社会開発調査部報告書

No. 52

THE FEASIBILITY STUDY
ON
RAIL-BASED COMMUTER SERVICES
IN
KLANG VALLEY, MALAYSIA

FINAL REPORT
(SUMMARY)

FEBRUARY 1991

JAPAN INTERNATIONAL COOPERATION AGENCY

(JICA)

THE FEASIBILITY STUDY
ON
RAIL-BASED COMMUTER SERVICES
IN
KLANG VALLEY,
MALAYSIA

FINAL REPORT

(SUMMARY)

FEBRUARY 1991

JAPAN INTERNATIONAL COOPERATION AGENCY

(JICA)

PREFACE

In response to a request from the Government of Malaysia, the Japanese Government decided to conduct a feasibility study on Rail-based Commuter Services in Klang Valley and entrusted the Study to the Japan International Cooperation Agency (JICA).

JICA sent to Malaysia a study team headed by Mr. Hotsumi Harada, and composed of members from the Japan Railway Technical Service and Pacific Consultants International Co., Ltd., three times between January 1990 and December 1990.

The team held discussions with the officials concerned of the Government of Malaysia, and conducted field surveys. 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.

February 1991

Kensuke Yanagiya

Kensuke Yanagiya
President
Japan International Cooperation Agency

Mr. Kensuke Yanagiya
President
Japan International Cooperation Agency

Dear Sir,

LETTER OF TRANSMITTAL

We have the pleasure of submitting herewith the final report for the Feasibility Study on "Rail-based Commuter Services in Klang Valley, Malaysia".

We conducted the Study during the period from January 1990 to January 1991, carrying out the field studies three times in Malaysia.

The Study formulated basic plans of the rail-based commuter service system along the Rawang - Kuala Lumpur - Seremban railway corridor, and analysed their techno-economic feasibility.

We hope that this report will serve as a starting point for development of the said Project which we consider is one of the most imminent and significant projects to be materialized by the turn of the century.

We also wish to express our sincere gratitude to the related officials of JICA, Advisory Committee, the Embassy of Japan in Malaysia, as well as to those of Government of Malaysia, for their kind guidance, assistance and cooperation extended to the Study Team.

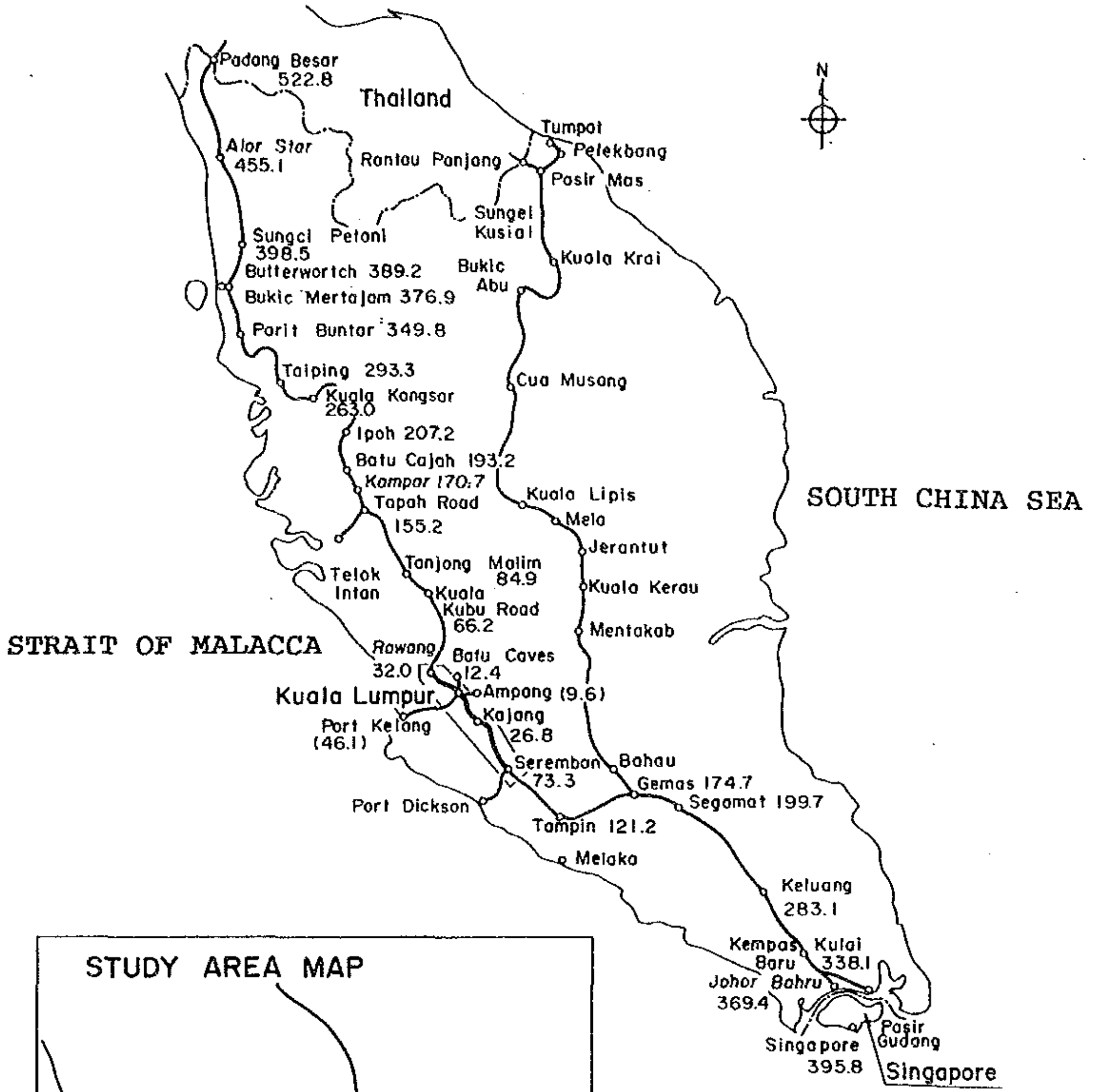
Very truly yours,

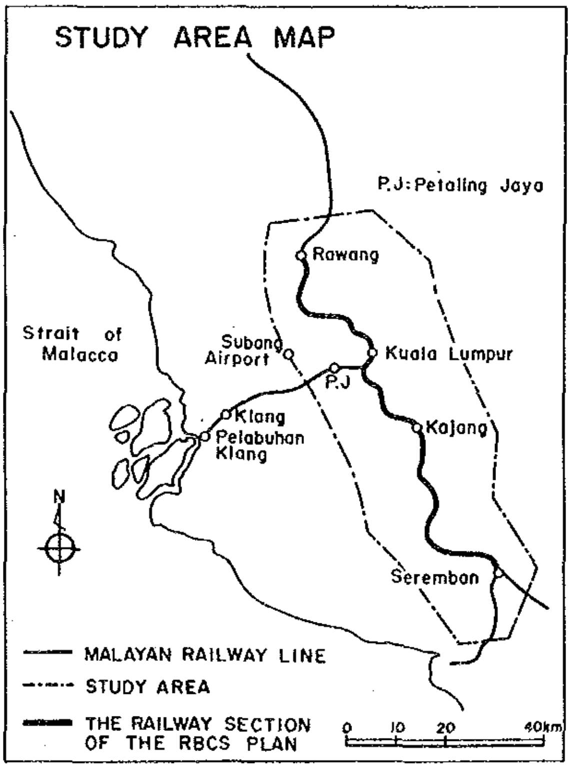
M. Sugawara

Misao Sugawara
President
Japan Railway Technical Service

CONTENTS

MRA Railway Network





ABBREVIATION

Corridor	:	Rawang ~ Seremban MRA route
DMU	:	Diesel Multiple Unit
DTP	:	Double Tracking Project
EIRR	:	Economic Internal Rate of Return
EPU	:	Economic Planning Unit
FIRR	:	Financial Internal Rate of Return
HPU	:	Highway Planning Unit
Jct.	:	Junction
JICA	:	Japan International Cooperation Agency
JICA M/P 87	:	Klang Valley Transportation Study (JICA, 1987)
JICA F/S 89	:	Klang Valley Feasibility Study for Transportation Facility Projects in klang Valley (JICA, 1989)
JNR	:	Japanese National Railways
JR	:	Japan Railway Group; Successor(s) of JNR
K.L.	:	Kuala Lumpur (area, station)
KVPS	:	Klang Valley Planning Secretariat
LRT	:	Light Rail Transit
MRA	:	Malaysian Railway Administration
OD	:	Origin and Destination
Perspective Plan	:	Klang Valley Perspective Plan (KVPS, 1984)
RBCS	:	Rail-Based Commuter Service
Review	:	Review of Klang Valley Perspective Plan (KVPS, 1988)
R/W	:	Right-of-way
S&T	:	Signalling and Telecommunication

1. OBJECTIVES OF THE STUDY

(1) To undertake technical, economic and financial feasibility studies on the introduction of a Rail-based Commuter Service (hereinafter referred to as the "RBCS").

(2) To recommend urban development policies and strategies in the vicinity of the railway stations, and/or along the corridors of the railway line involved.

(3) To undertake organizational and management studies for the railway system's operator.

(4) To suggest an implementation programme for the project including phasing in the track capacity.

2. STUDY AREA

The railway line to be studied (hereinafter referred to as the "RBCS Line") consists of two segments of about 106 km, as follows:

(1) Northern Line (32 km) from Kuala Lumpur Central Station to Rawang Station

(2) Southern Line (74 km) from Kuala Lumpur Central Station to Seremban Station passing through Sungai Besi and Bangi (Refer to Fig. 1)

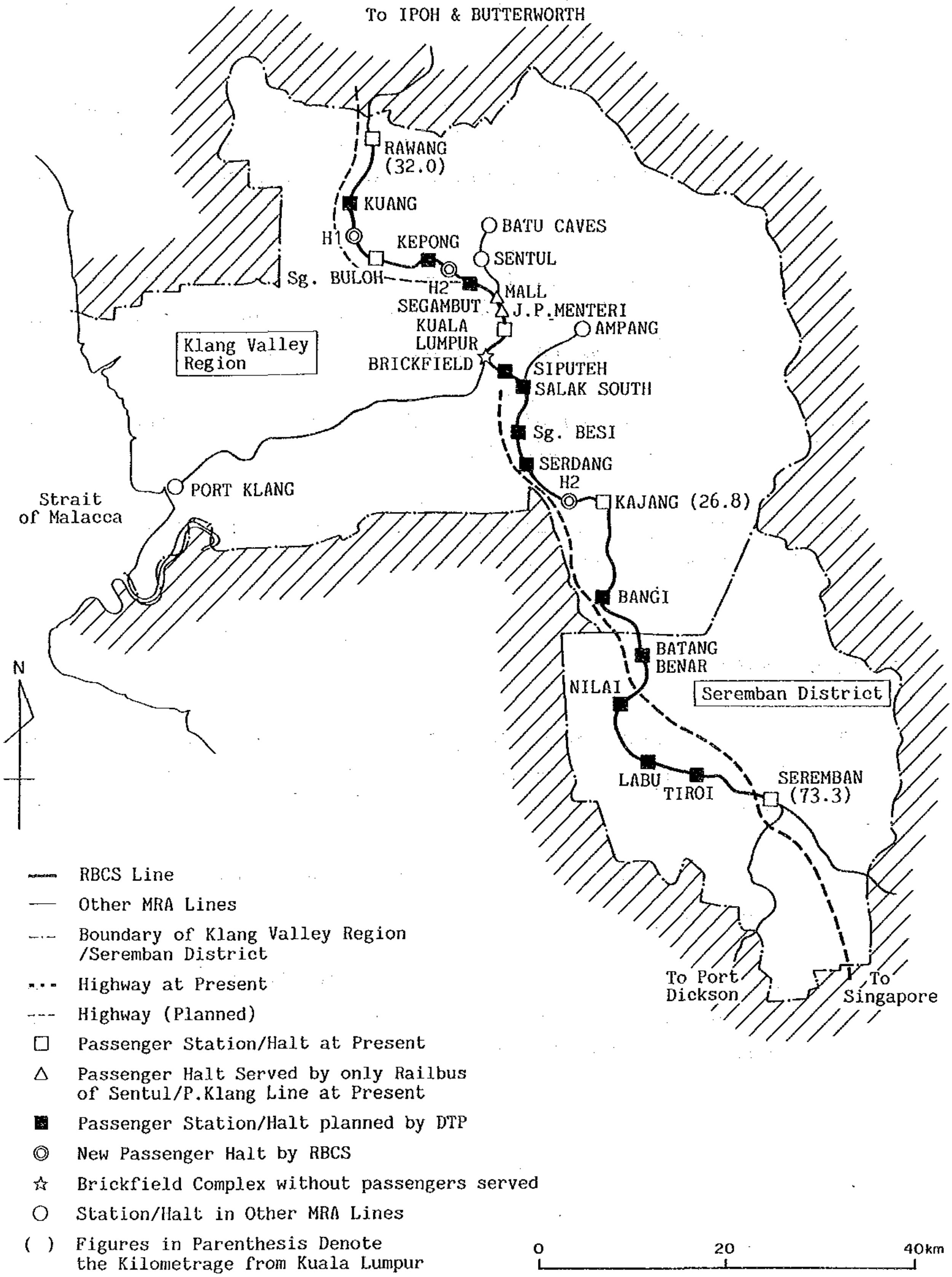


Fig. 1 Study Area

3. PRECONDITIONS OF THE STUDY

The RBCS System Plan is formulated with the following presumptions.

(1) The double tracking project

The following improvements will be implemented for the RBCS Line by 1993 under the Double Tracking Project (hereinafter referred to as the "DTP").

a. Doubling the track
b. Construction of 3 stations and 4 halts
c. Upgrading signalling and telecommunications system (colour light signal, relay interlocking, fiber-optics, etc.)
d. Introduction of DMUs
   (33 DMUs are presumed to be allocated for the RBCS Line)

(2) Other MRA-related expenses to be borne by the government

Investment costs to be borne by the privatized MRA excludes those for the followings;

a. Squatters will be removed from the right-of-way of the RBCS Line.
b. All level crossings will be either grade-separated or closed by 1997.
c. Station plazas and feeder-bus roads along the RBCS Line will be developed.
d. Maintenance facilities for DMUs introduced by DTP will be set up.
e. A half of the investment costs for free-passageway connecting railway station and adjacent road/plaza will be borne by the Government.

(3) Integrated RBCS network

The RBCS ridership forecasting and RBCS transport plan are formulated with the presumption that the Integrated RBCS will be established by 2005.
The Integrated RBCS consists of the followings;

a. MRA lines consisting of the RBCS (Rawang - K.L. - Seremban) Line, K.L. - Port Klang line, Batu Caves line, and Ampang - Puduraya line.

b. Monorail network of 16.6 km length in the K.L. area

c. LRT lines (i.e. People's Park - K.L., K.L. - Taman Connought, and K.L. - Manjalara) of 34 km length (Refer to Fig. 2)

d. Feeder-bus services for above RBCS modes will be developed.

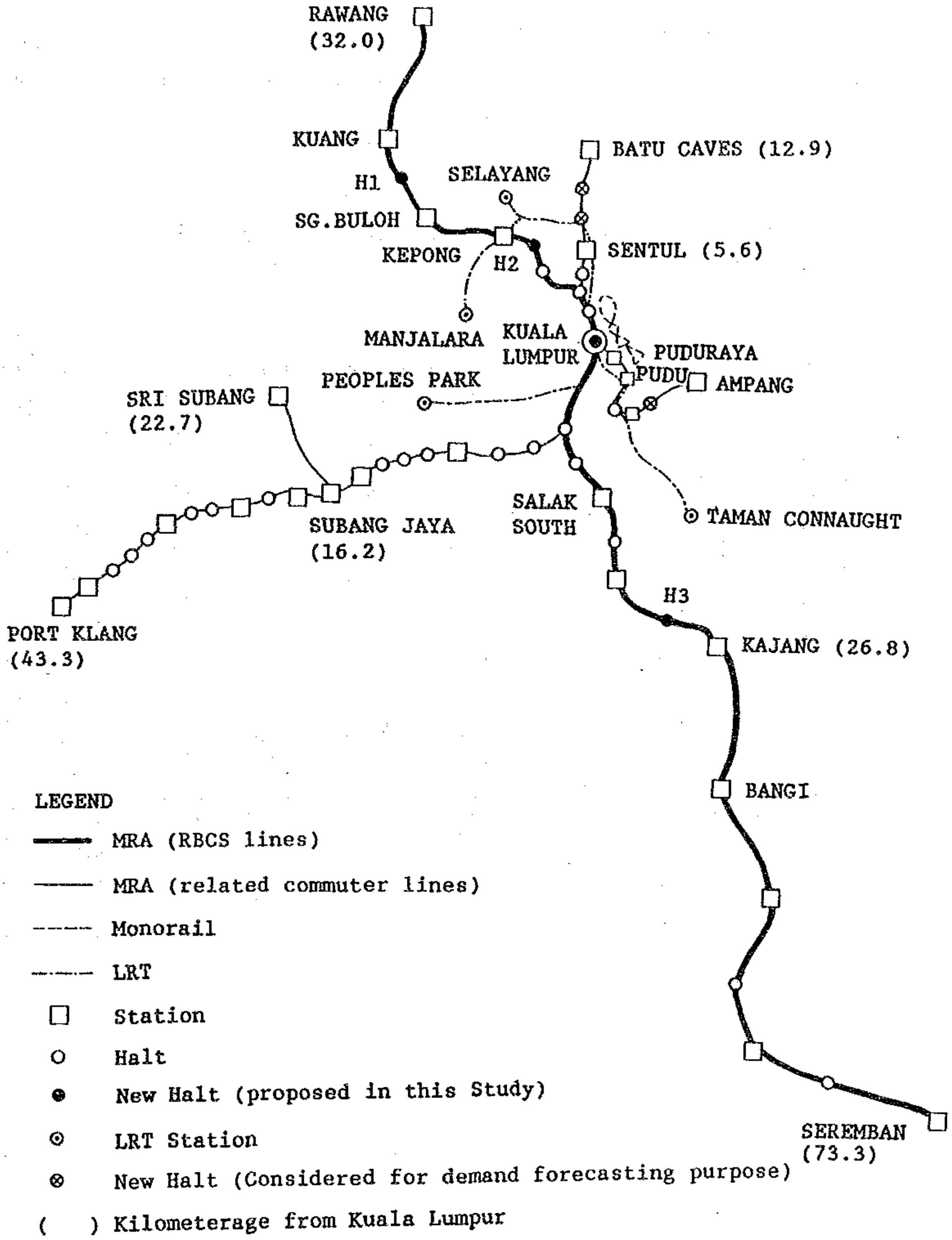


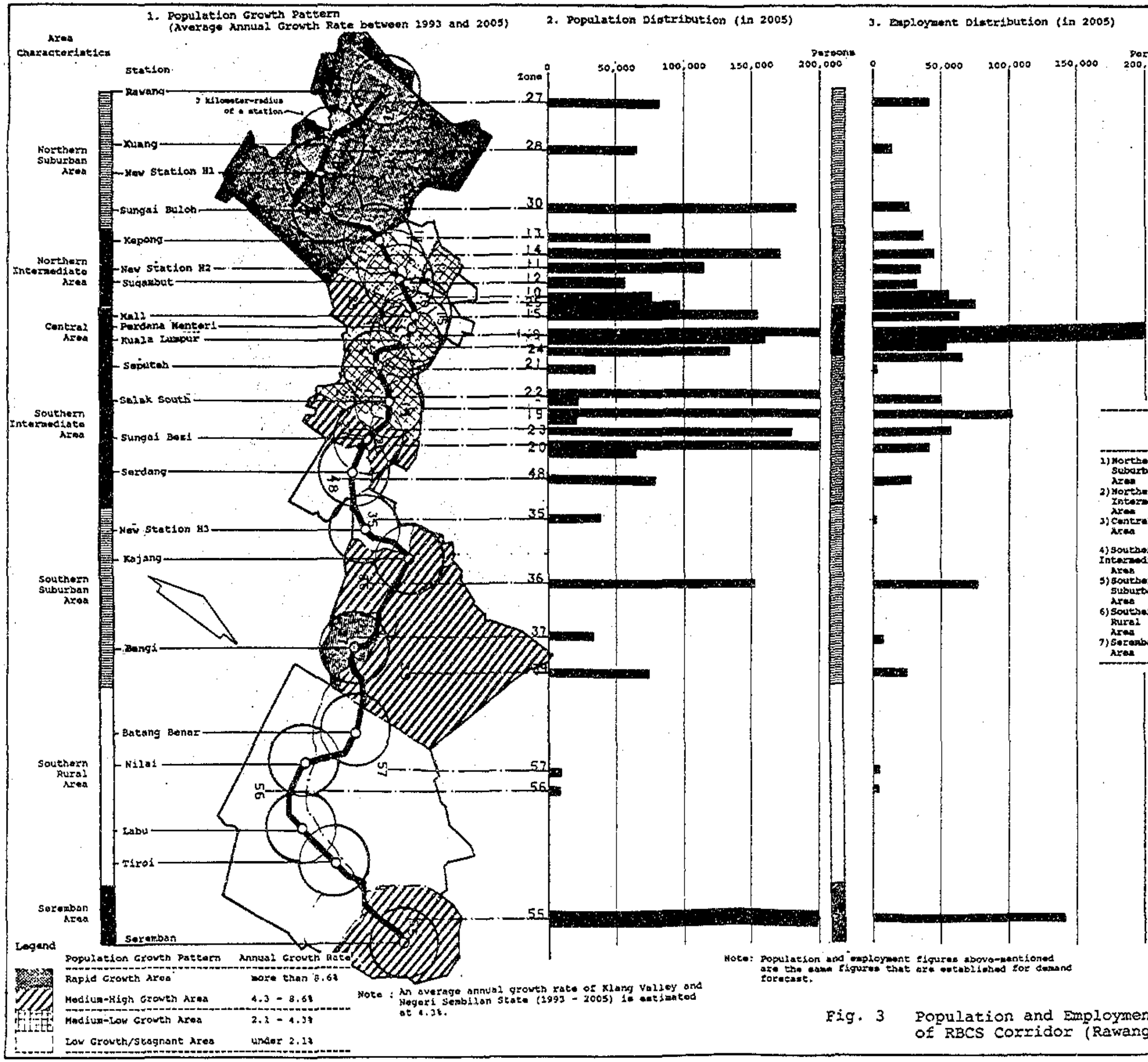
Fig. 2 Integrated RBCS Network (in 2005)

4. SOCIO-ECONOMIC FRAMEWORK

Population/Employment distribution and their growth rates are established as shown in Table 1. Their area-wise overview is shown in Fig. 3.

Table 1 Population/Employment Distribution and Growth Rate Along RBCS Corridor, 1993 - 2005

RBCS Code	RBCS ZONE	Stations Included in the Zone	Population 1993	Population 2005	Employment 1993	Employment 2005	Annual Growth Rate (1993/2005) Population	Employment
	[Southern Suburban Corridor]			(x1000)		(x1000)		(%)
1	27	Rawang	20.1	82.7	11.7	44.6	12.49	11.76
2	28	Kuang/H1	5.0	61.3	3.9	10.8	23.32	8.77
3	30	H1/Sg.Buloh	59.3	185.8	14.3	22.4	9.99	3.80
	[Southern Intermediate Corridor]							
4	13	Kepong/H2/Segambut	64.1	72.7	21.0	34.2	1.05	4.16
5	14	Kepong/H2	118.2	180.5	24.5	43.9	3.59	4.97
6	11	Segambut	76.8	106.1	17.5	33.0	2.73	5.44
7	12	Sugambut	43.1	60.6	18.3	31.1	2.88	4.52
8	10	Segambut/Mall	70.1	75.9	39.3	54.7	0.66	2.80
9	25	Mall/P.Menteri/KL.	55.7	99.0	40.4	78.1	4.91	5.64
10	15	Mall	137.0	154.5	41.7	61.6	1.01	3.30
	[Central Area]="City Centre"							
11	1-9*	Mall/P.Menteri/KL.	272.6	360.0	314.0	453.3	2.34	3.11
	[Southern Intermediate Corridor]							
12	24	KL./Seputeh	89.4	135.0	45.3	65.9	3.49	3.18
13	21	Seputeh	56.1	73.6	16.1	24.1	2.29	3.40
14	22	Salak South/Sg.Besi	152.7	223.6	31.7	48.3	3.23	3.56
15	19	Salak South	164.7	225.6	60.9	108.4	2.66	4.92
16	23	Sg.Besi	78.5	178.0	26.0	56.5	7.06	6.67
17	20	Salak South/Sg.Besi	139.5	264.2	27.4	39.6	5.47	3.12
	[Southern Suburban Corridor]							
18	48	Serdang	61.5	76.2	20.7	27.3	1.80	2.35
19	35	Serdang/H3/Kajang	30.5	38.2	8.8	20.4	1.89	7.29
20	36	H3/Kajang	80.9	152.0	37.3	76.4	5.40	6.16
21	37	Bangi	11.4	32.9	6.4	7.3	9.22	1.07
	[Southern Rural Corridor]							
22	57	B.Benar/Nilai/Labu/Tiroi	9.8	9.3	2.9	4.2	-0.44	3.13
23	56	Nilai/Labu/Tiroi	9.9	9.4	2.9	4.2	-0.43	3.13
	[Seremban City Area]							
24	55	Serembang	212.6	398.0	84.0	140.1	5.36	4.35



Note : An average annual growth rate of Klang Valley and Negeri Sembilan State (1993 - 2005) is estimated at 4.3%.

Note: Population and employment figures above-mentioned are the same figures that are established for demand forecast.

[Comment]

1. Seven Areas of RBCS Corridor

1) Northern Suburban Area (Rawang, Kuang, H1 and Sg.Buloh)
2) Northern Intermediate Area (Kepong, H2 and Sugambut)
3) Central Area (Mall, Perdana Menteri and KL.)
4) Southern Intermediate Area (Seputeh, Salak South, Sg.Besi and Serdang)
5) Southern Suburban Area (H3, Kajang and Bangi)
6) Southern Rural Area (Batang Benar, Nilai, Labu and Tiroi)
7) Seremban Area (Seremban)

2. Overview

	Population Growth (1993-2005)	Population planned for 2005	Employment planned for 2005
1) Northern Suburban Area	Rapid growth	Medium	Rather small
2) Northern Intermediate Area	Medium-low	Large	Rather small
3) Central Area	Medium-low	Largest	Largest
4) Southern Intermediate Area	Medium-low/ -high	Large	Large
5) Southern Suburban Area	Medium-high	Medium-large	Medium-large
6) Southern Rural Area	Stagnant	Small	Small
7) Seremban Area	Medium-high	Largest	Large

Fig. 3 Population and Employment Distribution of RBCS Corridor (Rawang-Seremban) in 2005

5. RBCS RIDERSHIP FORECAST

RBCS ridership demand forecasted for each section and station are shown in Fig. 4 and 5, respectively.
In 2005, RBCS traffic demand will amount to 4.5 million passenger-km and 300 thousand passenger trips per day.

(1) On the Kepong-K.L.-Kajang section (39 km), a large sectional traffic ranging 51 to 109 thousand passengers/day is projected except for the Mall-K.L. section (3.2km), where the traffic dips due to the existence of competing RBCS modes; i.e. Monorail and LRT.

(2) The sectional traffic on the Bangi-Seremban section (35.2km) is meager, less than 20 thousand passengers/day.

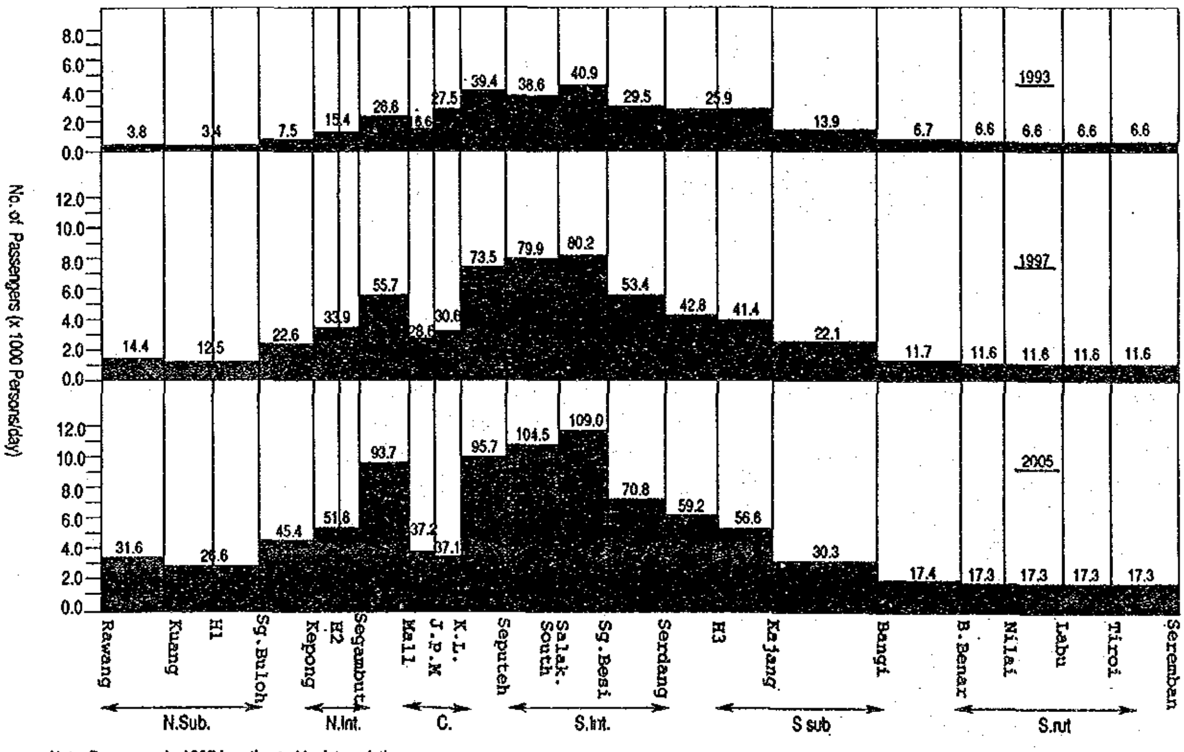


Fig. 4 Linktraffic Demand of RBCS Ridership

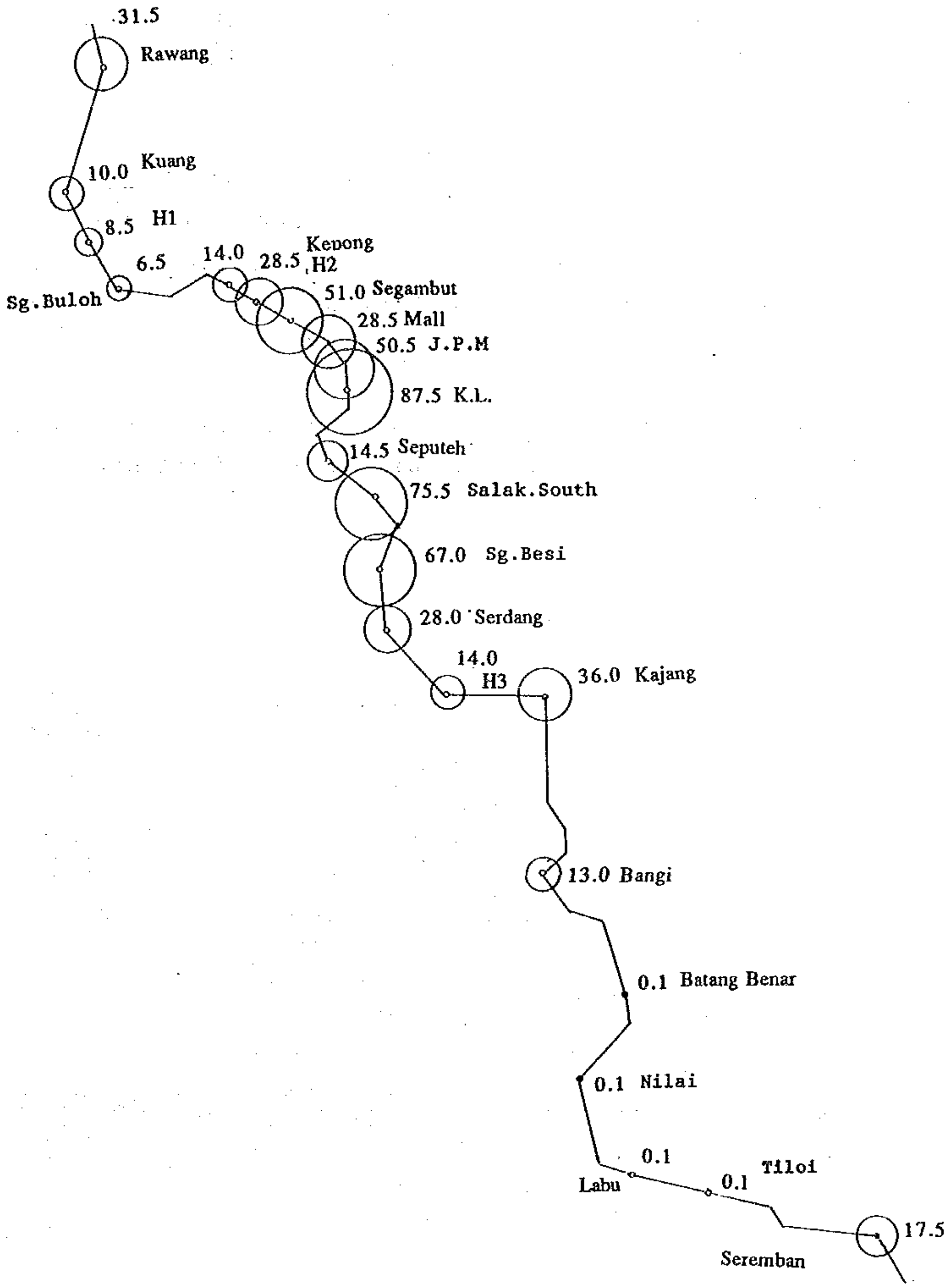


Fig. 5 Number of RBCS Passengers Forecasted for 2005
(with-the-project case)

6. RBCS TRANSPORT PLAN

Rail-based commuter transport system to cope with the RBCS traffic demand up to 2005 is summarized in Fig. 6, 7 and Table 2.

(1) In 2005, during peak hours, 7-car consist DMU trains will be operated with minimum time interval of 10 minutes, and travelling time of 44 minutes between Rawang and K.L. and 58 minutes between K.L. and Seremban.

(2) Feeder-bus service is provided to all railway stations (12 stations and 10 halts) with the minimum time intervals of 5 minutes.

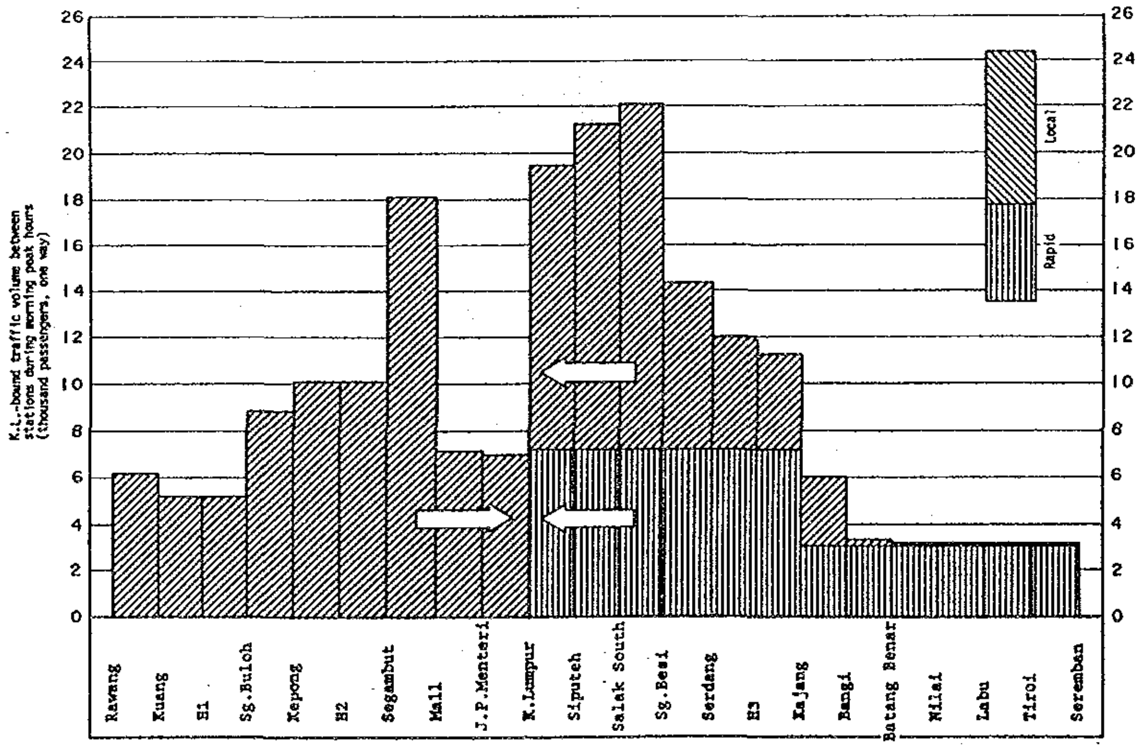


Fig. 6 In-bound Traffic Volumes between Stations During Morning Peak Hours by Type of Operation (2005, Weekdays)

Section	Train type	Distance (km)	Number of stopping stations	Travelling time (minute)
Rawang - K.L.	Local	32.00	8	44
K.L. - Kajang	Rapid	26.75	0	22
K.L - Seremban	Rapid	73.25	1	58
K.L - Bangi	Local	37.50	6	46
Bangi - Seremban	Local	35.75	4	35

Fig. 7 Standard Travelling Time Between Major Stations by Train Type (in 2005)

Table 2 Number of DMU Trains in 2005 (Weekdays, One Way) (Rawang - Seremban)

Section	Train type \ Time zone	6:00–8:30	8:30–16:00	16:00–19:00	19:00–24:00	Total	Train Consist
Rawang - K.L.	Local	12	15	12	10	49	7-car
K.L. - Kajang	Local	9	11	9	7	36	7-car
	Rapid	5	5	5	4	19	7-car
	Total	14	16	14	11	55	
Kajang - Bangi	Local	9	11	9	7	36	7-car
	Rapid	5	4	5	3	17	7-car
	Total	14	15	14	10	53	
Bangi - Seremban	Local	3	3	3	2	11	1-car
	Rapid	7	4	7	3	21	7-car
	Total	10	7	10	5	32	

7. RBCS SYSTEM PLAN

RBCS system to enable the planed commuter transport plan are formulated as summarized in Table 3.

139 DMUs and 861 feeder-buses are introduced. Feeder-buses pick up passengers at bus-stand installed at 400 m spacing and carry to every railway station, and vice versa.

Station layouts, platforms are modified to facilitate DMU train operation and passenger transfer.
Three new halts are added after DTP, and station buildings and passenger facilities are improved to upgrade the commuter service such as rear-gate, over-bridge, automatic vending machine, and free passageway.
Three stations are remodelled into over-the-bridge type with free-passageway.

New signalling and telecommunications system are introduced; automatic block system will enlarge line capacity, automatic train protection system will secure safety of dense DMU traffic, and yard radio system will enhance efficiency and security of train handling works.

Maintenance and stabling tracks for DMUs are prepared.

Table 3 Major Improvements of RBCS (1)

Phase / item	At Present	DTP	RBCS
DMU			
Number of cars	(Rail Bus)	33	172 (=33+139)
Number of crew/train	(4)	3	2
Carring capacity (passeng/car)	----	107	140
Structure		2 door, cross-seat	3 door, semicross seat
Train consist (car/train)	(3 or 5)	3	5 (1997-2000) 6 (2001-2004) 7 (2005-)
Repair workshop	(Sentul Workshop)	-	Prepare new repair-shop in Sentul Workshop
Max. speed (km/h)		120	120
Braking distance(m)		700	700
Track & Structure			
Track	Single	Double	Double
Stop station (including halt)	5	19 (7)	22 (10)
Platform (m)		130 without shelter	165 with shelter
Station building	6	12	20 (including 3 over-the-track stations)
Track layout modification			- To enable train turn-around: 3 stations - To facilitate passenger transfer: 2 stations - To remove postal/parcel handling: 1 station - To add DMU stabling tracks: 5 stations
Passenger facilities	-	-	Additional installation - ticket wicket: 54 - ticket window: 11 - automatic vending machine: 81 - overbridge (new): 2 (widened):9 - Free passegeway: 5 - Rear gate: 9

Table 3 Major Improvements of RBCS (2)

Item / Phase	At Present	DTP	RBCS
Signal & Telecom.			
Block	Tokenless	Tokenless	Automatic
(min. headway)	(13 min.)	(13 min.)	(5 min.)
Interlocking	Mechanical	Relay	Relay
Level Crossing Protection	20	7	0
Centralized Traffic Control (CTC)	None	Installed	Upgraded
Automatic Train Protection (ATP)	None	None	Introduced
Train Radio	None	Introduced	Increased
Yard Radio	None	None	Introduced
Transmission line	Bare wire	Fiber optics	Fiber optics
Passenger information	-	Introduced	Upgraded
Feeder-Bus			
No. of bus	-	-	Bus 451 Mini-bus 410
Carring capacity (passenger/vehicle)			Bus 60 Mini-bus 35
Bus stand spacing(m)			400
Minimum operating headway (min.)	-	-	5
Number of stations (halts) served	2 (K.L. & Seremban)	2 (K.L. & Seremban)	22 (10)

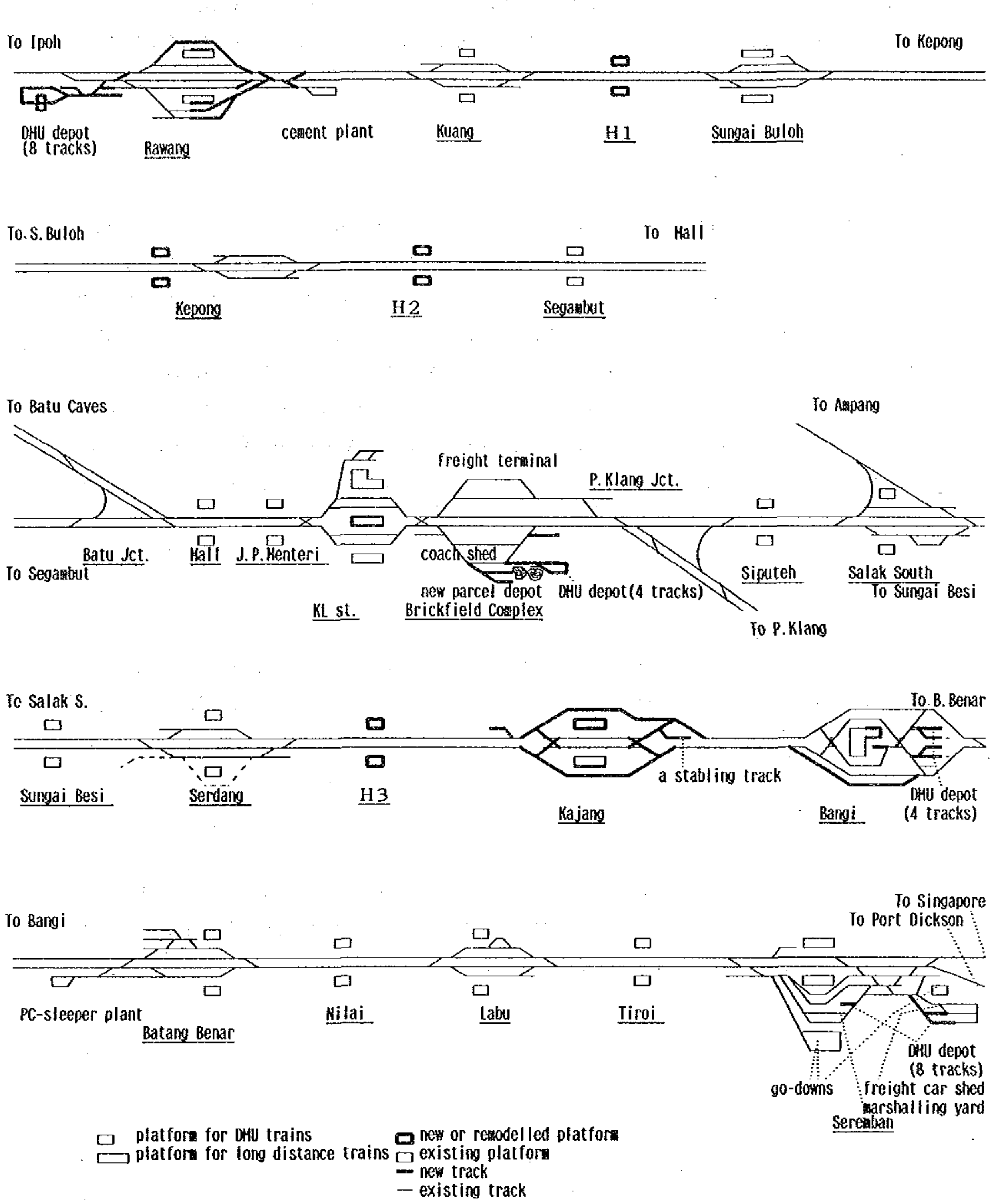


Fig. 8 Track Layout Plan by RBCS

8. POLLUTION CONTROL MEASURES

Deterioration of environmental problems in the Klang Valley such as noise and air pollution will be considerably mitigated by introduction of RBCS as stated below;

(1) Noise

Although noise generated from a DMU and a road vehicle will be approximately the same level, the noise level at a railway side will be smaller than that along a road side, because on the both sides of the railway track, right-of-way of 40m wide are reserved and the number of train is smaller than that of road vehicle. The noise of railway will be further reduced through adoption of long rail, under-floor wheel lathe device, heavier turnout, etc.

(2) Air pollution

By introduction of the RBCS, more than 27 million N m^3 of exhaust gas including NO_x and SO_x will be reduced per annum in the Klang Valley.

(3) Contaminated water

The refueling facilities at DMU depots and cleaning facilities at Sentul Workshop will be provided with the waste water treatment devices.

9. INVESTMENT COST AND IMPLEMENTATION SCHEDULE

Estimated total investment cost of the RBCS Project is 616 million M$, and annual operating cost is 109 million M$ (including depreciation cost of 31 million M$) as of 2005.

Detailed study for RBCS will start from 1993 when DTP is presumed to be inaugurated, and initial investment will be made in 1995.

Investment cost and implementation schedule of the RBCS Project are shown in Table 4 and 5.

Table 4 Investment Cost

(million M$)

		Initial ('93-'97)			Additional ('98-'05)			Total		
		Total	L/C	F/C	Total	L/C	F/C	Total	L/C	F/C
Rail	Track & structure	25.11	22.11	3.00	1.30	1.30	0	26.41	23.41	3.00
	Building	19.19	19.19	0	5.24	5.06	0.18	24.43	24.25	0.18
	Machinery & Equipment	12.52	2.21	10.31	18.78	4.19	14.59	31.30	6.40	24.90
	Signalling & Tele-communication	61.70	22.70	39.00	0	0	0	61.70	22.70	39.00
	DMU	235.27	30.69	204.58	142.05	18.53	123.52	377.32	49.22	328.10
	Engineering	7.19	0	7.19				7.19	0	7.19
	Sub total	360.98	96.90	264.08	167.37	29.08	138.29	528.35	125.98	402.37
Feeder bus		60.55	20.54	40.01	26.78	10.21	16.57	87.33	30.75	56.58
Grand total		421.53	117.44	304.09	194.15	39.29	154.86	615.68	156.73	458.98

L/C=local currency
F/C=foreign currency

Table 5 Implementation Schedule

(million M$)

	Year	1992	93	94	95	96	97	98	99	2000	01	02	03	04	05
Railway			▽ Inauguration of DTP				▼ Inauguration of RBCS								
	Designing		■	■											
	Track & structure				■	■		■			■			■	
	Building				■	■		■			■			■	
	Machinery & Equipment				■	■			■		■			■	
	Signalling & Telecommunication				■	■									
	DMU					■				■				■	
	Invest. total	—	3.60	3.59	47.13	306.66	—	3.69	16.83	49.17	2.79	—	—	94.89	—
	(Foreign Currency)	—	(3.60)	(3.59)	(20.48)	(236.41)	—	(0.18)	(12.96)	(42.76)	(0.87)	—	—	(81.52)	—
Feeder bus	Implementation						■	■	■	■	■	■	■	■	■
	Invest. total	—	—	—	—	—	60.55	3.39	3.39	3.39	3.39	3.39	3.32	3.32	3.19
	(Foreign Currency)	—	—	—	—	—	(40.01)	(2.10)	(2.10)	(2.10)	(2.10)	(2.10)	(2.05)	(2.05)	(1.97)

10. ECONOMIC/FINANCIAL ANALYSIS

(1) General

1) With-the-project case

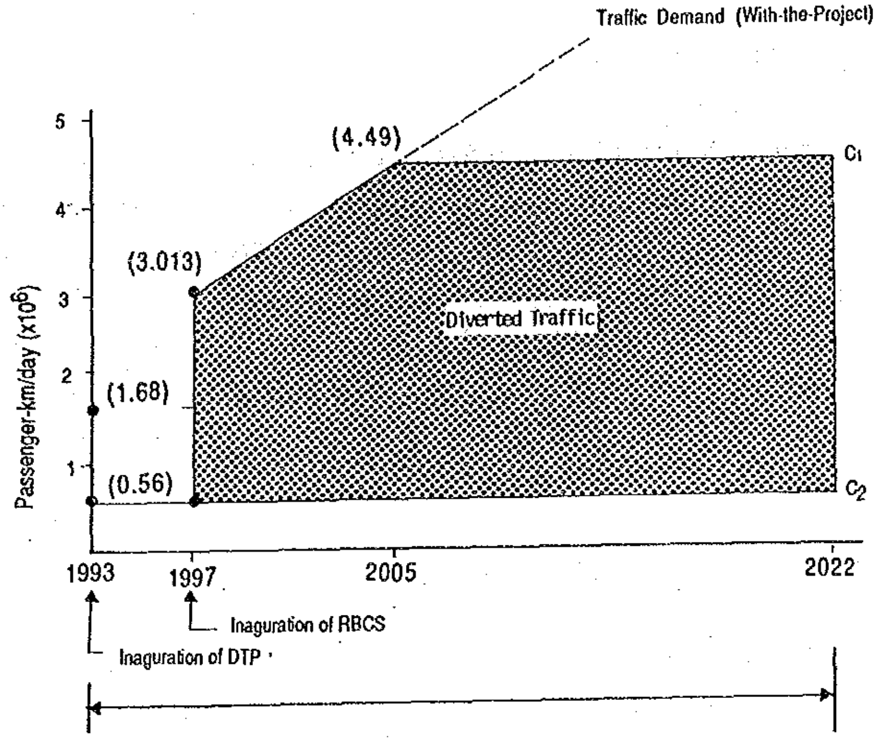
The Rawang - Seremban railway section and its feeder-bus service are upgraded in accordance with the increase in traffic demand, while the Integrated RBCS network except the Rawang - Seremban section (Port Klang, Batu Caves and Sri Subang railway lines, Monorail, LRT and related feeder-bus system) are presumed to be upgraded by 2005 to the same service level of the said section.

2) without-the-project case

The service level of the Rawang - Seremban railway section and its feeder-bus are not upgraded after completion of the DTP, while the other Integrated RBCS networks are upgraded to the same level as in the With-The-Project case.

3) Diverted traffic volume from bus to RBCS

Economic and financial analysis are conducted based on the cost and benefit/revenue caused relating to the diverted traffic from stage-bus to RBCS as shown in Fig. 9.



Note C1 : Transport Capacity by RBCS
C2 : Transport Capacity by DTP

Fig. 9 Concept of Diverted Traffic Volume

(2) Economic analysis

Table 6 Result of Economic Analysis

	EIRR(%)	B/C	NPV(x 10^3 M$)
Base case(with-the Project)	28.81	1.55	382,657
10 % Cost up	25.22	1.43	326,960
20 % Cost up	22.17	1.33	271,263
10 % Benefit down	24.85	1.42	288,694
20 % Benefit down	20.81	1.28	194,732
10 % Cost up, 10 % benefit down	21.55	1.31	232,997
20 % Ridership from bus	32.50	1.68	535,397
20 % Ridership from sedan	65.14	3.08	1,634,419
10 % from Bus, 10 % from Sedan	48.02	2.31	1,027,703

* Discounted by opportunity cost ratio of 12%
EIRR : Economic Internal Rate of Return
B/C : Benefit/Cost Ratio
NPV : Net Present Value

EIRR of the project calculated based on the project life of 30 years turned out to be 28.81%, thus proving the economic feasibility of the Project.

The major social benefits owe to saving in procurement and operating costs of road vehicles as well as time-saving of road/rail commuters.

(3) Financial analysis

FIRR for the Base Case is calculated to be 2.84%. In view of the prevailing interest rate of commercial banks exceeding 8%, it must be said that the Project is not viable for the privatized MRA, although in 1999 the minimum ridership would be secured. Hence, in order to make the Project financially feasible, some governmental measures have to be taken such as;

1) Alternative 1: Raise the DMU fare level to the same level of the stage-bus, and also the feeder-bus fare from 30 cent to 35 cent.

Table 7 Modification of Fare Structure

Mode	Base Case (M$)	Alternative (M$)
DMU train	0.044X	0.044X + 0.155*1
Feeder-bus	0.30	0.35*2

Note X: Passenger x km
*1: Current fare structure of stage-bus
*2: Current feeder-bus fare ranges 0.30 ~ 0.50 M$

2) Alternative 2: Exempt MRA from such costs required in 1995 and 1996 as investment costs for the ground facilities, engineering fee, and 30% of the DMUs, as well as the import tax for the DMUs as listed below;

* Initial investment of ground facilities (in 1995 and 1996)	- 119 million M$
* 30% of initial investment for DMU (in 1996)	- 61 million M$
* Import tax for initial investment of DMU (in 1996)	- 31 million M$
* Engineering & Consultant Fee (in 1993 and 1994)	- 7 million M$
	- 218 million M$

FIRR and sensitivity analysis for the above three cases are given in Table 8 and 9 respectively. As shown in Table 8, for both Alternatives, FIRR value exceeds 8%, thus turning the project financially feasible.

Further analysis was made as to the cases described below:

3) Alternative 3:

A. Raise the DMU and feeder-bus fares as in Alternative 1, exempt MRA from investment costs for ground facilities (excepting the ticket-vending machine and DMU maintenance plant/ machinery) and from import taxes during the whole project life.

B. Raise the feeder-bus fare as in Alternative 1, exempt MRA from investment costs for ground facilities (excepting the ticket-vending machine and DMU maintenance plant/machinery) and from import taxes during the whole project life, and sustain the DMU fare raise to the minimum, maintaining the FIRR nearest to 8.37%.

In these cases, the FIRR for Alternative 3-A is given in Table 8, and the DMU fare raise in Alternative 3-B is described in Note to Table 8.

Table 8 FIRR

Case	FIRR (%)
Base Case	2.84
Alternative 1	8.37
Alternative 2	8.33
Alternative 3-A	14.16
Alternative 3-B	8.37

Note:
In Alternative 3-B, DMU fare level will be reduced by 24.4%.

Table 9 Sensitivity Analysis

Case	Variation	FIRR (%)
Base Case	Cost Overrun 10 %	0.95
	Revenue Reduction 10 %	-0.48
	Ridership Increment 20 %	3.70
Alternative I	Cost Overrun 10 %	6.46
	Revenue Reduction 10 %	5.18
	Ridership Increment 20 %	9.32
Alternative II	Cost Overrun 10 %	5.33
	Revenue Reduction 10 %	3.08
	Ridership Increment 20 %	10.55

11. LAND-USE PLANNING

To promote the land-use development policies/strategies of the Government and to encourage RBCS, integration of the above two are proposed as follows;

(1) Regional setting beyond 2000

Introduction of RBCS will expand commuting zone along the Corridor. One-hour commuting area, for example, by stage-bus ranging an area of 10km radius from the city centre will be expanded into a 30km radius zone.

K.L.-to-Kuang/Rawang and K.L.-to-Bangi are two major Growth Directions (1985-2000) which the Klang Valley Perspective Plan (Review) adopted; this growth strategy could be extended beyond 2000 through coordinating with the RBCS development plan.

(2) Planning concept of station area

The urban structure, which has been developed depending on road-based transport, has a dispersed land-use pattern. On the other hand, the RBCS will have an impact on the land-use plans of the "station areas".

Three station area zones are proposed for planning, as follows:

- Primary Zone: Walking Access Zone (within a 400m radius circle; a 50ha area)

- Secondary Zone: 10- to 15-Minute Bus Access Zone (within a 1.5km to 2.2km radius circle; a 700ha to 1500ha area)

In the Primary Zone, inter-modal facilities, local-town centre, large-scale trip-attractive/generative facilities, etc. should be developed for publics' convenience and to mitigate road traffic.

In the Secondary Zone suburban housing, in particular low-/middle-costs housing, should be developed.

(3) Governmental action to encourage development in the station area

To solve housing shortage within the K.L. Conurbation for developping the suburban New Growth Centre and Satellite Towns, development of low-cost housing in the station area is very important.

Since the private sector is major supplier for the low-cost housing, at early stage of the RBCS Project, same governmental actions will be required to provide the private sectors such incentives, as land value increment due to RBCS and land readjustment.

(4) Guidelines for land-planning of each case-study area

1) The RBCS impacts should coordinate with the established policy of the satellite towns at Rawang and Kuang. Population growth and commuter housing development in these areas will encourage urban activities and introduction of industrial developments. Therefore development actions of primary and secondary zones should be taken.

2) The convenient accessibility for K.L. by RBCS will encourage growth for Bangi New Town; however, actual development actions in the station area should be controlled in accordance with the

Structure Plan. Development concepts for the full-scale inter-modal facilities in the primary zone are proposed.

3) It is proposed that, the Nilai Station area in short term be reserved for future development, and in long-term, be developed to a satellite town with industrial/institutional facilities. Related development guideline of the State is, therefore, required.

4) The station-areas of the intermediate areas (Salak South, Sg. Besi, Serdang) will be comparatively small. Hence development of intermodal facilities in the Primary Zone is proposed.

5) For the K.L. Station-area, inter-modal transfer facilities among railway, LRT, Monorail and road-modes in forms of pedestrian malls/plazas, which will cross over the railway tracks and rivers, are proposed.

6) Seremban Station should be a core of Seremban's town centre; a large number of RBCS passengers and MRA's right-of-way should be utilized to encourage the town centre development.

12. RBCS MANAGEMENT AND OFF-RAIL BUSINESS

(1) RBCS management

Organization of RBCS

1) A steering top agency with power of tax alleviation to encourage RBCS should be designated in the Government. The expected achievements are:

- Powerful Project Management
- Review of regional plans
- Legislation/regulation giving priority to RBCS

2) RBCS Carriers should be planned as private enterprises.

3) RBCS should be placed in a free market. But Government should assist the carriers. Some detaxation, compensation and their timely capital increase by the government are necessary.

(2) Safety training:

Detailed programs for RBCS staff training should be implemented.

(3) Common ticketing system

Passengers must be cleared of the troubles of getting a new ticket as often as they change the RBCS mode. Ride-in system and zone fare system should be studied and carefully selected. Team considers that the former is more conformable with the Government's policy to privatize the public services, since it ensures the carrier's enterpreneurial initiative, an prerequisite for the successful off-rail business activity.

(4) Planning of off-rail business

1) Core notion:

- Endow the RBCS carriers with sufficient assets at its foundation stage. Particularly, the land space.
- Give them free hand in exploiting the assets. As to the result, they will be responsible only to their Boards
- Encourage co-investment by financial institutions and developers, making them participate in joint-ventures to promote the business.
- The carriers may entrust the project/business execution to their subsidiary companies. The companies may further farm it out.

2) Activities and their scale should be developed on step-by-step basis in accordance with the commuter traffic increase.

3) To begin with, the land reserve and acquisition for off-rail business and preparation of feeder-bus service (as an off - rail business) should be implemented. Others could be planned later.

13. CONCLUSION AND RECOMMENDATION

13-1 Conclusion

Undertaking the RBCS Project immediately after completing the Double Tracking Project (DTP) is highly recommended for the following reasons.

(1) Technical feasibility

The transport capacity of 4.5 million passenger-km/day and service level of 10 minutes train headway during peak hours, etc., which are required to cope with the traffic demand up to the year of 2005, can be attained through introducing additional fleets of diesel rail car, improving railway facilities after DTP, and development of feeder-bus networks.

(2) Economic/financial feasibility

EIRR of the project calculated based on the project life of 30 years turned out to be 28.81%, thus proving the economic feasibility of the Project.

On the other hand, FIRR for the Base Case was calculated to be 2.84%. In view of the prevailing interest rate of commercial banks exceeding 8%, it must be said that the Project is not viable for the privatized MRA, although in 1999 the minimum ridership would be secured. Hence, in order to make the Project financially feasible, some governmental measures have to be taken such as;

Alternative 1: Raise the DMU fare level to the same level of the stage-bus, and also the feeder-bus fare from 30 cent to 35 cent.
(FIRR: 8.37%)

Alternative 2: Exempt MRA from such costs required in 1995 and 1996 as investment costs for the ground facilities, engineering fee, and 30% of the DMUs, as well as the import tax for the DMUs.
(FIRR: 8.33%)

Alternative 3-A: Raise the DMU/feeder-bus fares as in Alternative 1, exempt MRA from investment costs for ground facilities (excepting the ticket-vending machine and DMU maintenance plant/machinery) and from import taxes during the whole project life.
(FIRR: 14.16%)

Alternative 3-B: Raise the feeder-bus fare as in Alternative 1, exempt MRA from investment cost and import tax as in Alternative 3-A above, and sustain the DMU fare raise to the minimum, maintaining the FIRR nearest to 8.37%.
(FIRR: 8.37%. The DMU fare level will be reduced by 24.4%)

(3) Other benefits

Implementation of this Project will produce various unquantifiable benefits such as mitigation of air population caused by road vehicles, development of satellite cities/town along the railway corridor, promotion of related industries/job opportunity.

13-2 Recommendation

(1) Consistency with the double tracking project

Railway system of the RBCS is planned to upgrade the commuter transport capacity of the DTP system which will have been established by 1993.

In this context, it is recommended that system planned in this Study such as feeder-bus, station building and track layout would be positively adopted in the DTP as pilot projects, so far as its construction schedule and resources permit.

(2) A powerful steering authority to lead the integrated RBCS project

The RBCS Plan has been prepared presuming that related railway commuter lines such as Port Klang line and Sentul line, and Monorail/LRT network will also be developed by the year of 2005.

Hence, it is recommended to establish an powerful steering organization in the Government for planning and promoting such key issues of the Integrated RBCS as total network, roles/interface of each mode, construction schedule, management, coordination with land development plan, etc., so that each project could be materialized with maximal integration and cost-efficiency.

(3) Policies to encourage railway commuter ridership

Governmental actions to encourage the RBCS ridership are recommended, such as;

- Development of housing complex, schools in particular, close to railway station

- Disapproval of new stage-bus routes parallel with the railway corridor
- Development of feeder road to railway stations
- Promotion of park-and-ride system
- Introduction of common ticket/season ticket system which ensures independent management of each RBCS carrier and sound competition among them

(4) <u>Measures for upgrading RBCS service level</u>

Timely investment for the followings is recommended to be considered;

a. Electrification to shorten travel time and to eliminate hazards due to exhaust gas

b. Track realignment/rehabilitation to minimize speed restriction

c. Remodelling of more stations to over-the-track typed and provision of more public passageways/rear-gates, than planned in this study.

d. Broader station plaza to enable constructing feeder-bus terminal, car-park, access road, shopping complex, etc., than planned in this Study.

(5) <u>Off-rail activities related with the RBCS passengers</u>

Prompt land acquisition for off-rail business is recommended. It should be started with the space adjacent to the station-front plazas.

Step-by-step development of off-rail business according to increase in RBCS commuters will improve financial viability of RBCS operation.

(6) Training

It is recommended that prior to the inauguration of RBCS, training be systematically provided to the related employees on not only knowledge and skills but also on practices required to properly operate/maintain the heavily dense commuter railway system.

(7) Maintenance

To cope with the sharp increase in traffic density on the upgraded railway sections, it is recommended to further develop the efficiency of maintenance work through mechanization and better maintenance control system.

(8) Measures to cope with the further traffic demand increase after 2005

Commuter trains of the Rawang - Seremban line and the Port Klang - Batu Cave line are jointly operated on the section between Batu Cave Jct. (383 km) and Port Klang Jct. (390 km). Hence this section (7 km in length) forms the bottleneck of the whole line.

Transport capacity of 4.5 million passenger-trips/day planned in the RBCS Project could be increased by lengthing a DMU train consist from 7 car/train to 10 car/train.

To cope with further increase in RBCS traffic demand in the future, however, some of the following measures would have to be taken;

a. Grade-separating the said two junctions

b. Quadrupling the track

c. Diverting some of the K.L. - Seremban trains into the Ampang line via S. South Jct.

d. Constructing a detour line so that freight trains can be operated by-passing K.L.

JICA