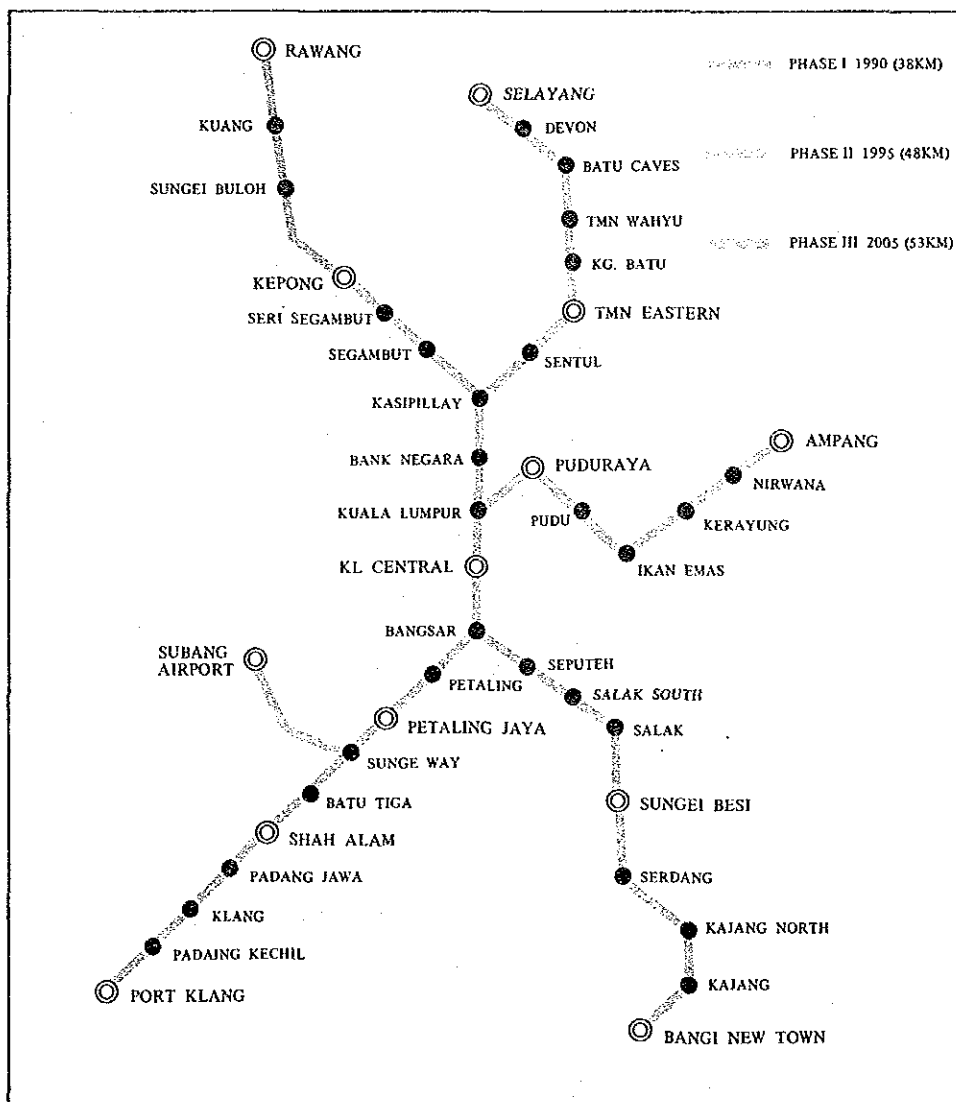


Figure 14: Proposed MRT Phasing Plan

(f) Management Organization for MRT System

The MRT System development requires considerable investment costs of M\$310 million by 1990, M\$788 million by 1995 and M\$1384 million by 2005.

Since the MRT System development is aimed at providing the principal public transport system for the mobility of people in the Klang Valley, the Study Team suggests the formation of a management organization for the MRT System as follows:-

- (i) To promote the MRT System development, a limited company possibly called the Klang Valley Transit Company Limited (KVTC) be established. KVTC is to have the sole function of developing and operating the MRT System.
 - (a) Construction of MRT System
 - (b) Operation of MRT System
 - (c) Land Development along the MRT Lines
 - (d) Development and management of amusement centres, shopping centres particularly at train stations
- (ii) KVTC will be organized with participation from:-
 - (a) Selangor State Government or Selangor State Development Corporation (PKNS)
 - (b) Kuala Lumpur City Hall (DBKL)
 - (c) Malayan Railway (KTM)
 - (d) Private Enterprises

4.4.2 Bus Transport Improvement Plan

(a) Deregulation of Government Controls

The control of bus operation through the franchise of routes to companies should be deregularized whenever possible. A double or triple bus operators system should be encouraged to provide healthy competition and to revitalize the existing bus transport industry.

(b) Bus Service Improvement

In order to improve bus services, the following measures should be implemented:-

- (i) Expansion of bus services into newly developed areas
- (ii) Improvement of services in existing bus routes
- (iii) Improvement in attractiveness and reliability of bus operation
- (iv) Shorter bus headway time

- (v) Introduction of express or limited express services from new town centres to the Central Planning Area of Kuala Lumpur

(c) Bus Fleet Improvement

The bus fleets should be upgraded through the following measures:-

- (i) Introduction of some 360 new stage buses to the Klang Valley Region equipped with two(2) doors, low floor and preferably air-conditioned coaches by the year 1990.
- (ii) Upgrading the engine capacity or horse power of minibuses.
- (iii) Incentives for replacement of old buses.
- (iv) Establishment of three(3) common sharing bus depots in the first phase; two(2) out of three(3) bus depots to be located in the Kuala Lumpur Conurbation and one(1) bus depot be in Klang. These depots are to ensure a well maintained bus fleet so as to minimize breakdown and reduce maintenance costs.

(d) Fare and Pricing Policy

The following policies concerning bus fare should be implemented,

- (i) The present fare structure is found to be acceptable by the public and should be maintained for as long as possible. Bus companies should be encouraged to channel savings from lower fuel costs to expediate replacement of old age fleet.
- (ii) To encourage private vehicle users to use bus transport, premium bus services using air conditioned, comfortable, seating only coaches could be implemented. A premium bus fare structure should then be imposed for such buses only.
- (iii) The physically handicapped and elderly persons should be provided with discounted or free fare as a social equity policy.
- (iv) In the long term when MRT system has been introduced, a common ticketing system shall be encouraged to ease inter-modal transfer and to encourage a greater usage of public transportation.

(e) Bus Transport Facility Improvement

The following improvements to bus transport facilities should be implemented:-

- (i) Bus priority lanes should be set up on major arterial roads having high bus volume to ensure that buses can maintain their operational speed. Roads for possible implementation of bus priority lanes are:-

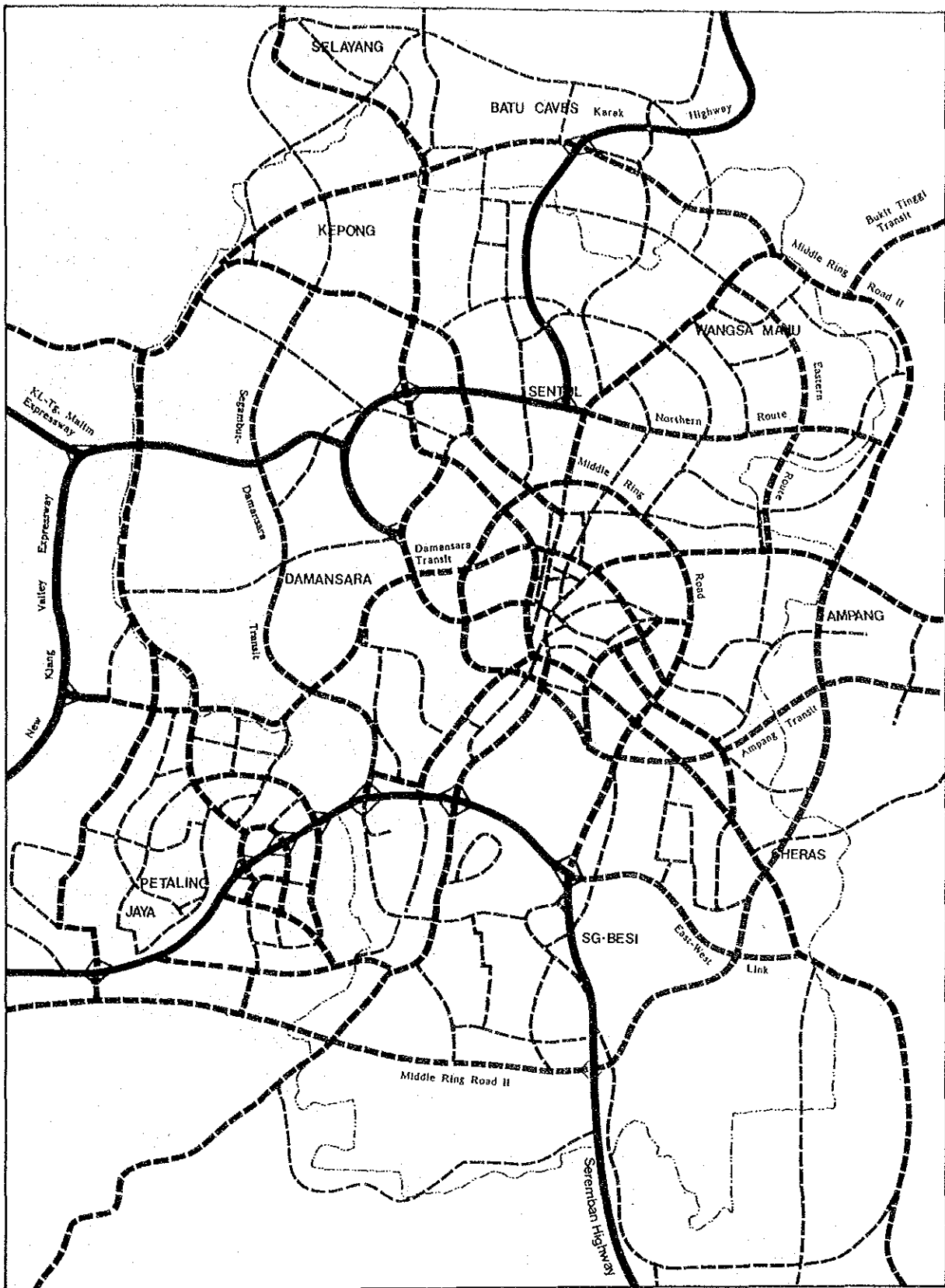
- * Jalan Pantai - Jalan Bangsar-Jalan Travers
- * Jalan Pudu - 7th km Jalan Cheras
- * Jalan Pahang/Jalan Genting Klang

- (ii) Establishment of bus terminals at all major growth centres in the Klang Valley Region
 - (iii) Continuous improvement of bus-stands/shelters
 - (iv) Continuous improvement of pedestrian facilities
 - (v) Improvement of bus information system
- (f) Introduction of Feeder Services to MRT System
- When the Mass Transit System is introduced to the Klang Valley in future, competitive bus routes with the MRT System should be rerouted and the feeder bus services to the MRT Stations should be provided.
- (g) Modernization of Bus Operating/Management System
- Modern management techniques should be practised by bus transport operators to reduce cost of operation while increasing productivity.
- (i) Improve the existing cost control methods to identify any operational deficiency
 - (ii) Improve the existing method of bus service planning and bus/crew scheduling in order to optimise the use of resources
 - (iii) Introduction of One Man Operation Ticketing System (OTS) to save labour cost
 - (iv) Introduction of employee training to instill better driving habits, courtesy and good public relations

4.5 Proposed Road Plan

The proposed road plan seeks to fully utilize the existing road network in forming an adequate road network linking all the six growth centres and Bukit Tinggi to meet the future travel demand and capable of alleviating the forecasted future traffic problems.

In Kuala Lumpur, efforts will be required to strengthen the radial and circumferential roads and the construction of new roads linking the proposed new sub-centres at Bandar Tun Razak, Wangsa Maju, Damansara and Bukit Jalil (Figure 15).



LEGEND





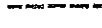

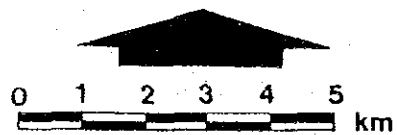
-  Existing Expressway
-  Proposed Expressway
-  Existing Primary Distributor
-  Proposed Primary Distributor
-  Existing District Distributor
-  Proposed District Distributor

Figure 15: Proposed Road Plan in Kuala Lumpur Conurbation, 2005



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In the Other Klang Valley Area, new roads are required to complete the road network in each respective urban centre with clear hierarchical functions.

The regional expressway network has to be further strengthened such as providing an alternative route along the vital Kuala Lumpur-Klang Corridor and linking up with the North-South National Grid (Figure 16).

The future road network for Klang Valley amounts to 1,226 km of roads excluding local distributors of which 205 km are expressways, 405 km are primary distributors (Table 14). A total of 408 km of new roads are proposed while 487 km of existing roads need to be widened (Table 15).

Table 14: Proposed Road Plan

Road Types	Length (km)	Road Areas (sq.km)
Expressway	205.7	13.2
Primary Distributor	405.1	17.5
District Distributor	615.2	18.5
Total	1226.0	49.2

Table 15: Road Construction and Improvement Cost Estimates

	Length/Number	Construction Cost (M\$million)
New Construction		
6-lane	54.6 km	657.2
4-lane	308.7 km	2,002.6
2-lane	44.8 km	125.8
Sub-total	408.1 km	2,785.6
Widening		
2-lane to 6-lane	34.9 km	106.1
2-lane to 4-lane	326.9 km	595.2
4-lane to 6-lane	116.6 km	297.7
Sub-total	478.4 km	999.0
Upgrading	14.5 km	9.6
Grade-Separation for Intersections and Railway Crossings	41 Nos	517.0
Total	901 km and 41 Nos	4,311.2

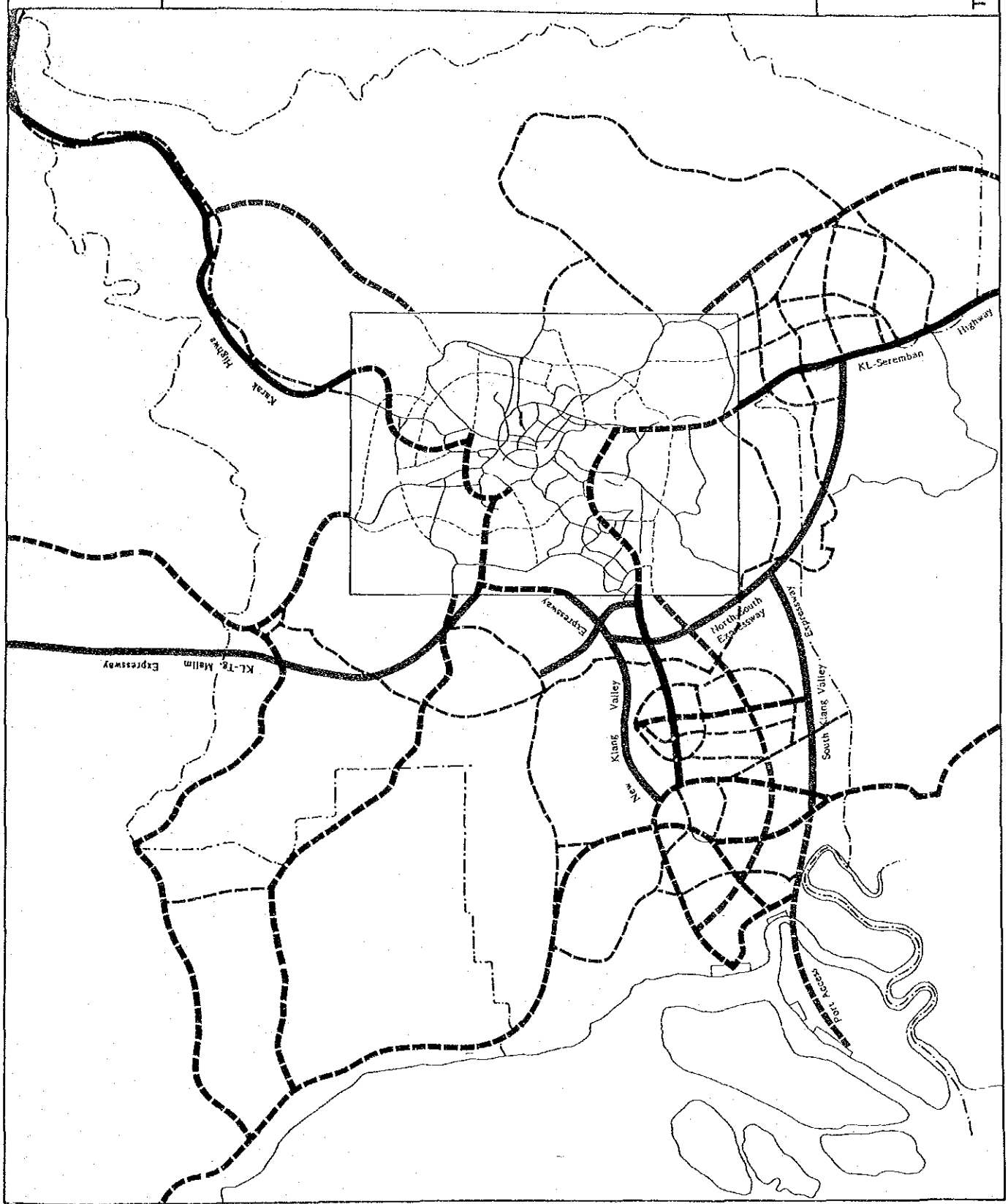
Figure 16:
Proposed Road Plan
in Other Klang
Valley Area, 2005

LEGEND

- Existing Expressway
- Proposed Expressway
- - - Existing Primary Distributor
- - - Proposed Primary Distributor
- - - Existing District Distributor
- - - Proposed District Distributor

0 5 10 15 km

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4.6 Traffic Management Measures

4.6.1 Traffic Restraint Programme

Urban development featuring multi-storeyed buildings has either been completed or in progress within the Middle Ring Road and especially within the Inner Ring Road. This outcome has resulted in inducing more traffic into the Central Area.

Application of traffic restraint measures to the CPA of Kuala Lumpur has been found to be economically feasible. The Study Team therefore proposes this measure as a possible traffic management option to be implemented if sufficient social and administrative support can be obtained.

This possible option will take the form of:-

- * Motor car users with less than 4 persons in the vehicle would be charged for travelling into the Central Area within the Inner Ring Road in the morning peak hours but buses, emergency vehicles and motorcycles would be exempted from the charge. By the introduction of this scheme, traffic congestion on the major roads can be expected to reduce.
- * The cordon charge is recommended at two(2) dollars per day or fifty(50) dollars per month levied by means of pre-purchased stickers which would be displayed on the vehicle windscreen.
- * This would earn the Government a large amount of revenue with less initial costs.
- * As supportive measures to the cordon pricing scheme the following measures are to be implemented simultaneously:-
 - Traffic surveillance and control system especially in the Central Area of Kuala Lumpur
 - Implementation of the MRT System, Phase I
 - Implementation of bus priority lanes in particular:
 - Jalan Pahang and Jalan Genting Klang
 - Jalan Cheras

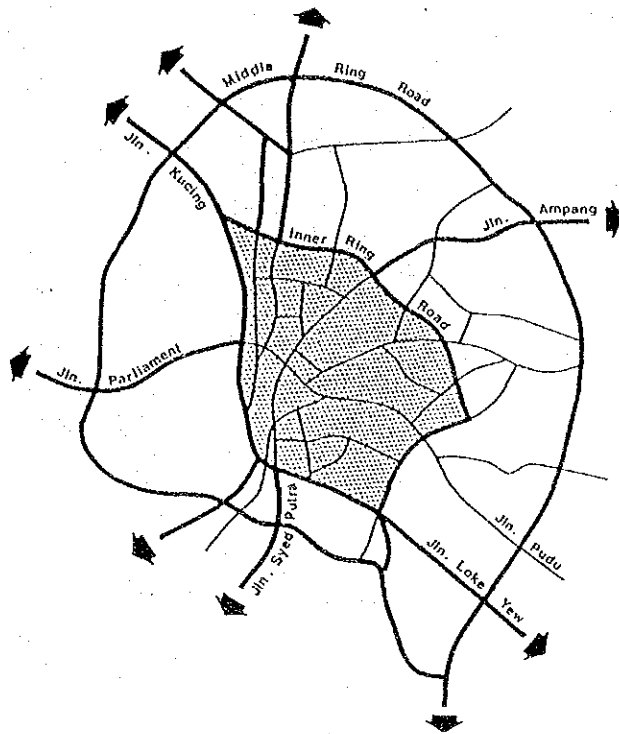


Figure 17 : Proposed Traffic Restraint Zone

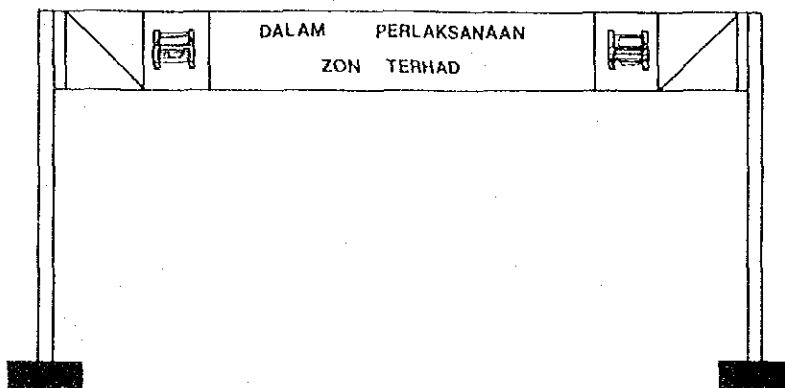


Figure 18 : Example of a Display Gate at Checkpoint to the Traffic Restraint Zone

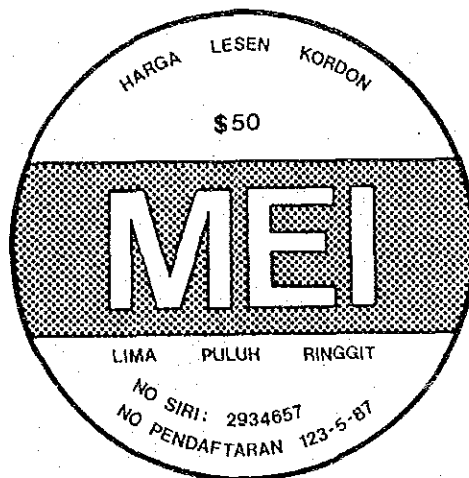


Figure 19 : Example of the Cordon Charge Sticker

4.6.2 Traffic Surveillance and Control System

A traffic surveillance and control system is proposed for the function of:-

- (a) Traffic Surveillance for collecting data required in traffic management and monitoring the traffic for prompt first aid counter-measures.
- (b) Central control and monitoring of traffic for special enforcement, detour implementations and incident detections.
- (c) Traffic control with centrally controlled changeable message signs, radios and traffic signals.

Two systems are proposed, one covering the trunk road network within the Federal Territory and Federal Route II from Kuala Lumpur to Shah Alam and Airport route which is an advanced type of Freeway Surveillance and Control System (Figure 20). The other system covers the Kuala Lumpur Conurbation featuring the innovation of the existing Area Traffic Control System (Figure 21).

4.6.3 Parking Control in the CPA of Kuala Lumpur

Parking supply within the CPA should be strictly controlled and monitored if a more positive mode shift from the private modes to the public modes is to be effected in the future. This is to be in compatible with the traffic limitation measure and the mass transit system introduction proposal.

- (1) Control of Parking Supply in the CPA
- (2) Parking Charges Control covering Public as well as Private facilities
- (3) Removal of On-street Parking along Major streets
- (4) Enforcement on illegal parking operators as well as parkers

4.6.4 Pedestrian Facility Improvement

For Kuala Lumpur and the other urban centres in the Klang Valley, continuous effort should be made:

- (1) To improve the pedestrian network system consisting of foot-paths, side walks, malls, grade-separated crossings and pedestrian decks; whereby this networks are carefully planned to connect major urban activity areas with transport terminals such as bus, MRT/LRT terminals.
- (2) To provide pedestrian paths and network in residential areas or neighbourhoods connecting residential units to local urban centres and public transport terminals or bus-stop.

- Locations of Vehicle Detectors**
- Mainline detectors at 800 m spacing.
 - On and off ramps
 - Queue detectors on the off ramps where congestion occurs
- Locations of CCTV Cameras**
- Recurrent congestion sites or road sections
- Locations of Changeable Message Signs**
- Upstream of interchanges where recurrent congestion takes place
 - Upstream of accident prone sites
 - Upstream of key interchange for route selection
- Locations of Detectors**
- Federal Route II between Pantai Baru interchange and University interchange

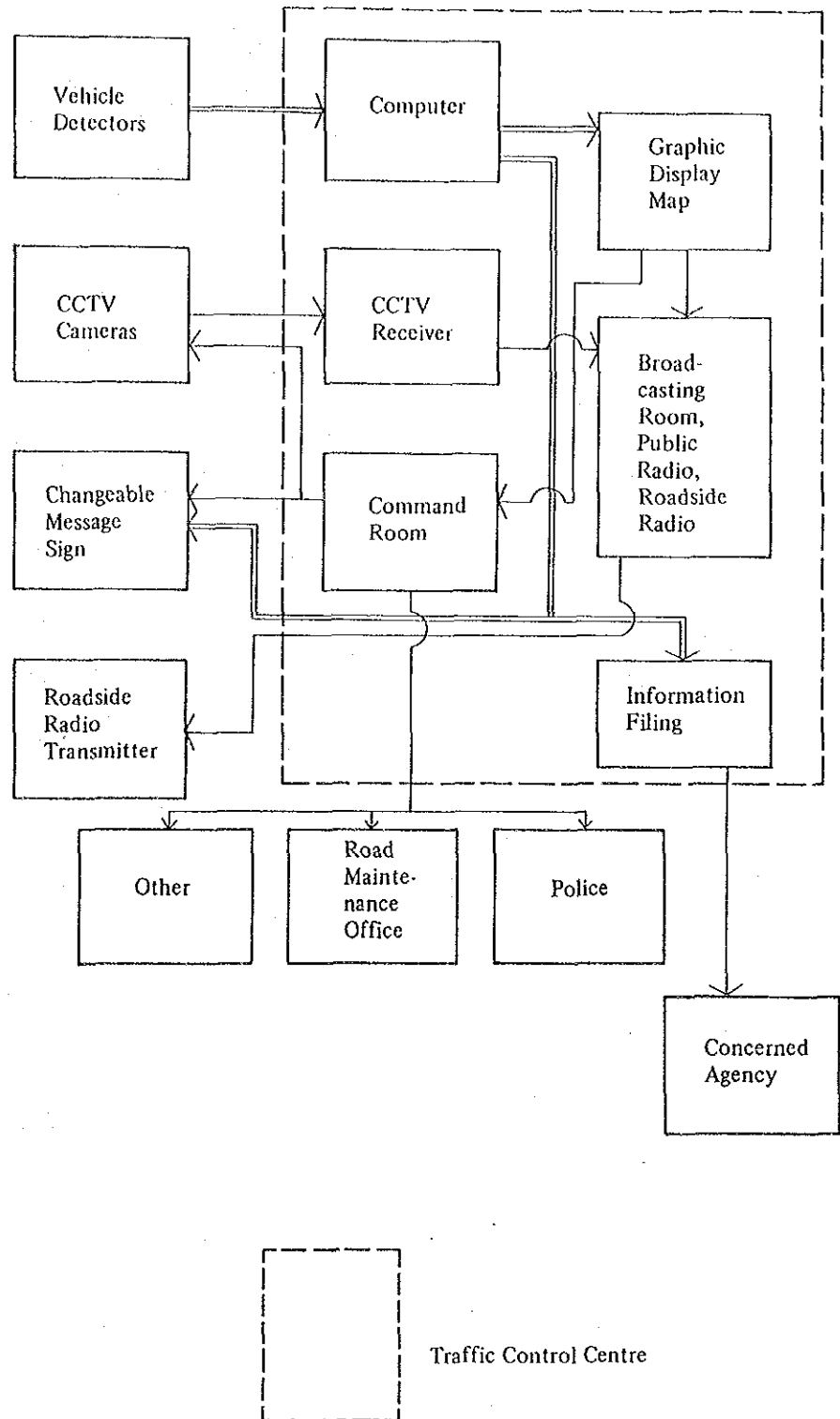


Figure 20 : All Illustration Showing the Flow of Functions and Activities of Expressway Traffic Surveillance and Control System

Locations of Roadside Radio

*Major Arterial Links

*Approaches to critical intersections

Locations of CCTV Cameras

*Critical intersections or sites where congestion occurs

Locations of Changeable Message Signs

*Before the critical intersections where route selection is possible

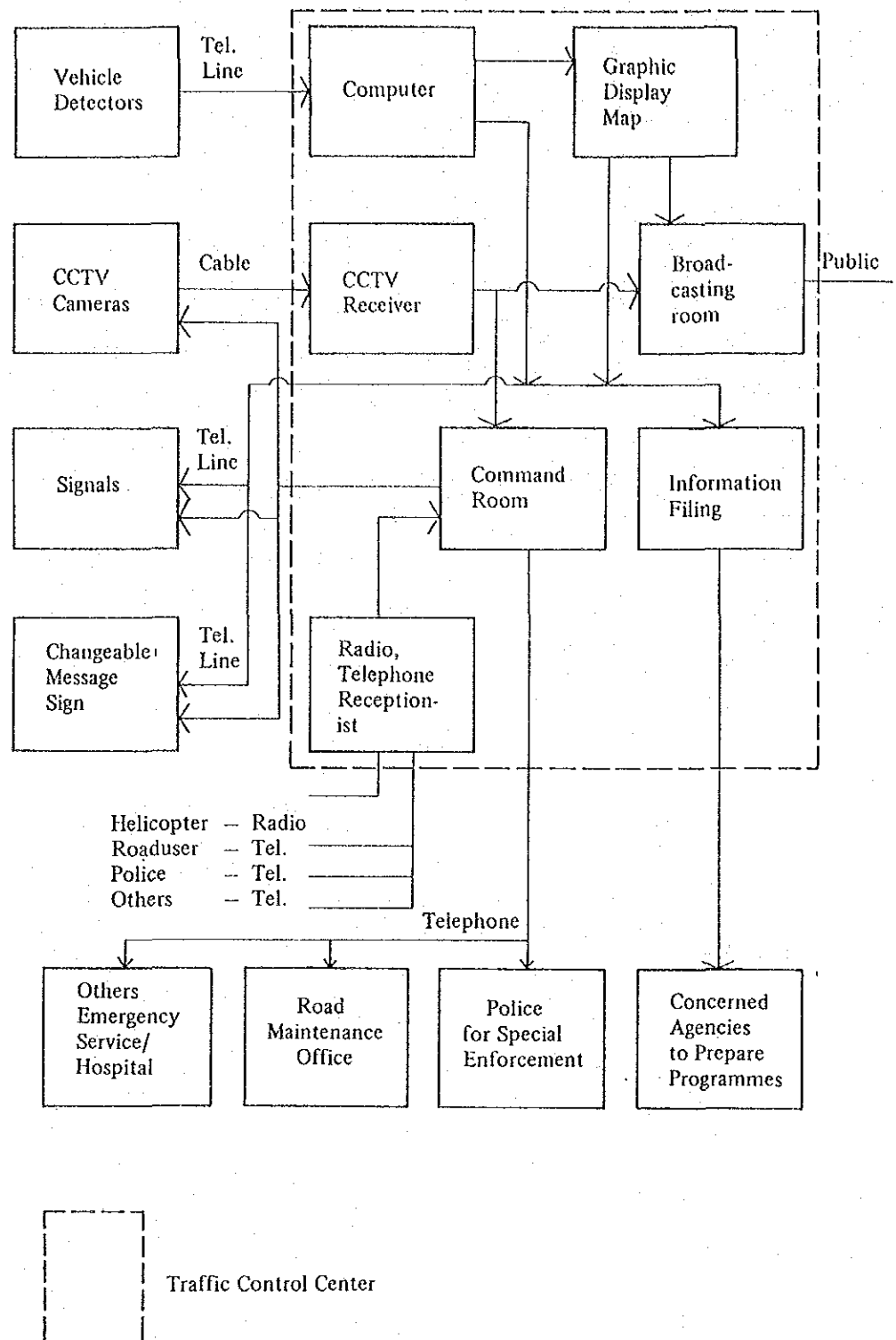


Figure 21 : An Illustration Showing the Flow of Functions and Activities of Kuala Lumpur Traffic Surveillance and Control System

4.7 Transport Terminals

(1) Bus Terminal

- (a) Two new inter-state bus terminals be constructed at the fringe areas to the north and south of Kuala Lumpur
 - * The New North Terminal is to accommodate north and east bound inter-state buses which are to be shifted from the existing Puduraya, Pekeliling and Medan Tuanku Terminals.
 - * The New South Terminal is to operate south bound inter-state buses which are to be shifted from Puduraya Terminal.

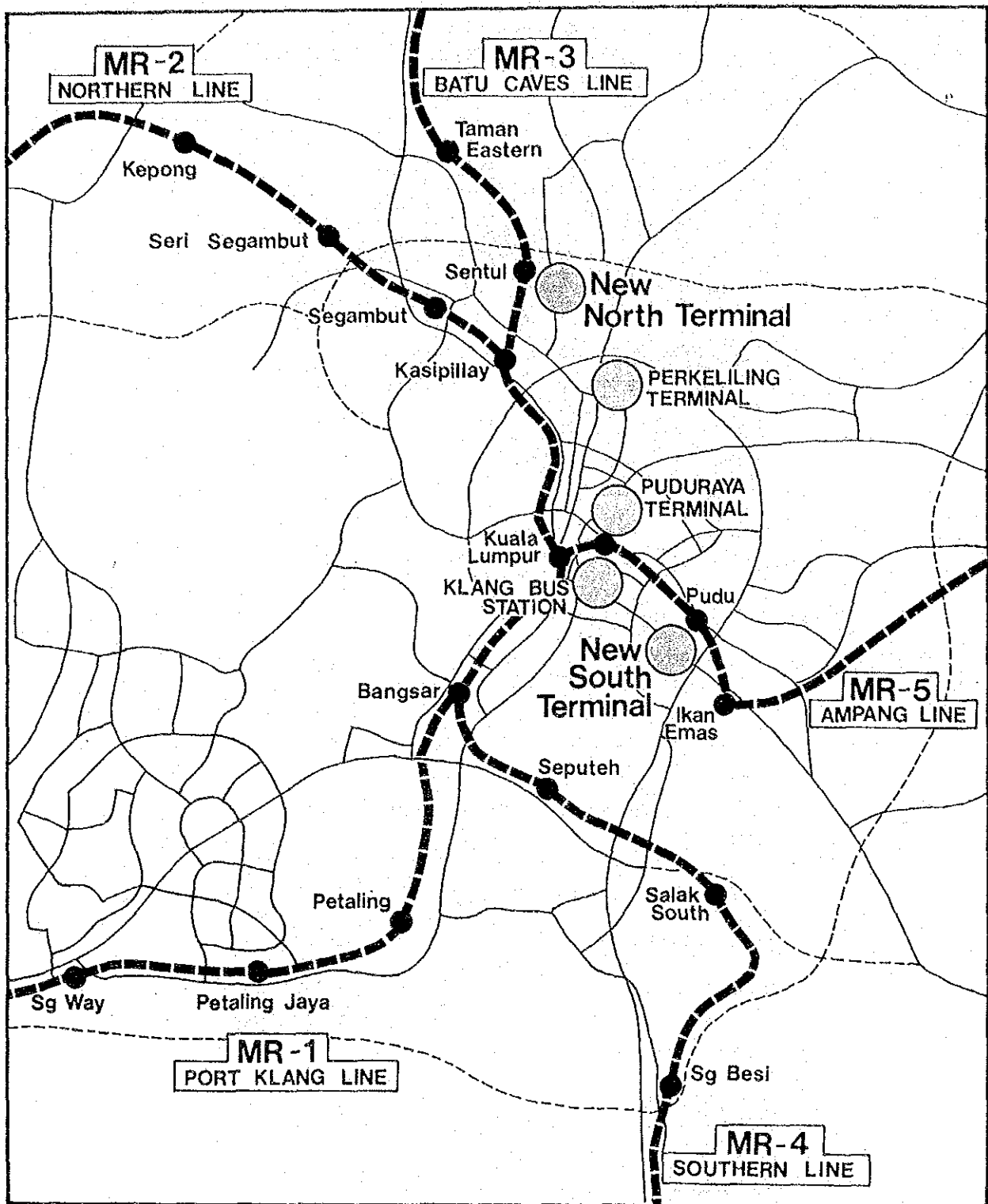
The possible sites are Sentul (an advantageous site with the proposed New Klang Valley Expressway) for the New North Terminal and the Pudu MRT Station proposed in this Study for the New South Terminal (Figure 22).

- (b) The existing two terminals at Puduraya and Pekeliling be converted to exclusive intra-state bus use. Congestions in and around the Puduraya Terminal will therefore be mitigated.
- (c) Construction of four intra-state bus terminals in providing efficient bus service between the CBD of Kuala Lumpur and the proposed sub-centres district not covered by the MRT service in particular the planned Wangsa Maju New Sub-Centre. Other locations are Bukit Tinggi, Bandar Tun Razak and Bukit Jalil.
- (d) Local bus centres be developed at the proposed MRT stations for the effective usage of these two public transport modes. The major MRT stations to be provided with such bus passenger facilities are Petaling Jaya, Shah Alam, Klang, Kepong, Selayang, and Bangi New Town.

(2) Freight Terminals

Although there is a container terminal in Sungei Way, a marshalling yard of KTM and some garages of lorry operators in the Klang Valley, these facilities are inadequate to meet the expected demand for goods transport.

- (a) Two(2) truck terminals be constructed at the outskirts to the north and south of Kuala Lumpur.
 - * The site of a disused tin mine along Jalan Ipoh for the North Freight Terminal
 - * A location in Sungei Besi near the access to Seremban Highway for the South Freight Terminal (Figure 23).
- (b) A multi-mode freight terminal be constructed at Port Klang.



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

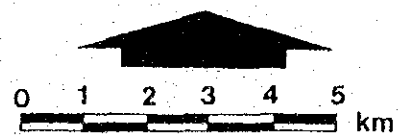
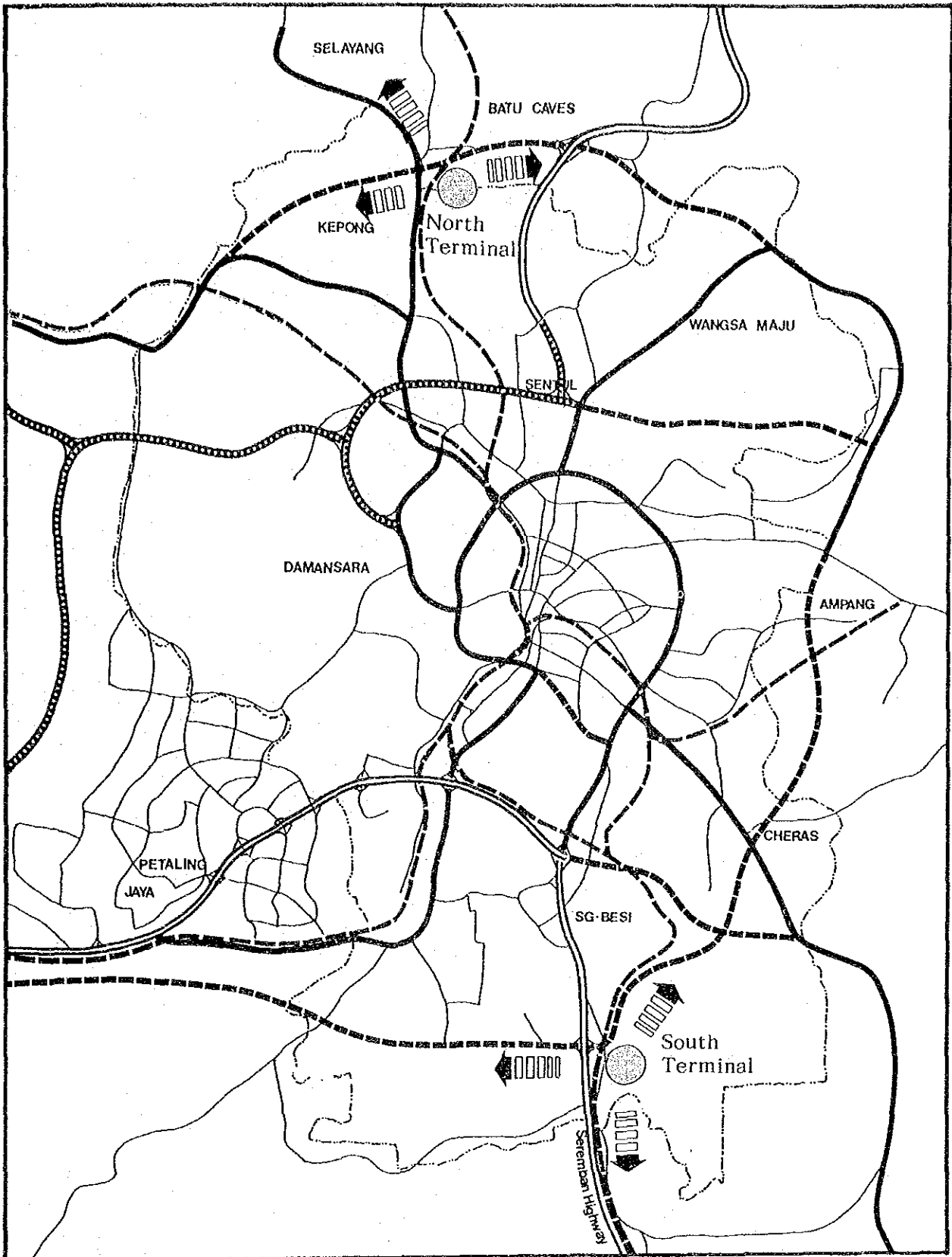
-  PROPOSED NEW BUS TERMINAL
-  EXISTING BUS TERMINAL
-  PROPOSED MRT LINES
-  EXISTING ROAD
-  PROPOSED HIGHWAY

Figure 22;
Proposed Inter-State Bus
Terminals Location in
Kuala Lumpur Conurbation



**KLANG VALLEY
TRANSPORTATION STUDY**



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





- | | | | |
|---|---------------------|---|----------------------------|
|  | Existing Expressway |  | Proposed Freight Terminals |
|  | Proposed Expressway | | |
|  | Existing Major Road | | |
|  | Proposed Major Road | | |
|  | Railway | | |

Figure 23: Proposed Location of Freight Terminals in Kuala Lumpur Conurbation



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4.8 Land Readjustment (Kukaku-seri) as an approach for Infrastructure Improvement

The pilot study has indicated that land readjustment technique is a feasible approach for infrastructure development in the Klang Valley.

It is proposed that areas with small individual plots, the Malay Reserve Area that need urban infrastructure improvement especially access roads which fall within the proposed urban areas be examined for the possible application of Kukaku-seiri.

(a) Set up a task force with participation from:-

- * Selangor State Planning Unit
- * Federal Department of Town and Country Planning
- * Planning Unit in City Hall
- * Klang Valley Planning Secretariat

with the specific function of:-

- * Conduct a detailed feasibility study as a follow up study from the Pilot Study and possibly implement it as a Pilot Project.
- * Identifying other possible areas for land readjustment for the improvement of urban infrastructure
- * Further promoting the social acceptance of the concept of Kukaku-seiri among policy makers, planners as well as land owners
- * Preparing replotting plans
- * Implementing the plans

4.9 Follow-Up Studies

The Masterplan Study has recommended the development of various transport facilities in achieving a well balanced transport system for Klang Valley. The Study has accordingly identified some of these recommendations as priority projects on the basis of their urgency.

To ensure continuity and on-schedule implementations, feasibility studies and/or engineering studies should be carried without further delay on:-

(a) Public Transport Projects

- (1) Feasibility and Engineering Study on Mass Rapid Transit Railway (MRT) System Introduction Project for Port Klang, Batu Caves and Kepong Lines.
- (2) Study on Bus Transport Improvement Project in Kuala Lumpur Conurbation.

(b) Road Projects

- (1) Feasibility Study on Middle Ring Road (II) Extension and Shah Alam Highway Project
- (2) Feasibility Study on North-South Expressway Link Project

- (c) Traffic Management Projects
 - (1) Study on Traffic Restraint Measure Introduction Project in Central Planning Area of Kuala Lumpur
 - (2) Feasibility and Engineering Study on Traffic Surveillance and Control System Project
- (d) Transport Terminal Projects
 - (1) Feasibility Study on Freight Terminal Introduction Project
 - (2) Feasibility Study on Bus Terminal Relocation Project
- (e) Urban Development Projects in Relation to Transportation Projects
 - (1) Study on Land Readjustment (Kukaku-seiri) Project
 - (2) Study on Urban Development and Landuse near MRT Stations

5. IMPLEMENTATION PROGRAMME AND INVESTMENT REQUIREMENTS

5.1 Total Investment Requirement

The transport projects proposed in the Masterplan are classified into the following:-

- (a) Road and Intersection Projects
- (b) Public Transport Projects
- (c) Traffic Management Projects
- (d) Other Transport Facilities Projects

The total investment required for realizing the above proposed projects by the year 2005 is estimated to be approximately M\$6,692.0 million as shown in Table 16. Road and intersection projects make up a predominant share of about 65% of the total requirement or M\$4,311.2 million.

A higher priority in implementation is given to projects particularly the improvement on radial roads in Kuala Lumpur which are effective in mitigating the existing heavy traffic congestion areas with relatively low cost.

Public transport projects will require an investment of about M\$1,862.5 million, 75% of which will be for the development of the proposed Mass Rapid Transit (MRT) System.

The MRT project will commence with developing lines connecting the high population density areas namely the Central Area of Kuala Lumpur, Petaling Jaya, Shah Alam, Sentul and Kepong.

Efforts to improve the bus transport services and facilities will be continuously carried out incorporating with the improvement works on other transport modes, particularly the MRT system.

Traffic management projects preferably to be implemented in short and medium terms require only M\$74.0 million in total. It is recommended to start these projects as early as possible, since they are highly effective in reducing traffic in the most congested area and in managing the main traffic flows.

Projects on other transport facilities including transport terminals will require about M\$444.3 million, a large portion of which is to be borne by the private sector.

In accordance with the proposed implementation scheduling, the total investment requirement is estimated to be M\$790.0 million for Phase I (1988-1990), M\$1,892.8 million for Phase II (1991-1995) and M\$4,009.2 million for Phase III (1996-2005).

Table 16: Total Transport Investment Requirement in Klang Valley to Year 2005

Projects	Project Cost (M\$million)
1. Road Projects	
1.1 Expressways and Primary Roads	2,342.0
1.2 Distributor Roads	1,452.2
1.3 Interchanges and Grade Separation	517.0
Sub-total	4,311.2
2. Public Transport Projects	
2.1 Mass Rapid Transit (MRT)	1,384.0
2.2 Improvement of Bus Facilities	24.9
2.3 Bus Depots	15.0
2.4 Buses and Equipment	438.6
Sub-total	1,862.5
3. Traffic Management Projects	
3.1 Traffic Surveillance and Control System	72.0
3.2 Cordon Pricing	2.0
Sub-total	74.0
4. Other Transport Facilities Projects	
4.1 Bus Terminals	68.6
4.2 Freight Terminals	53.2
4.3 Pedestrian Facilities	104.0
4.4 Parking Facilities	218.5
Sub-total	444.3
TOTAL	6,692.0

5.2 Implementation Programme for Road Projects

Major projects scheduled in Phase I (1988-1990) are:-

- (1) Widening of Federal Route I from Kepong to Selayang,
- (2) Construction of the eastern part of Middle Ring Road II,
- (3) Widening of Jalan Ampang, Genting Klang, Jalan Gombak and part of Jalan Ipoh,
- (4) Construction of East-West Link and improvement of Jalan Cheras and together with the related interchange improvements.

In early 1990's several capital intensive projects will follow:-

- (1) Construction of northern part of Middle Ring Road II
- (2) Extension of Middle Ring Road II
- (3) Shah Alam Highway
- (4) North-South Expressway Link and others

(Refer to Figures 24 and 25).

Road projects scheduled for the period beyond 1995 are also shown in Figures 24 and 25.

The investment requirement for road projects is estimated at M\$298.0 million for Phase I (1988-1990), M\$1,091.1 million for Phase II (1991-1995) and M\$2,922.1 million for Phase III (1996-2005).

5.3 Implementation Programme for Public Transport Projects

As for the MRT System, Taman Eastern-Shah Alam line and Kepong-Kuala Lumpur line are recommended to be implemented in Phase I. In Phase II, Ampang Line, Subang Airport Line and the extensions from Shah Alam to Port Klang and from Taman Eastern to Selayang are scheduled.

In accordance with the commencement of MRT system, reorganization of bus routes will be required so as to promote the effective usage of MRT system.

Bus lanes will be introduced for Jalan Genting Klang and Jalan Cheras when their widening projects are completed in Phase I.

The improvement of bus facilities comprising mainly of bus shelters should be implemented continuously throughout the planning period. Construction of two bus depot is scheduled in Phase I and one in Phase II. In addition, replacement for old buses and additional purchase of new buses should also be continuously carried out during the planning period.

The public transport projects will require an investment of M\$360.3 million, M\$609.8 million and M\$892.4 million for the three phases respectively.

5.4 Traffic Management Projects

The proposed traffic Surveillance and Control System is preferably to be implemented in Phase I and the Cordon pricing on private car users entering the area within the Inner Ring Road could be started in Phase I if desirable by the authorities. The installation of traffic control devices is scheduled for Phase II. The investment requirement for traffic management projects is M\$38.0 million for Phase I and M\$36.0 million for Phase II.

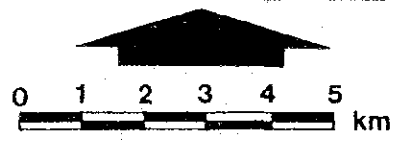
5.5 Other Transport Facilities

The first stage of inter-state bus terminal projects in Kuala Lumpur is to be implemented in Phase II.



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	Proposed New Road Construction } (Phase I 1988-1990)
	Proposed Road Improvement } (Phase I 1988-1990)
	Proposed New Road Construction } (Phase II 1991-1995)
	Proposed Road Improvement } (Phase II 1991-1995)
	Proposed New Road Construction } (Phase III 1996-2005)
	Proposed Road Improvement } (Phase III 1996-2005)
	Proposed MRT Phase I
	Proposed MRT Phase II
	Proposed MRT Phase III
	Existing Roads

Figure 24
Proposed Road Construction and Improvement and MRT System by Phase in Kuala Lumpur Conurbation



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The proposed intra-state bus terminals at Wangsa Maju should be constructed in Phase I, followed by the terminals at Bandar Tun Abdul Razak and Bukit Jalil in Phase II and the Bukit Tinggi Terminal in Phase III.

The implementation of freight terminal projects in Kuala Lumpur is to be undertaken in Phase I.

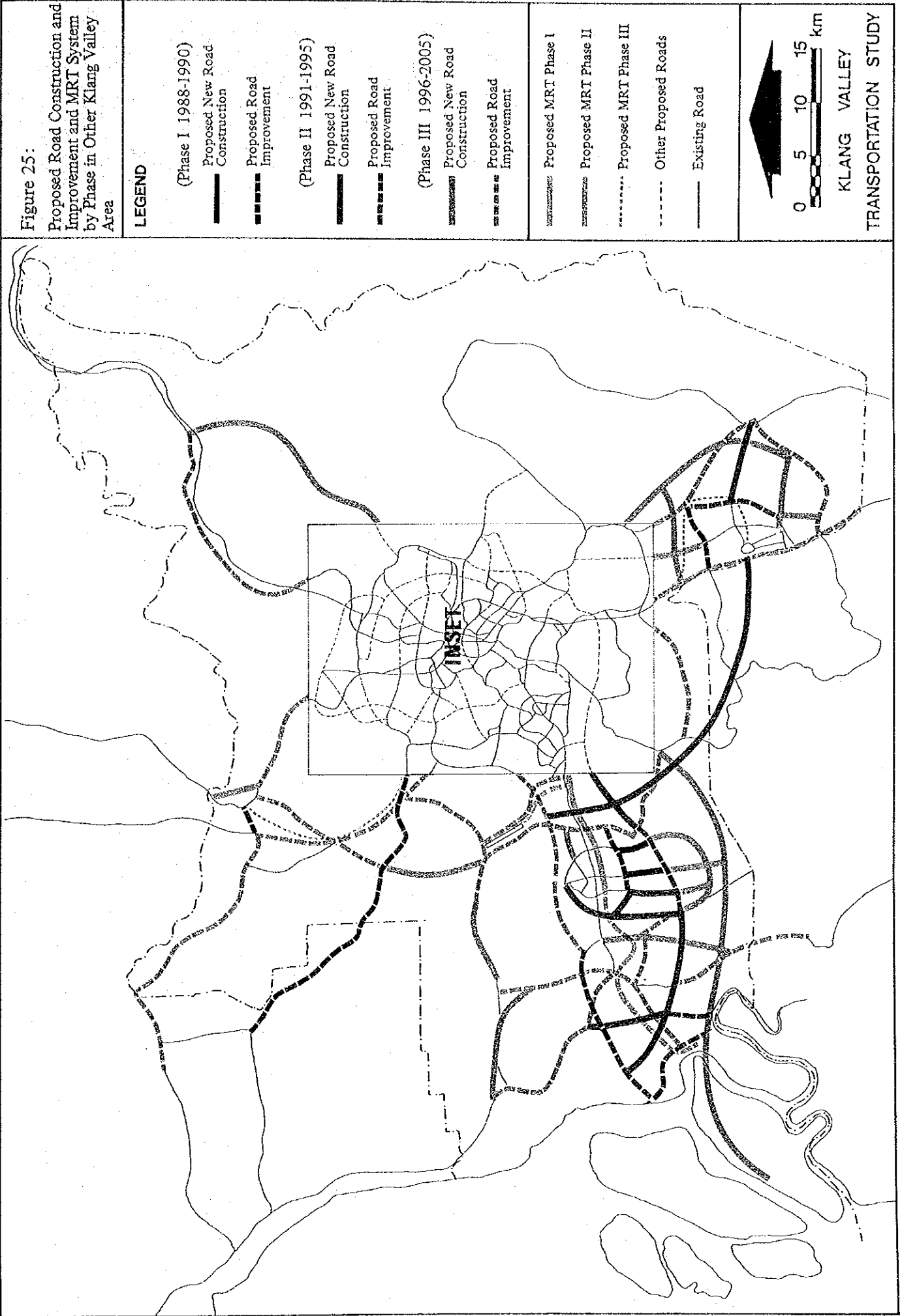
Pedestrian facilities comprising mainly of bridges, foot path and pedestrian mall will be developed steadily and gradually starting with some selected points at the central area of Kuala Lumpur, commercial zones in the sub-centres and major streets where pedestrians are expected to congregate.

Off-street parking facilities will also be developed in the central area of Kuala Lumpur continuously till the year 2005 and in conjunction with the cordon pricing scheme if the latter is implemented.

The investment requirement for these transport facilities development is estimated to be M\$93.7 million for Phase I, M\$155.9 million for Phase II and M\$194.7 million for Phase III.

Table 17: Investment Requirement by Phase

Projects	Project Cost (M\$million)		
	Phase I 1988-'90	Phase II 1991-'95	Phase III 1996-2005
Road Projects			
1) Expressway and Primary Roads	221.1	786.0	1,334.9
2) Distributor Roads	32.9	166.6	1,252.7
3) Interchanges and Grade-Separation	44.0	138.5	334.5
Sub-total	298.0	1,091.1	2,922.1
Public Transport Projects			
1) Mass Rapid Transit (MRT)	310.0	478.0	596.0
2) Improvement of Bus Facilities	4.2	6.9	13.8
3) Bus Depots	10.0	5.0	—
4) Buses and Equipment	36.1	119.9	282.6
Sub-total	360.3	609.8	892.4
Traffic Management Projects			
1) Cordon Pricing	2.0	—	—
2) Traffic Surveillance and Control System	36.0	36.0	—
Sub-total	38.0	36.0	—
Other Transport Facilities Projects			
1) Inter-State Bus Terminals	—	48.5	7.1
2) Intra-State Bus Terminals	2.9	6.7	3.4
3) Freight Terminals	30.4	—	22.8
4) Pedestrian Facilities	24.0	40.0	40.0
5) Parking Facilities	36.4	60.7	121.4
Sub-total	93.7	155.9	194.7
Total	790.0	1,892.8	4,009.2



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