7-2 Maintenance

The maintenance costs have been estimated on the assumed conditions as stated hereunder. This estimation is based upon the JNR's experiences in the maintenance service. It is clear that further studies should be required for education and training of the personnel prior to implementation of the Project.

7-2-1 Maintenance of track and civil structure

The Master Plan envisages large increase in the number of trains to be operated and in the running speed in the future as compared with the present level of train operation. Therefore, along with employment of heavy-weight rail, track maintenance must be taken, to fix the track corresponding to the progress of destruction and to replace track materials systematically, such as rail, fastening device, sleeper and ballast.

According to this principle, required quantity for replacement of rails, sleepers and ballast has been estimated as per passing tonnage (Fig. 7-2-1) for each line in each of alternative Cases.

Furthermore, to promote the saving of manpower for maintenance, the maintenance work will be mechanized with the following items of equipment and tools:

① Tie tamper
② Motor-car and trolley for track inspection
③ Rail flaw detecting car
④ Mini bus
⑤ Small-size truck

Each station will be provided with the refuge track (of 150 m in effective length) for those maintenance vehicles. In addition to that, the maintenance depot and its related facilities will be required.

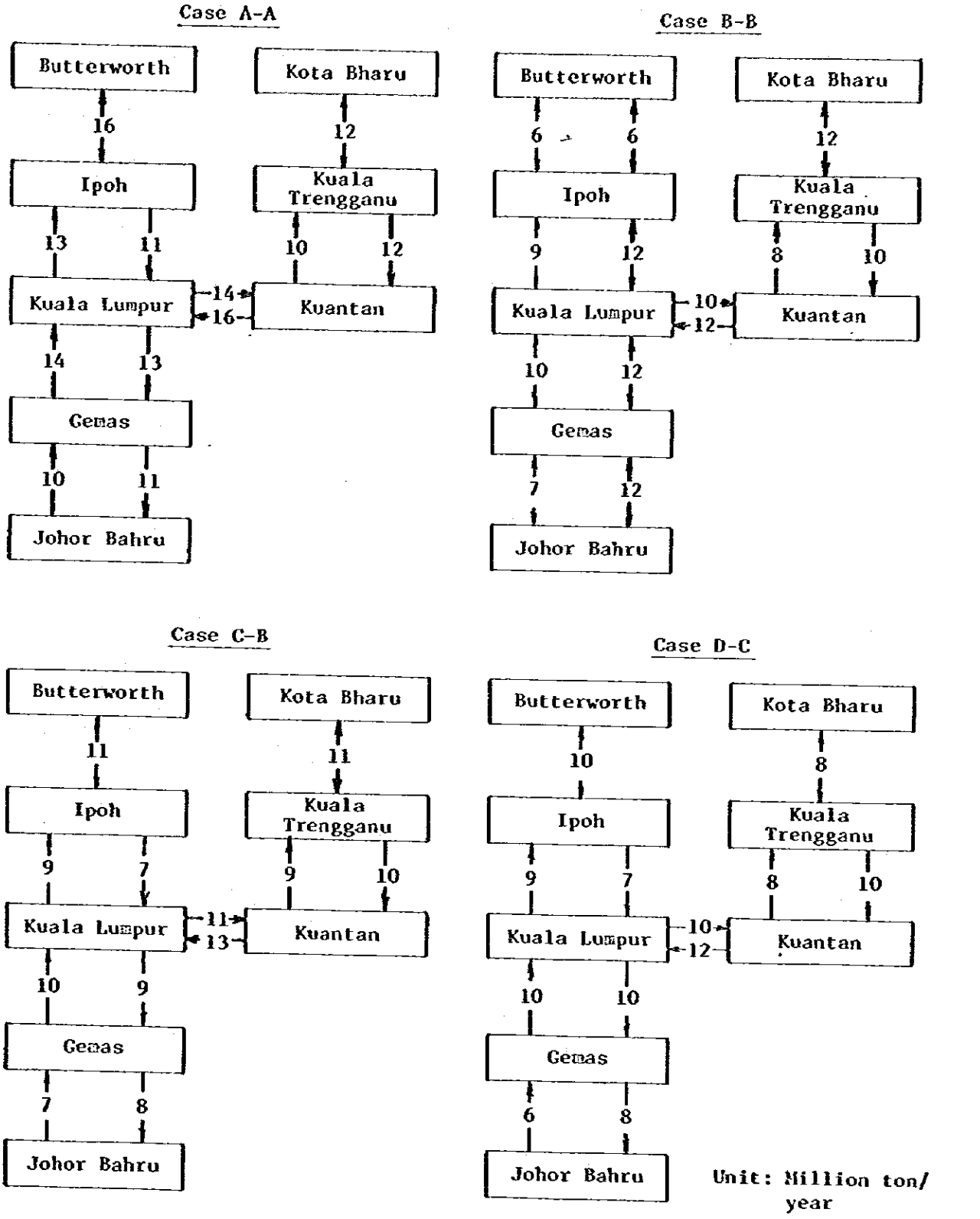


Fig. 7-2-1 Passing Tonnage (2005)

7-2-2 Maintenance of electric facilities

Electric facilities will be designed in consideration of the maintenance saving, utilizing many semiconductor parts and introducing the centralized monitoring system. The electrical inspection car will be operated on the track at a regular cycling period for inspection of the following items:

- Reflection, height and voltage of overhead contact wire
- Track circuit and ATS for signalling
- Train radio system for telecommunication control

All the other items of electric facilities will undergo periodic inspections individually or collectively by patrol.

7-2-3 Maintenance of rolling stock

(1) Categories of inspection and divisions in charge may be proposed as follows:

Table 7-2-1 Categories of Inspection and Division

	EL	DL	PC	FC	Division in charge
I	Daily inspection				Depot
II	Regular inspection				Depot
III	Bogie inspection		Regular inspection (replace designated parts)		Depot
IV	Main components inspection		———		Workshop
V	Overall inspection				Workshop
VI	Temporary inspection				Depot & workshop

(2) Required cycling period for inspection may be proposed as follows by reference to the JNR's standard of cycling period (on a basis of operating kilometerage) and also with due consideration to daily car kilometerage and running conditions.

Table 7-2-2 Cycling Period for Inspection

	Standard Gauge				Meter Gauge			
	EL	DL	PC	FC	EL	DL	PC	FC
I	Daily			Prior to use	Daily			Prior to use
II	1 month	2 months	1 month	2 months	1 month	2 months	1 month	2 months
III	8 months	15 months	12 months	18 months	11 months	15 months	18 months	18 months
IV	15 months	30 months	-	-	21 months	30 months	-	-
V	30 months	60 months	24 months	36 months	42 months	60 months	36 months	36 months
VI	If and when necessary				If and when necessary			

7-2-4 Train operation

Power costs consist of electric energy for locomotives on the main line and diesel oil to be spent for shunting locomotives. The unit price used for estimation of such costs has been assumed as follows by reference to the prevailing price now in Malaysia.

Electric energy	M$ 0.178 per kwh
Diesel oil	M$ 0.651 per liter

7-2-5 Management and maintenance costs

Management and maintenance costs are summarized in Table 7-2-3 for each alternative Case (at 1981 price level).

Table 7-2-3 Summary List on Management & Maintenance Costs

	Management & maintenance costs Sum (thousand HK$)	Remarks
Case A-A		
Track & structure	67,813	
Electrification, signalling & telecommunications	42,695	
Rolling stock & operation	106,466	
Power cost	130,472	
General manager's office	6,912	
Total	354,358	
Case B-B		
Track & structure	70,661	
Electrification, signalling & telecommunications	44,768	
Rolling stock & operation	98,263	
Power cost	106,399	
General manager's office	6,912	
Total	327,003	
Case C-B		
Track & structure	63,269	
Electrification, signalling & telecommunications	39,172	
Rolling stock & operation	95,065	
Power cost	85,794	
General manager's office	6,912	
Total	290,212	
Case D-C		
Track & structure	60,353	
Electrification, signalling & telecommunications	37,326	
Rolling stock & operation	94,479	
Power cost	65,111	
General manager's office	6,912	
Total	264,181	

CHAPTER 8.
ECONOMIC AND FINANCIAL ANALYSIS

CHAPTER 8 ECONOMIC AND FINANCIAL ANALYSIS

8-1 Purpose

The Master Plan, which outlines the development programme of the Malaysian Railway system, consists mainly of the improvement of the existing West Coast Line (the South North Line) and the construction of the New East-West Line. This plan includes route alignment, improvement or new construction of civil works, track, rolling stock, workshops, signalling and telecommunications facilities, electric power supplies and electrification facilities.

Traffic demand emerging from the economic activities of a country must generally be satisfied by safe, sufficient, economical and efficient services. The investment for transport facilities is, however, characterized by huge construction costs because of the indivisibility of facilities, the long range of the depreciation period and the prolonged period of construction before completion.

Therefore, it is first of all necessary to make comparative study from the broad viewpoint of the macro-economy between the socio-economic benefits accruing from execution of the plan and social costs required for its implementation. This is necessary in order to insure that relatively scarce resources may be allocated most efficiently by selection of the most beneficial transportation development plan among the alternatives or by giving priority to any other project in place of the transportation development plan.

In most instances, the sum of required investment funds exceeds the self-financing capability of the operation because of the characteristics of transportation investment as aforestated. Therefore, the profitability of the project must be assessed prior to its implementation.

This chapter examines both economic analysis and financial analysis of the railway development project in Malaysia from such a point of view.

8-2 Economic Analysis

8-2-1 Methodology of economic analysis

The fundamental concept of economic analysis is to compare the sum of investments required by the alternative cases being assumed, which are "with" and "without" execution of the Master Plan, and the economic benefits expected to result from each of those, establishing effective transport facilities to satisfy future forecasted increases in transportation demand.

(1) Definition of "With the Project" and "Without the Project"

"With the Project" : The case where this Master Plan will be carried out.

"Without the Project" : The case where this Master Plan will not be carried out and future new traffic demand is met by alternative means of transport.

(2) Items to be analyzed

1) Benefits of possible savings in both time and cost to accrue from the case of "With the Project".

2) Investment sums for ground facilities related to the railway transportation system (civil structure, track, signalling and telecommunications equipment, electric power supply and electrification, and workshops), rolling stock (for EL, DL, PC and FC), land acquisition for railway construction, road and road vehicles (such as car/taxi, bus and lorry), aircraft and airport facilities, and coastal ships and port facilities.

(3) Evaluation

Values of goods and services are evaluated on a basis of economic prices; that is to say, what is called "numéraire" allowing for some deductions (such as tax, interest and subsidy) from market prices.

(4) Criteria for evaluation of a project

As a general practice the following three (3) methods are used as criteria for evaluation of a project.

Where, Bi: Time sequence of a benefit

Ci: Time sequence of a cost

r : Discount rate

1) Net present value

$$NPV = \sum_{i} \frac{Bi}{(1 + r)^i} - \sum_{i} \frac{Ci}{(1 + r)^i}$$

This compares the degree of difference between the total present value of benefits and the total present value of costs during the project life after discounting by a certain rate.

2) Benefit cost ratio

$$BCR = \sum_{i} \frac{Bi}{(1 + r)^i} \Big/ \sum_{i} \frac{Ci}{(1 + r)^i}$$

This compares the ratio of the total present value for benefits to the total present value for costs during the project life after discounting by a certain rate.

3) Internal rate of return

$$\phi\ (\rho) = \sum_{i} \frac{Bi}{(1 + \rho)^i} - \sum_{i} \frac{Ci}{(1 + \rho)^i}$$

This compares the value ρ (internal rate of return) so as to obtain $\phi(\rho)=0$.

Under this analysis the proposed method of 3) is used as the criterion for comparative study of alternative cases.

8-2-2 Premises

The following premises are assumed for economic analysis:

(1) Traffic volume

Future traffic volume to be shared by the railway would be comprised of the following three items.

1) Ordinary traffic demand

Demand that will exist even if the project is not executed.

2) Converted traffic demand

Demand which is shifted to railway use away from other traffic modes (such as roads, airlines, and coastal shipping) as the project is executed.

3) Induced traffic demand

Newly induced demand for railway transportation which results from enhanced attractiveness of railway traffic (due to shortening of trip times of passengers and goods, improved amenities and higher safety) after execution of the project.

Out of the three (3) different categories cited above, items 1) and 2) have been taken up for calculation on the basis of passenger-km for passengers and ton-km for goods transport, respectively, in accordance with traffic demand forecast demonstrated by modes in Chapter 5. Futhermore, passenger traffic demand for the purpose of either business or leisure has been split at a ratio of 80% for the former and 20% for the latter, in accordance with Tourist Statistics in Brief 1979, TDC Malaysia, by due reference to the probable future trends of rising incomes, changing social structure and increased leisure time, etc.

(2) "Without the Project"

The alternative plan in the case of "Without the Project" assumes the use of roads (by car/taxi and express bus) and air (by domestic airline) for passenger traffic, and roads (by lorry) and marine transport (by coastal shipping) for goods traffic, as the alternative means of transport to satisfy future increase of traffic demand. These assumptions are based upon comprehensive considerations of railway passengers' characteristics (purpose, distance and frequency of trip), railway goods characteristics (loading items, way of loading and unloading, and trip route and distance), the Malaysian road network and road capacity (including proposed network & capacity), the domestic airline network and ground facilities, and the coastal shipping network and port facilities. At the same time, review has been made to check acceptability of this alternative in the case of "Without the Project", especially from the viewpoint of competition among traffic modes and their capacity, by due reference to statistics and discussions with the Malaysian

Airline System, Highway Planning Unit, Malaysian International Shipping Corporation, and some major companies in Malaysia.

(3) Market prices versus economic prices

The following adjustments have been made so as to convert market prices into economic prices.

1) Import price of equipment and material

The Malaysia Import Duty Table indicates that the customs tariff is zero for almost all import items of equipment and material to be furnished for the Project. Therefore, only the import surtax of 5% has been deducted.

2) Payroll in local currency

The personal income tax has been subtracted from payroll costs by reference to the Malaysia Income Tax Table.

3) Equipment and material expense in local currency

The sales tax of 5% has been subtracted from the domestic purchase price for equipment and materials.

4) Power expense

A purchase subsidy is granted for the sake of public welfare and price stability to the public transport service agencies because of their diesel oil consumption in bulk quantities. This subsidy is added to the market price.

5) Other adjustments

Price distortion of land price, foreign exchange rate, wages payable to unskilled workers etc. undergo no adjustment in this analysis because of restrictions on the availability of data and in view of the fact that the economy in Malaysia is based upon a free competitive market to a considerable extent.

The market prices adopted for this analysis are based in principle upon the average price (in terms of Malaysian dollars) in the year of 1981 and partly

reflecting estimates for the year 1982. Future potential inflationary factors are not incorporated into market prices.

(4) Project life

The project life defined under this Master Plan covers the period of 30 years from 1984 to 2014 judging from economic and physical durability and maintenance capability. Finally, this economic analysis sets the base year at 1984, which is the starting year of construction under this Project (not 1990, the start of commercial operation), and all benefits and costs should accrue not at the year end but at the beginning of each year.

(5) Construction schedule

The construction schedule covering the period of 1984 - 1989 has been set up as follows:

Unit: %

Year	1984	1985	1986	1987	1988	1989	1990
Land acquisition	20%	30	50				
Civil work	5	15	15	30	30	5	
Track structure			30	45	20	5	
Electrification							
Signalling			20	30	45	5	
Telecommunications							
Rolling stock					30	70	
Workshop				20	50	30	

The schedule above refers to the physical progress of construction in the case of economic analysis and the disbursement of construction funds in the case of financial analysis.

8-2-3 Composition of economic benefits

(1) Time saving benefits

1) Savable time length

After completion of this Project, it is certain that the average time per unit distance for both passengers and goods (including access and check-in time) will be shortened owing to doubling of the track, electrification, acquisition of the right-of-way, construction of new facilities, and gauge conversion (except Case D-C). On the other hand, in the case of "Without the Project", the time required to travel by each mode of existing railway, road vehicle traffic, airline and marine liner is estimated and compared with the above to obtain the average time saving between the two alternatives.

- Passenger traffic Unit: h/km

Existing line	0.0210
New line (A-A)	0.0110
" (B-B)	0.0110
" (C-B)	0.0118
" (D-C)	0.0145
Airline	0.0090
Car/taxi	0.0150
Bus	0.0190

- Goods traffic Unit: h/km

Existing line	0.2002
New line (A-A)	0.0951
" (B-B)	0.1094
" (C-B)	0.1021
" (D-C)	0.0964
Coastal shipping	0.1635
Lorry	0.0498

2) Time value

For the assessment of time value for passengers, the average value of the income distribution of passengers has been taken from the average level of wages applicable in 1981 for clerks, non-desk workers and supervisors for passengers utilizing railway and bus service, and of senior engineers and general managers for passengers utilizing car and airline traffic. Time value for passengers utilizing transportation facilities for leisure purposes has been assessed at 20% of the time value observed for passengers on business by due reference to the survey by I.G. Heggie (page 88 of Transport Engineering Economics).

On the other hand, the time value for goods transport has been attained from the weighted average by application of the goods loading ratio of each traffic mode to the average price level in 1981 for palm oil, petroleum and cement, and then adjusting by the interest rate per unit hour.

Clerk/non-desk worker	M$ 6,600 per annum
Senior engineer/General Manager	M$ 20,000 per annum
Palm oil	M$ 950 per tonne
Petroleum	M$ 596 per tonne
Cement	M$ 180 per tonne
(All in terms of economic price)	
Short-term interest rate	14% per annum

(2) Cost saving benefits

The difference in the calculated total of maintenance, replacement, power, and payroll costs between the two alternative cases of "With the Project" and "Without the Project" is considered the cost saving benefit.

1) Railway

In the case of "With the Project", the applicable maintenance and replacement procedures for each operating system of railway has been first determined. After assessment of both material and personnel costs on the basis of such applicable procedures, total cost estimates have been integrated from all such cost items for electric power, payroll and head

office administration overhead as may be necessary for management and operation of the railway business. Referring to the case of "Without the Project", costs have been calculated with allowance for forecasted increases in railway traffic demand in the case of "Without the Project", on the basis of the current level (1980 and 1981) for the Malayan Railway Administration.

2) Road

Maintenance and replacement costs, fuel and engine oil costs and crew wages for road vehicle traffic have been calculated by basic reference to the data available from the Highway Planning Unit and Ministry of Works and Utilities. These calculations have been made by vehicle type: for instance, DATSUN 120Y and TOYOTA CAROLLA 1200 for cars and taxis, MERCEDES BENZ 1113/44 (44 passengers) for express buses and BEDFORD J5LZ5 (9 tonnes) for lorries.

3) Coastal shipping

With regard to costs for coastal shipping, maintenance and replacement costs, fuel costs and crew wages have been calculated for ships of 4000-tonne order by due reference to the record of hearing available from the Malaysian International Shipping Corporation.

4) Airline

Airline costs include maintenance, replacement, fuel and crew wage costs for a B-737 type aircraft in accordance with the record of hearing available from Malaysian Airline System.

Road vehicle traffic

		Car	Bus	Lorry
Personnel	(M$/annum)	7,500	15,600	12,000
Maintenance	(M¢/mile)	5.8	11.5	4.7
Fuel	(M¢/mile)	9.4	13.6	18.1
Oil	(M¢/mile)	0.7	1.0	0.9
Tyre	(M¢/mile)	2.5	20.0	13.3

Airline

Crew wages	(M$/annum)	360,000
Maintenance & replacement	(M$/mile)	12
Fuel	(M$/mile)	120

Coastal-shipping

Crew wages	(M$/annum)	500,000
Maintenance & replacement	(M$/mile)	20
Fuel	(M$/mile)	19

(All in terms of economic price)

(3) Other benefits

The Project provides some other benefits as follows in addition to benefits of time and costs saving. However, the analysis in this study has not incorporated these other items of benefits, because of restricted availability of necessary data, some ambiguity in concept and the fact that a uniform approach for evaluating these data has not as yet been developed with resultant differences in the measured results to be obtained by each survey researcher. Nevertheless, these benefits must be taken into full consideration at the final stage of evaluation of this Project.

1) Multiplier effect

According to Keynesian theory, it is defined that investment for each unit can increase the GNP directly and indirectly up to reciprocal times of the marginal propensity to savings in a closed system.

2) Promotion of job opportunities

In connection with the effect referred to in 1) above, the project will help to increase not only direct employment but also job opportunities indirectly together with increases of the GNP.

3) Promotion of change in industrial structure

The industrial structure will be shifted towards higher value-added sectors at an accelerated pace by mass transit of both passengers and goods at relatively low prices and at shortened times.

4) Induced spending for tourism

New spending for tourism will be induced by construction of a new railway traffic system and will further be promoted by rise of the personal income level along with an increase of freely disposable time.

5) Regional development

Regional development will be accelerated towards dissolution of existing gaps among regions by construction of other infrastructure as well as by development of the transportation system. A particularly remarkable effect will be demonstrated by the coupling of both new construction of the New East-West Line under this Project and the development of some areas on the East Coast.

6) Technological influence

By introduction of highly advanced technologies into both the hardware and software of the construction project, new technology will tend to spread into other industrial sectors.

7) Pollution reduction

The current transportation system gives rise to space transfer by the conversion of thermal energy into kinetic energy with resultant occurrence of pollution. In this regard, an electrified railway helps reduce the rate of pollution occurrence to a relatively low level.

8-2-4 Composition of investments

The total sum of investment in the case of "With the Project" in excess of the sum in the case of "Without the Project" has been taken into consideration. All such investment sums are expressed, in principle, in terms of the economic prices prevailing in 1981.

(1) Investment for "With the Project"

The investment for the case of "With the Project" is basically the same as demonstrated in Chapter 7, except for the following points.

1) Market prices are converted into economic prices

2) Salvage value is added up at the end of the project life for each facility, system, rolling stock and acquired land, where the value of such facilities and rolling stock is based on the following years of depreciation (by JNR's standard).

Civil and track structures	68 years
Electrical and electrification systems	30 years
Signalling and telecommunications	20 years
Rolling stock	18 years
Workshops	30 years

3) Since the expected life of the signalling and telecommunications equipment is 20 years, the sum of re-investment is estimated.

4) Since Sentul Workshop and Brickfields Yard can be used for other purposes after the execution of this project, the cost of land to be acquired can be offset by the land value of those facilities.

(2) Investment for "Without the Project"

The investment items and sums have been estimated as follows for the case of "Without the Project". Estimation of investment sums is based mainly upon the result of hearing or the data available from Highway Planning Unit, Highway Authority, Ministry of Transport, Ministry of Works and Utilities, Malaysian Airline System, and Malaysian International Shipping Corporation.

1) Road

- Vehicles

Car/Taxi (DATSUN 120Y & TOYOTA CAROLLA 1200)	M$ 10,596
Bus (MERCEDES BENZ 1113/44)	M$ 79,540
Lorry (BEDFORD J5LZ5)	M$ 30,706

- Road

4 lanes, 3.5 m lane width, paved, with designed speed of 120 km/h	M$ 5 mil./km

2) Air flight

- Aeroplane (B-737) M$ 30 mil.
- Airport facilities

Runway	M$ 36 mil. (45 m ×2,000 m)
Control systems	M$ 10 mil.
Terminal building	M$ 2,000/m^2

3) Coastal shipping

- Ship

Coastal ship (4,000 t)	M$ 12 mil.

- Port facilities

Total cost of M$88 million has been estimated with reference to feasibility study results for several port construction projects proposed in Malaysia, on the assumption of constructing the quays (-7.5 m × 260 m ∿ -2.0 m × 175 m) and the berth (-5.0 m × 1 berth), including other associated facilities, which will be capable of accepting approach of 5,000 D.W.T. general cargo ships, 1,000 D.W.T. oil tankers and 50 G.T. ∿ 20 G.T. fishing boats to the coast.

8-2-5 Results of economic evaluation

The economic internal rate of return may be calculated as follows for each alternative case on the basis of the premises, benefits and investment sums as aforestated:

Case A-A	13.8%
Case B-B	12.6%
Case C-B	11.5%
Case D-C	12.9%

The premises for this calculation, such as traffic volume, proposal of alternative plans, criteria of evaluation, project life and construction schedule are as given in the foregoing section 8-2-2. Refer to 8-2-3 for the breakdown of benefits such as benefits of time and cost saving and 8-2-4 for the breakdown of investments such as investment for "With the Project" and investment for "Without the Project".

It is possible to attach priority to the alternative cases from these calculations, with the result that Case A-A could be selected as the Master Plan. However, in view of the nature of the Master Plan, the calculation process is based on rather bold assumptions. The final decision for implementation of this Project, including execution of the staged construction, should be made after full review of the technology, profitability and financing sources of the project at the next stage of feasibility study, and after sensitivity analysis has been made in connection with possible variations of the given conditions.

8-3 Financial Analysis

8-3-1 Basic concept

Prior to implementation of this Project, financial analysis will be made to seek the financial internal rate of return as the measure of profitability of the Project itself. Namely, where Ri denotes the value of time sequence for net income (revenue minus expense) and Ci denotes the value for construction cost:

$$\psi(\rho) = \sum_i \frac{Ri}{(1+\rho)^i} - \sum_i \frac{Ci}{(1+\rho)^i}$$

The discount rate ρ for $\psi(\rho) = 0$ may be called the financial internal rate of return or the return on investment. Thus, the profitability of the Project can be evaluated depending upon the figure obtained. This is of particular importance in the event that the required sum of funds for the Project exceeds the financial capability on the balance sheet. If the financial internal rate of return for the Project is sufficiently high, the total sum of both principal and interest can be repaid from the net income of the project itself during the project life, even though the required funds may be too high to be financed on a normal corporate financing basis.

8-3-2 Items and premises for financial analysis

(1) Items to be analyzed

Items for analysis include operating revenues (passenger fare × number of passengers plus freightage × freight tonnage) yielded by the Project, operating expenses (maintenance, replacement, payroll, power and head office overhead costs) required by the Project and capital investments (civil work, track structure, signalling and telecommunications equipment, electric and electrification system, rolling stock, workshops and land acquisition).

(2) Premises

1) Goods and services to be required for this Project are all evaluated on the basis of the prevailing market prices. The inflation rate is set at 5% per annum over the whole period of the project life (30 years from 1984 up to 2014). Incidentally, for the decade of the 1970's the annual average rate of increase has been 5.9% for the consumer price index and 7.0% for the G.D.P. deflator.

2) New fare and tariff rates applicable to the New East-West Line and the West Coast Line to be newly opened to traffic have been determined as follows in accordance with the existing rate system:

New fare rate

Passenger traffic:	Super express	£5.94/person-km
	Express	£4.95/person-km
	Local	£3.70/person-km

Freight traffic : Through/local ¢6.30/tonne-km

(Present fare rate (1981)
Express Rakyat (Air cond.) ¢4.95/person-km
Ordinary third class ¢3.70/person-km
Freight (Average in all 19 items) ¢5.30/tonne-km)

Basically, the new fare and tariff rate would not affect the existing tariff structure of railway and other competitive modes. The only one revision is that the new super express rate has been determined by an increase of 20%, higher than the existing rate for the Express Rakyat (air-conditioned) in view of its considerable time saving benefits and amenities. In respect of the freightage, the new tariff rate at average of total 19 items has been determined at an increase of 18.9% over the present level because of the varied composition of cargo items.

It is also assumed that the net decrease in the real value of the fare and tariff rate in proportion to inflation could be compensated by the fare and tariff increase.

3) The sums of capital investments may be variable though basically are the same as referred to in Chapter 7, depending upon the conditions that: salvage values are added up at the end of the project life for each item of facilities, rolling stock and acquired land in accordance with the depreciation years as stated in 8-2-4; that the sum of re-investment is estimated for a period of 2007 to 2009 because the depreciation period for the signalling and telecommunication system covers the period of 20 years; that the cost of acquired land can be offset by the disposal of the Sentul Workshop and Brickfields Yard because of their usability for other purposes; and that the pricing structure reflects an escalation of 5% per annum.

The construction schedule is the same as referred to in 8-2-2.

8-3-3 Results of financial analysis

(1) Financial internal rate of return

The financial internal rate of return (or the return on investment) has been

calculated as follows on the basis of the aforestated premises, operating revenues, operating expenses and capital investments as referred to previously:

Case A-A	9.4%
Case B-B	8.3%
Case C-B	8.8%
Case D-C	7.8%

Reference is made to the preceding section 8-3-2 for major assumptions for calculation (such as the setting of fare & tariff rates, inflation rate, treatment of Sentul Workshop and Brickfields Yard and project life) and for breakdowns of operating revenues and expenses and capital investments.

By reference to the figures obtained for this financial internal rate of return it is possible to determine priorities among all the alternative plans. In terms of profitability, it is suggested that Case A-A could be selected for implementation of the Project from among all the alternatives. It should be noted, however, that those calculations are based on rather bold assumptions in view of the nature of the Master Plan. Therefore, it is important to say that at the subsequent stage of feasibility analysis further details should be made, along with full review for any future changes in the given conditions, before arriving at a decision concerning execution of the project including the staging of construction.

(2) Cash flow

Further study has been made in connection with Case A-A by calculation of cash flow of a simplified pattern under the such condition that required funds would be borrowed in full amounts at 8% interest per annum with 10 years in the maturity (inclusive of 5 year grace period) and equal installment repayments.

The results of calculation are as shown in Fig. 8-3-1 and Fig. 8-3-2. In the graphic chart, the white bar shows the total sum of both construction costs (civil works, track structure, signalling and telecommunication equipment, the electric and electrification system, rolling stock, workshops, land acquisition costs and interest payments during construction) and operating

expenses (maintenance, replacement, payroll, power and interest payment costs). The black bar shows operating revenues (revenues from passengers and freightage). Besides those, the vertical bar shows incomes that accrue from transfer of the Sentul Workshop and Brickfields Yard to other uses.

From the Chart, it can be noted that there would be cumulative increases of outstandings since the sum of the expenditure items (such as rolling stock purchases, re-investment for telecommunications system and operating expenses) would exceed the sum of the revenue items from the starting year of business in 1990 to 2003. Therefore, every effort must be made to lead the cash flow into the preferable direction by taking the following measures:

1) To try to enlarge the fund portion of equity and subsidies without any accrual of interest to be paid or any repayment.

2) To increase the share of loan funds, at low interest rates, such as soft loans.

3) To try to keep the railway fare and tariff rate at a fair and proper level as viewed in the framework of the nation's traffic policy.

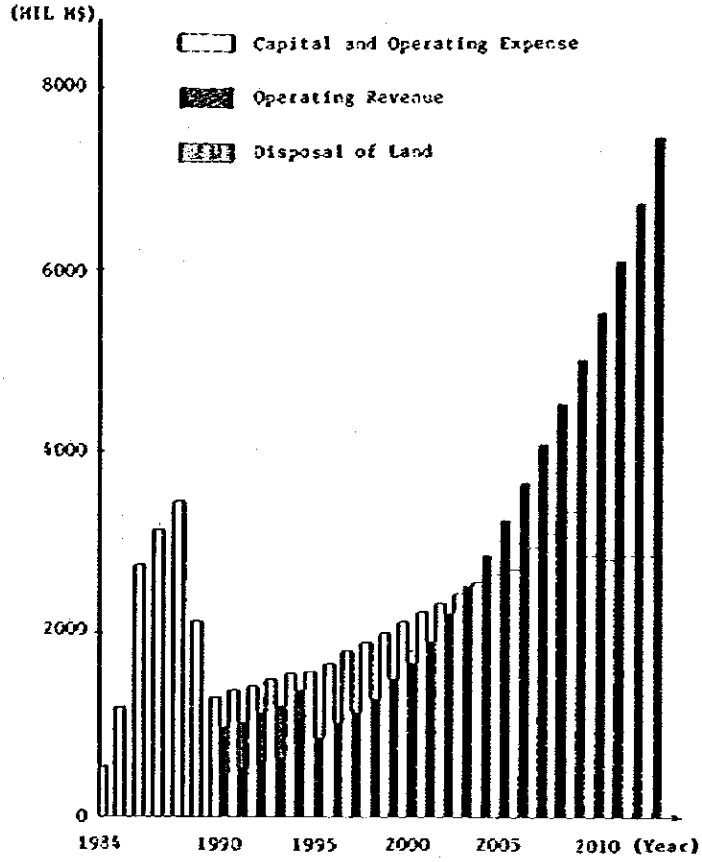


Fig. 8-3-1 Cash Flow

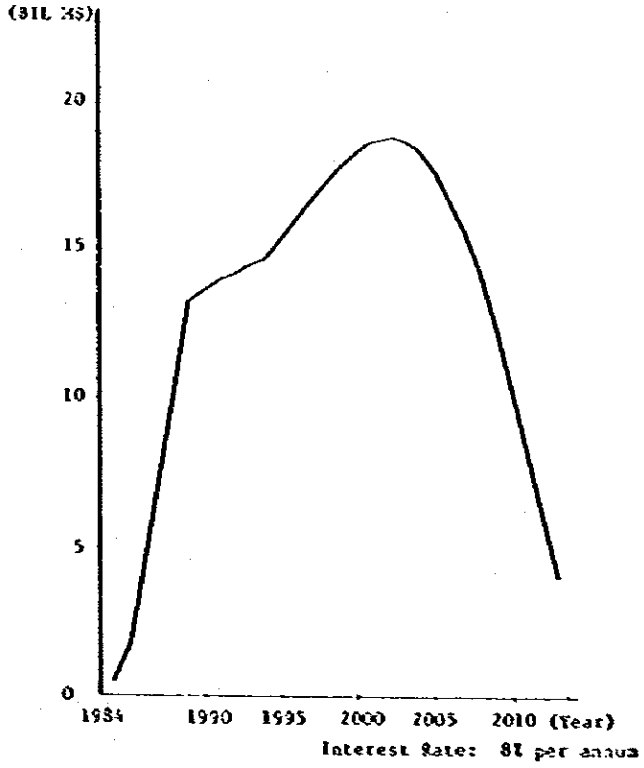


Fig. 8-3-2 Outstandings

8-4 Sensitivity Analysis

Analysis has been made to see possible changes in the viability of this Project by varying the traffic demand used for both economic and financial analyses in the Base Case.

As stated in Chapter 5, traffic demand forecast for passengers and freight is based upon various premises. Therefore, there may be a considerable degree of uncertainty in the results of forecast as to whether or not those conditions as premises can in fact be achieved or, in other words, whether or not the results of forecast thus obtained can be achieved as anticipated.

Case A-A has thus been taken up for calculation, as shown in Fig. 8-4-1, to see how much influence would be exerted upon the values of both E.I.R.R. and F.I.R.R. from the possible degree of achievement, by percentage, in the demand forecast under the Base Case.

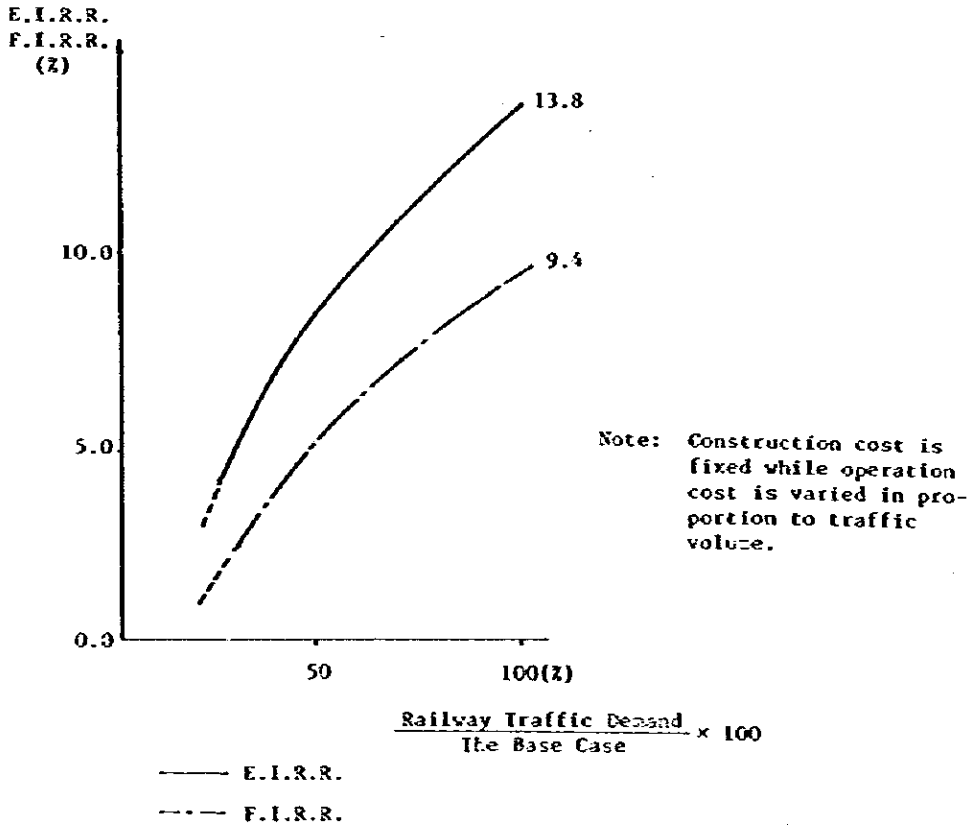


Fig. 8-4-1 Relationship between Traffic Demand and E.I.R.R./F.I.R.R. (Case A-A)

CHAPTER 9.
STRATEGIES FOR RAILWAY DEVELOPMENT

CHAPTER 9 STRATEGIES FOR RAILWAY DEVELOPMENT

9-1 Selection of the Master Plan

(1) As discussed in detail in the previous chapters, four (4) scenarios that combine four (4) alternative plans for development of the West Coast Line and three (3) plans for the East Coast Line have been developed to formulate the Master Plan for railway development on the Peninsula Malaysia up to the target year 2005. Comparative study of these four (4) scenarios has been undertaken including forecast of traffic demand, estimation of construction costs and economic and financial analysis.

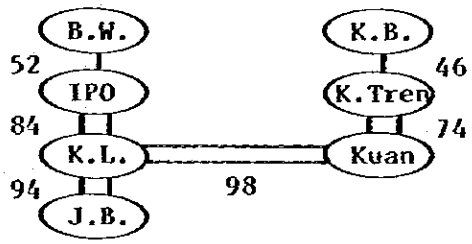
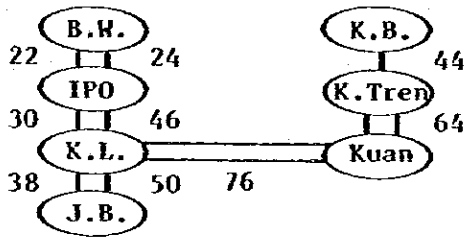
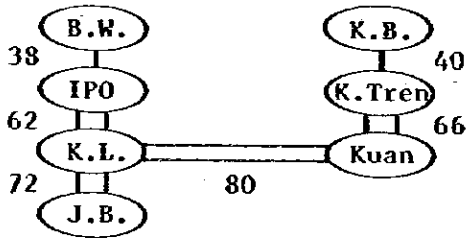
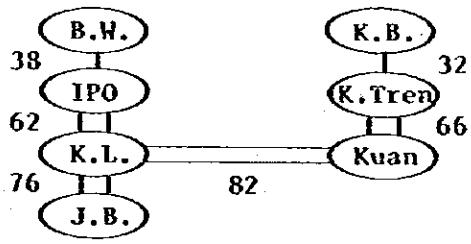
	West Coast Line	New East-West Line
Case A-A	Standard Gauge Electrification Double track	Standard Gauge Electrification Double track
Case B-B	Meter Gauge (Conventional Line) Standard Gauge (New Line) Electrification Single or double track	Standard Gauge Electrification Single or double track
Case C-B	Meter Gauge Electrification Single or double track	Standard Gauge Electrification Single or double track
Case D-C	Meter Gauge Electrification Single or double track	Meter Gauge Electrification Single or double track

The results of the analysis of each of the four (4) scenarios are shown below in Table 9-1-1.

Although Case A-A was originally planned to include double tracking of the entire line, please note that this case was revised after the final traffic demand forecast to have some areas single tracked in 2005.

Table 9-1-1 Summary of Analysis of Four Master Plan Scenarios

	Traffic volume (2005 A.D)	Estimated cost (1981 A.D)
Case A-A	Passenger 13,018 million passenger-km Freight 5,238 million ton-km	Construction 11,589 million M$ Maintenance & operation 354 million M$/year
Case B-B	Passenger 12,718 million passenger-km Freight 3,255 million ton-km	Construction 11,572 million M$ Maintenance & operation 327 million M$/year
Case C-B	Passenger 10,594 million passenger-km Freight 3,534 million ton-km	Construction 9,959 million M$ Maintenance & operation 290 million M$/year
Case D-C	Passenger 8,038 million passenger-km Freight 4,234 million ton-km	Construction 9,230 million M$ Maintenance & operation 264 million M$/year

	Internal rate of return	Skeleton of lines & number of trains (both directions) per day (2005 A.D) Standard Gauge Mater Gauge
	E.I.R.R. 13.8% F.I.R.R. 9.4%	
	E.I.R.R. 12.6% F.I.R.R. 8.3%	
	E.I.R.R. 11.5% F.I.R.R. 8.8%	
	E.I.R.R. 12.9% F.I.R.R. 7.8%	

Note: Assumed as GDP growth rates are 7.9%/year until 1990 and 6.5%/year in 1991-2005.

(2) The summary given in Table 9-1-1 shows that Case A-A would be the most effective scenario for railway development up to the target year 2005. In other words, Case A-A could be selected for the Master Plan on the basis of evaluations given certain socio-economic conditions.

(3) It should be noted, however, that all the alternative scenarios are in danger of becoming infeasible should certain significant changes occur to the previous for the traffic demand forecast. This is explained in Chapter 8, Section 4.

(4) The work for this study, which examines an extensive project that effects development on the whole of Peninsular Malaysia, had to be completed within a tight time frame, using only pre-existing data for analyses. Furthermore, the study does not reflect in the least the fundamental effects to the world economy caused by the Counter Oil crisis that occurred in the midst of the Study in autumn 1982.

(5) Due to the inaccuracy of available maps and the absence of a geological survey by the study team, technically speaking, it is highly probable that the swampy zone along the east coast may pose considerable difficulties in the construction of the high speed railway track. Moreover, the geological conditions between Kuala Lumpur and Temeloh may affect construction costs considerably.

(6) Especially with regard to the construction of the New East-West Line, the present traffic volume in the eastern region is extremely limited. Even though the railway construction project is being proposed as part of a strategy to promote regional development in that area, the construction of the railway should be undertaken only after full review of the status of regional development.

(7) All these things considered, it is recommended that thorough study be made for each stage of execution of the project for any of the alternative cases.

9-2 Measures for Implementation

9-2-1 Stage by stage implementation

Since this is a large scale project requiring huge investment in excess of M$10 billion, it is highly desirable that the project be executed on a step-by-step basis to the extent possible.

(1) In the case a plan is adopted for construction of an entirely new railway system, utilization value may be reduced unless the track line is completed for a relatively long section all at once. This differs considerably from road construction, where sections as short as 100 m can effectively be put to use immediately.

(2) A double tracked railway system is planned in accordance with the vision of development in 2005 of the Master Plan. In the actual execution of the project, however, the railway system could initially be constructed with single tracking and then later converted to a double track system as traffic demand increases. In this instance, the project should be designed to enable easy conversion to a double track system at any time in the future.

(3) It would also be possible to start development with a non-electrified system that would be electrified at a later date. In this case, complete study should be undertaken to minimize the number of necessary locomotives until the conversion date.

(4) In particular, if construction of the New East-West Line is begun prior to construction of the West Coast Line, it would be possible to operate trains on a meter gauge track for the time being and to convert from meter gauge to standard gauge at a future date. In this case, the Plan should include provisions for easy conversion of facilities and rolling stock originally designed for meter gauge.

This is a previous instance in Japan when a private railway company (the Kinki Nippon Railway) made an effective conversion of gauge within a short period of time. This requires extensive preliminary study of the technical aspects of conversion.

(5) Careful study is also required in regard to the start of the construction. Since a minimum construction period of five (5) years may be required to complete one section, it is advisable to execute construction sequentially so that both traffic demand and facility capacity is well-balanced every five (5) years ahead. If completion is much earlier than it should be, the efficiency would fall because of low demand; if it is instead late, demand would flow into other means of transport as railway facilities could not accept such existing demand.

9-2-2 Personnel training

(1) The Master Plan forecasts that passenger traffice will increase about ten (10) times and freight traffic about five (5) times by the year 2005, but the total number of the MRA's personnel are to increase only about 30% due to improved operating efficiency. Accordingly, the maintenance system for both facilities and rolling stock should be improved to allow for manpower saving as much as possible.

(2) Therefore, in order to operate the new high-speed railway system, it is necessary either to train personnel to raise their technical capabilities or to recruit such a qualified staff.

In the case of track maintenance, for instance, as a minimum the maintenance crews must learn the skills and team play for the automatic inspection by track inspection car and the subsequent maintenance, and the skills for the maintenance operation handling the multiple tie tamper. In the field of maintenance of electrical installations, it is absolutely essential that the technical staff become skilled in the necessary maintenance for substations and trolley lines and for electronic equipment such as ATS, CTC, optical fiber communications and radio systems. For rolling stock, there is no way to avoid the necessity of becoming completely familiar with the maintenance and operation of electric locomotives.

(3) Since a considerably long period is needed for the training of personnel with these qualifications, a training programme should be formulated as early as possible so that they can be educated in a suitable sequence.

9-2-3 Financing and governmental subsidies

The financing the large expenditures necessitated by this project may, as stated above, be a drag on the railway management and, in turn, the national economy.

Generally speaking, in many countries an independent accounting system integrating all phases of construction, operation and maintenance is adopted as the fundamental system of management. In most of these countries, however, the management of railway is in deficit and is therefore compensated by each government with large subsidies.

Some new experiments are being taken with respect to railway construction. Like bus or airline businesses that utilize expressways or airports by paying fees or dues, the construction and operation of rialways could similarly be considered separately. This is exactly the case in Japan where the Japan Railway Construction Corporation is responsible for the new railway construction while the Japanese National Railways operates the railway system after completion of construction. There are also many instances where the financing for construction funds can be helped largely be governmental outlays such as subsidies for interest or construction.

In this project, some governmental assistance such as governmental guarantees for borrowing, and subsidies for interest or construction should be taken up.

9-2-4 Diversification of business and efficiency improvement

In order to operate the railway service most efficiently, it is worthy to study the possibility that the MRA manages related businesses, such as truck transport of cargo from the station to factories owned and operated by consigners and the lease of cargo containers to consigners. In Japan, while the Japanese National Railways has been limited by law until very recently managing solely to the management of railway business only, a number of private railway companies have enjoyed considerable success for many years by undertaking various associated business services.

Although further details must be referred to future studies, some successful examples of related businesses that have been managed by private railway companies are given below.

Complete further study would be necessary to determine which if any of these should be undertaken by MRA. There may be other businesses not cited here that should be included:

1) Transport businesses utilizing bus, taxi, truck or plane
2) Real estate management including residential land and office buildings
3) Civil and building construction
4) Manufacturing of rolling stock
5) Shopping centers, department stores and supermarkets
6) Restaurants and catering both on railroad and off
7) Recreational business including hotels, golf courses and movie theaters
8) Cultural and welfare businesses including schools, hospitals and museums

APPENDIX

APPENDIX (A)

O-D Table of the Railway Freight Traffic between Zones (Case A-A, 2005)

(Unit: 1,000 tons/year)

O \ D		1	2	3	4	5	6	7	9	8	TOTAL
1	KEDAH/PERLIS (ALOR STAR)	0	247.4	31.9	93.9	22.7	163.0	80.3	12.4	10.8	662.4
2	PENANG (BUTTERWORTH)	122.5	0	62.4	28.3	8.8	104.5	81.2	6.7	2.1	416.5
3	PERAK (IPOH)	34.1	152.2	0	302.0	52.6	250.5	128.4	1.2	11.0	932.0
4	SELANGOR/ FED. TERRITORY (KUALA LUMPUR)	117.9	214.4	167.8	0	175.7	556.0	353.9	180.8	126.0	1,892.5
5	N.SEMBILAN/ MALACCA (SEREMBAN)	131.6	195.4	121.2	277.4	0	395.6	183.0	416.8	189.3	1,910.3
6	JOHOR (JOHOR BAHRU)	183.7	183.3	228.5	325.7	68.1	0	34.8	66.7	118.0	1,208.8
7	PAHANG (KUANTAN)	254.6	893.2	189.2	592.6	74.0	87.7	0	25.3	40.5	2,157.1
9	TRENGGANU (KUALA TRENGGANU)	87.5	118.1	242.0	1,109.9	249.6	263.4	377.3	0	74.2	2,522.0
8	KELANTAN (KOTA BHARU)	14.5	21.3	15.7	186.4	35.1	139.6	127.2	21.4	0	561.2
TOTAL		946.4	2,025.3	1,058.7	2,916.2	686.6	1,960.3	1,366.1	731.3	571.9	12,262.8

O-D Table of the Railway Freight Traffic between Zones (Case B-B, 2005)

(Unit: 1,000 tons/year)

O \ D		1	2	3	4	5	6	7	9	8	TOTAL
1	KEDAH/PERLIS (ALOR STAR)	0	168.8	51.4	117.8	22.8	158.2	72.5	9.8	9.3	610.6
2	PENANG (BUTTERWORTH)	81.0	0	43.0	21.7	3.7	43.9	23.4	0.4	0.2	217.3
3	PERAK (IPOH)	54.5	110.3	0	242.1	38.1	156.2	72.6	20.9	5.6	700.3
4	SELANGOR/ FED.TERRITORY (KUALA LUMPUR)	142.8	180.4	126.1	0	146.6	384.2	333.3	226.4	139.4	1,679.2
5	N.SEMBILAN/ MALACCA (SEREMBAN)	84.0	185.7	83.7	230.3	0	266.1	19.6	7.4	3.8	880.6
6	JOHOR (JOHOR BAHRU)	117.9	266.8	180.8	198.6	62.7	0	12.0	17.9	28.4	885.1
7	PAHANG (KUANTAN)	59.1	60.7	54.5	602.2	29.6	32.5	0	43.4	69.8	951.8
9	TRENGGANU (KUALA TRENGGANU)	24.4	34.7	60.6	849.1	113.3	144.3	375.0	0	75.5	1,676.9
8	KELANTAN (KOTA BHARU)	5.3	18.6	8.1	194.3	21.2	94.2	130.1	16.5	0	488.3
TOTAL		569.0	1,026.0	608.2	2,456.1	438.0	1,279.6	1,038.5	342.7	332.0	8,090.1

O-D Table of the Railway Freight Traffic between Zones (Case C-B, 2005)

(Unit: 1,000 tons/year)

O \ D		1	2	3	4	5	6	7	9	8	TOTAL
1	KEDAH/PERLIS (ALOR STAR)	0	180.2	63.1	139.2	27.3	171.7	76.7	10.4	10.7	679.3
2	PENANG (BUTTERWORTH)	87.2	0	52.2	32.7	5.4	58.3	25.3	0.5	0.2	261.8
3	PERAK (IPOH)	67.8	130.0	0	269.7	44.8	178.1	76.5	19.8	6.0	792.7
4	SELANGOR/ FED.TERRITORY (KUALA LUMPUR)	178.3	226.9	147.4	0	162.1	441.7	331.7	123.5	85.7	1,697.3
5	N.SEMBILAN/ MALACCA (SEREMBAN)	121.9	218.9	105.8	248.1	0	275.4	27.3	12.1	7.1	1,016.6
6	JOHOR (JOHOR BAHRU)	174.0	253.8	229.2	251.1	70.5	0	15.9	18.9	31.6	1,045.0
7	PAHANG (KUANTAN)	62.6	65.1	57.5	658.0	37.4	44.1	0	28.8	43.3	996.8
9	TRENGGANU (KUALA TRENGGANU)	30.7	40.8	64.4	998.3	130.3	194.3	377.6	0	74.1	1,910.5
8	KELANTAN (KOTA BHARU)	6.2	20.5	8.1	200.5	24.2	114.4	126.6	20.3	0	520.8
TOTAL		728.7	1,136.2	727.7	2,797.6	502.0	1,478.0	1,057.6	234.3	258.7	8,920.8

O-D Table of the Railway Freight Traffic between Zones (Case D-C, 2005)

(Unit: 1,000 tons/year)

O \ D		1	2	3	4	5	6	7	9	8	TOTAL
1	KEDAH/PERLIS (ALOR STAR)	0	180.1	62.9	139.1	27.2	172.6	82.5	11.4	11.5	687.3
2	PENANG (BUTTERWORTH)	87.5	0	52.7	22.1	6.7	45.7	30.5	4.0	0.5	249.7
3	PERAK (IPOH)	67.5	129.8	0	269.7	44.5	179.0	88.2	21.5	6.3	806.5
4	SELANGOR/ FED.TERRITORY (KUALA LUMPUR)	174.6	231.5	146.3	0	162.1	450.4	322.7	159.4	90.2	1,737.2
5	N.SEMBILAN/ MALACCA (SEREMBAN)	127.4	267.9	112.0	247.7	0	341.4	135.5	436.3	107.8	1,776.0
6	JOHOR (JOHOR BAHRU)	95.8	164.9	102.5	346.2	53.4	0	26.2	35.4	52.9	877.3
7	PAHANG (KUANTAN)	217.7	254.5	146.9	552.2	62.0	79.7	0	29.5	49.7	1,392.2
9	TRENGGANU (KUALA TRENGGANU)	54.4	116.6	142.3	884.8	205.5	230.5	358.6	0	70.5	2,063.2
8	KELANTAN (KOTA BHARU)	7.6	22.5	9.5	160.8	28.2	132.5	112.3	18.8	0	492.2
TOTAL		832.5	1,367.8	775.1	2,622.6	589.6	1,631.8	1,156.5	716.3	389.4	10,081.6

O-D Table of the Railway Passenger Traffic between Zones (Case A-A & B-B, 2005)

(Unit: 1,000 persons/year)

O \ D		12	1	2	3	4	5	6	11	7	9	8
12	THAILAND											
1	KEDAH/PERLIS (ALOR STAR)	248										
2	PENANG (BUTTERWORTH)	76	418									
3	PERAK (IPOH)	1	112	484								
4	SELANGOR/FED. TERRITORY (KUALA LUMPUR)	11	353	864	1,981							
5	N.SEMBILAN/MALACCA (SEREMBAN)	0	9	19	36	305						
6	JOHOR (JOHOR BAHRU)	0	22	34	54	461	11					
11	SINGAPORE	11	126	166	317	2,424	77	152				
7	PAHANG (KUANTAN)	0	46	84	145	1,598	36	25	171			
9	TRENGGANU (KUALA TRENGGANU)	0	27	35	92	1,225	23	42	236	942		
8	KELANTAN (KOTA BHARU)	0	6	13	35	873	17	43	251	464	1,043	
TOTAL		347	1,367	2,193	3,257	10,095	533	844	3,931	3,511	3,665	2,745

O-D Table of the Railway Passenger Traffic between Zones (Case C-8, 2005)

(Unit: 1,000 persons/year)

O \ D		12	1	2	3	4	5	6	11	7	9	8
12	THAILAND											
1	KEDAH/PERLIS (ALOR STAR)	248										
2	PENANG (BUTTERWORTH)	76	418									
3	PERAK (IPOH)	1	93	312								
4	SELANGOR/FED. TERRITORY (KUALA LUMPUR)	11	244	511	1,245							
5	N.SEMBILAN/MALACCA (SEREMBAN)	0	6	10	16	158						
6	JOHOR (JOHOR BAHRU)	0	15	21	31	258	6					
11	SINGAPORE	11	84	97	185	1,530	48	118				
7	PAHANG (KUANTAN)	0	40	65	116	1,598	34	18	107			
9	TRENGGANU (KUALA TRENGGANU)	0	22	25	77	1,225	21	30	172	942		
8	KELANTAN (KOTA BHARU)	0	5	11	29	873	15	36	204	464	1,043	
TOTAL		347	1,175	1,546	2,105	7,653	314	533	2,556	3,384	3,557	2,680

O-D Table of the Railway Passenger Traffic between Zones (Case D-C, 2005)

(Unit: 1,000 persons/year)

O \ D		12	1	2	3	4	5	6	11	7	9	8
12	THAILAND											
1	KEDAH/PERLIS (ALOR STAR)	248										
2	PENANG (BUTERWORTH)	76	418									
3	PERAK (IPOH)	1	57	141								
4	SELANGOR/FED. TERRITORY (KUALA LUMPUR)	11	175	350	1,245							
5	N. SEMBILAN/MALACCA (SEREMBAN)	0	4	7	16	158						
6	JOHOR (JOHOR BAHRU)	0	12	18	31	258	6					
11	SINGAPORE	11	74	82	185	1,530	48	118				
7	PAHANG (KUANTAN)	0	26	46	94	1,305	25	14	81			
9	TRENGGANU (KUALA TRENGGANU)	0	13	15	54	924	17	23	132	732		
8	KELANTAN (KOTA BHARU)	0	3	8	18	563	10	26	155	379	749	
TOTAL		347	1,030	1,161	1,842	6,519	291	506	2,416	2,702	2,659	1,911

APPENDIX (B)

Case A-A

MALAYSIA RAILWAY DEVELOPMENT

CASE A-A EIRR : 13.0%

(MIL. M$) PAGE 1 /PART 1

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
BENEFIT													
TIME SAVING							99	112	128	145	165	187	218
COST SAVING							583	641	701	768	847	931	1043
(RAILWAY)							-32	-34	-41	-49	-52	-59	-67
MAINT.& REPLACE.							-20	-21	-23	-25	-26	-28	-30
PERSONNEL							12	13	12	9	10	9	7
FUEL							-24	-26	-30	-33	-36	-40	-44
(ROAD,SEA,AIR)							615	675	742	816	899	991	1109
INVESTMENT													
INVESTMENT DIF.	530	1041	2270	2311	2285	684	-1819	30	29	30	8	29	26
(RAILWAY)	530	1041	2270	2311	2285	994	-1793	58	63	67	72	77	82
CIVIL WORK	164	493	1113	1918	1400	268							
SIGNAL & TELE.			91	138	286	23							
ELECT.P.& ELECTRIF.			150	225	337	38							
ROLLING STOCK					264	618	55	58	63	67	72	77	82
WORKSHOP				30	78	47							
LAND	366	548	914				-1848						
SALVAGE VALUE													
(ROAD,SEA,AIR)						309	26	28	34	37	64	49	56
NET FLOW	-530	-1041	-2270	-2311	-2285	-684	2301	723	799	883	1004	1091	1235

Case A-A

MALAYSIA RAILWAY DEVELOPMENT

CASE A-A EIRR : 13.8% (MIL. M$) PAGE 1 /PART 2

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
BENEFIT													
TIME SAVING	243	276	314	358	408	465	529	603	688	756	829	908	993
COST SAVING	1133	1250	1385	1533	1701	1884	2094	2328	2595	2807	3029	3271	3533
(RAILWAY)	-74	-85	-93	-104	-115	-131	-145	-164	-179	-191	-209	-225	-237
MAINT.& REPLACE.	-32	-34	-35	-38	-41	-43	-46	-49	-52	-54	-56	-56	-58
PERSONNEL	6	2		-2	-5	-12	-15	-24	-28	-29	-34	-37	-37
FUEL	-48	-53	-58	-64	-69	-76	-84	-91	-99	-108	-119	-130	-142
(ROAD,SEA,AIR)	1207	1335	1478	1637	1816	2015	2240	2492	2774	2998	3238	3495	3770
INVESTMENT													
INVESTMENT DIF.	28	23	-3	15	10	-1	-15	-80	26	34	106	151	164
(RAILWAY)	88	94	100	107	115	123	132	141	151	161	244	290	375
CIVIL WORK													
SIGNAL & TELE.											71	105	177
ELECT.P.& ELECTRIF.													
ROLLING STOCK	88	94	100	107	115	123	132	141	151	161	173	185	198
WORKSHOP													
LAND													
SALVAGE VALUE													
(ROAD,SEA,AIR)	60	71	103	92	105	124	147	221	125	127	138	139	210
NET FLOW	1347	1503	1702	1876	2099	2350	2630	3011	3257	3529	3753	4028	4362

Case A-A

MALAYSIA RAILWAY DEVELOPMENT

(MIL. M$) PAGE 1 /PART 3

CASE A-A EIRR : 13.8%

	2010	2011	2012	2013	2014
BENEFIT					
TIME SAVING	1084	1182	1286	1398	1518
COST SAVING	3810	4107	4427	4773	5142
(RAILWAY)	-255	-276	-296	-317	-343
MAINT.& REPLACE.	-61	-62	-64	-66	-68
PERSONNEL	-39	-45	-47	-49	-56
FUEL	-155	-169	-185	-202	-219
(ROAD,SEA,AIR)	4065	4382	4723	5090	5486
INVESTMENT					
INVESTMENT DIF.	57	63	77	84	-3347
(RAILWAY)	212	227	242	259	-3660
CIVIL WORK					
SIGNAL & TELE.					
ELECT.F.& ELECTRIF.					
ROLLING STOCK	212	227	242	259	
WORKSHOP					
LAND					
SALVAGE VALUE					3660
(ROAD,SEA,AIR)	155	164	165	175	-313
NET FLOW	4837	5226	5636	6087	10008

Case B-B

MALAYSIA RAILWAY DEVELOPMENT

CASE B-B EIRR : 12.6%

(MIL. M$) PAGE 1 /PART 1

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
BENEFIT													
TIME SAVING							96	109	124	141	160	181	206
COST SAVING							330	392	452	518	597	683	782
(RAILWAY)							-20	-22	-26	-33	-35	-42	-48
MAINT. & REPLACE.							-22	-23	-25	-28	-29	-31	-33
PERSONNEL							17	18	19	17	18	17	16
FUEL							-15	-17	-20	-22	-24	-28	-31
(ROAD,SEA,AIR)							350	414	478	551	632	725	830
INVESTMENT													
INVESTMENT DIF.	529	1021	2632	2502	2078	576	-1824	23	19	21	-10	19	16
(RAILWAY)	529	1021	2632	2502	2078	856	-1805	46	49	53	57	61	66
CIVIL WORK	151	454	1439	2102	1249	284							
SIGNAL & TELE.			91	138	206	23							
ELECT.P.& ELECTRIF.			157	237	355	39							
ROLLING STOCK					201	469	43	46	49	53	57	61	66
WORKSHOP				25	66	40							
LAND	378	567	945				-1848						
SALVAGE VALUE													
(ROAD,SEA,AIR)						280	19	23	30	32	67	42	50
NET FLOW	-529	-1021	-2632	-2502	-2078	-576	2259	479	558	637	766	845	972

Case B-B

MALAYSIA RAILWAY DEVELOPMENT

(MIL. M$) PAGE 1 /PART 2

CASE B-B EIRR : 12.6%

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
BENEFIT													
TIME SAVING	235	267	304	346	394	449	512	584	667	733	804	880	962
COST SAVING	894	1019	1165	1328	1514	1718	1958	2225	2531	2786	3060	3363	3695
(RAILWAY)	-54	-63	-69	-77	-86	-102	-110	-126	-139	-149	-163	-173	-182
MAINT. & REPLACE.	-35	-37	-39	-42	-44	-48	-51	-53	-56	-58	-60	-60	-63
PERSONNEL	15	12	12	11	9	2	3	-5	-8	-9	-12	-13	-10
FUEL	-34	-38	-42	-46	-51	-56	-62	-68	-75	-82	-91	-100	-109
(ROAD,SEA,AIR)	948	1082	1234	1406	1600	1820	2069	2351	2671	2935	3223	3536	3877
INVESTMENT													
INVESTMENT DIF.	17	11	-25	1	-6	-17	-31	-109	8	17	96	129	92
(RAILWAY)	71	76	81	88	95	101	109	117	126	135	215	260	342
CIVIL WORK											69	104	174
SIGNAL & TELE.													
ELECT.P.& ELECTRIF.													
ROLLING STOCK	71	76	81	88	95	101	109	117	126	135	146	156	168
WORKSHOP													
LAND													
SALVAGE VALUE													
(ROAD,SEA,AIR)	54	65	106	87	101	118	140	226	118	118	129	131	250
NET FLOW	1111	1275	1494	1673	1914	2184	2502	2918	3189	3502	3778	4114	4566

Case B-B

MALAYSIA RAILWAY DEVELOPMENT

(MIL. M$) PAGE 1 /PART 3

CASE B-B EIRR : 12.6%

	2010	2011	2012	2013	2014
BENEFIT					
TIME SAVING	1050	1145	1246	1355	1471
COST SAVING	4054	4443	4872	5348	5861
(RAILWAY)	-196	-213	-229	-240	-261
MAINT. & REPLACE.	-65	-67	-69	-71	-73
PERSONNEL	-11	-15	-16	-12	-17
FUEL	-120	-131	-144	-157	-171
(ROAD,SEA,AIR)	4249	4656	5101	5588	6123
INVESTMENT					
INVESTMENT DIF.	34	42	53	61	-2806
(RAILWAY)	181	195	208	225	-3134
CIVIL WORK					
SIGNAL & TELE.					
ELECT.P.& ELECTRIF.					
ROLLING STOCK	181	195	208	225	
WORKSHOP					
LAND					
SALVAGE VALUE					3134
(ROAD,SEA,AIR)	147	153	155	164	-328
NET FLOW	5070	5546	6066	6642	10138

Case C-B

MALAYSIA RAILWAY DEVELOPMENT

(MIL. M$) PAGE 1 /PART 1

CASE C-B EIRR : 11.5%

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
BENEFIT													
TIME SAVING							84	95	108	122	138	157	177
COST SAVING							207	239	277	318	371	427	493
(RAILWAY)							-6	-7	-10	-16	-17	-23	-26
MAINT. & REPLACE.							-16	-17	-18	-21	-21	-23	-25
PERSONNEL							19	20	21	19	20	19	20
FUEL							-9	-10	-13	-14	-16	-19	-21
(ROAD,SEA,AIR)							214	246	288	335	389	450	519
INVESTMENT													
INVESTMENT DIF.	458	900	1972	2021	1979	555	-1822	26	32	33	-9	22	16
(RAILWAY)	458	900	1972	2021	1979	806	-1804	47	51	54	58	63	67
CIVIL WORK	144	430	971	1672	1220	234							
SIGNAL & TELE.			85	126	191	22							
ELECT.P.& ELECTRIF.			132	197	298	34							
ROLLING STOCK					205	477	44	47	51	54	58	63	67
WORKSHOP				25	66	40							
LAND	314	470	784				-1848						
SALVAGE VALUE													
(ROAD,SEA,AIR)						252	18	21	39	31	67	41	51
NET FLOW	-458	-900	-1972	-2021	-1979	-555	2113	308	364	417	518	562	654

Case C-8

MALAYSIA RAILWAY DEVELOPMENT

(MIL. M$) PAGE 1 /PART 2

CASE C-8 EIRR : 11.5%

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
BENEFIT													
TIME SAVING	201	229	260	295	336	382	435	496	564	620	680	744	813
COST SAVING	566	649	747	857	984	1125	1291	1474	1693	1864	2050	2250	2472
(RAILWAY)	-33	-40	-45	-52	-59	-70	-77	-92	-99	-107	-114	-124	-131
MAINT. & REPLACE.	-27	-29	-30	-32	-34	-37	-40	-42	-44	-46	-47	-47	-49
PERSONNEL	17	16	15	13	11	7	0					-3	
FUEL	-23	-27	-30	-33	-36	-40	-45	-50	-55	-61	-67	-74	-82
(ROAD,SEA,AIR)	599	690	792	909	1043	1195	1368	1566	1792	1971	2164	2374	2603
INVESTMENT													
INVESTMENT DIF.	18	0	-30	-6	-18	-30	-53	-144	15	28	90	136	85
(RAILWAY)	72	78	84	90	96	104	112	120	129	139	213	257	335
CIVIL WORK											64	97	162
SIGNAL & TELE.													
ELECT.P.& ELECTRIF.													
ROLLING STOCK	72	78	84	90	96	104	112	120	129	139	149	160	173
WORKSHOP													
LAND													
SALVAGE VALUE													
(ROAD,SEA,AIR)	54	70	114	96	114	134	165	264	114	111	123	121	250
NET FLOW	749	870	1036	1159	1339	1537	1779	2114	2243	2456	2640	2858	3200

Case C-B

MALAYSIA RAILWAY DEVELOPMENT

CASE C-B EIRR : 11.5%

(MIL. M$) PAGE 1 /PART 3

	2010	2011	2012	2013	2014
BENEFIT					
TIME SAVING	887	967	1052	1143	1241
COST SAVING	2712	2974	3242	3580	3923
(RAILWAY)	-141	-152	-163	-172	-180
MAINT. & REPLACE.	-51	-52	-54	-56	-57
PERSONNEL					
FUEL	-90	-100	-109	-120	-131
(ROAD,SEA,AIR)	2853	3126	3425	3751	4111
INVESTMENT					
INVESTMENT DIF.	48	57	73	83	-2775
(RAILWAY)	105	199	214	231	-3168
CIVIL WORK					
SIGNAL & TELE.					
ELECT.P.& ELECTRIF.					
ROLLING STOCK	105	199	214	231	
WORKSHOP					
LAND					
SALVAGE VALUE					3168
(ROAD,SEA,AIR)	137	142	141	148	-393
NET FLOW	3532	3884	4241	4640	7939

Case D-C

MALAYSIA RAILWAY DEVELOPMENT

CASE D-C EIRR : 12.9%

(MIL. M$) PAGE 1 /PART 1

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
BENEFIT													
TIME SAVING							24	26	28	30	33	36	39
COST SAVING							433	481	534	591	658	729	812
(RAILWAY)							3	1	-1	-6	-7	-11	-13
MAINT.& REPLACE.							-13	-14	-15	-17	-18	-19	-21
PERSONNEL							18	18	19	17	18	17	18
FUEL							-2	-3	-5	-6	-7	-9	-10
(ROAD,SEA,AIR)							430	480	535	597	665	740	825
INVESTMENT													
INVESTMENT DIF.	419	801	1849	1836	1819	547	-1825	25	25	27	-1	27	29
(RAILWAY)	419	801	1849	1836	1819	838	-1805	47	50	53	57	60	64
CIVIL WORK	117	348	886	1501	1054	205							
SIGNAL & TELE.			87	129	195	22							
ELECT.P.& ELECTRIF.			121	181	272	31							
ROLLING STOCK					232	540	43	47	50	53	57	60	64
WORKSHOP				25	66	40							
LAND	302	453	755				-1848						
SALVAGE VALUE													
(ROAD,SEA,AIR)						291	20	22	25	26	30	33	35
NET FLOW	-419	-801	-1849	-1836	-1819	-547	2281	482	537	594	691	739	821

Case D-C

MALAYSIA RAILWAY DEVELOPMENT

CASE D-C EIRR : 12.9%

(MIL. M$) PAGE 1 /PART 2

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
BENEFIT													
TIME SAVING	42	46	50	53	58	62	66	70	74	80	85	91	98
COST SAVING	900	998	1110	1234	1371	1523	1697	1885	2103	2290	2493	2711	2950
(RAILWAY)	-19	-25	-29	-35	-41	-50	-56	-68	-73	-79	-85	-93	-97
MAINT.& REPLACE.	-22	-24	-25	-27	-29	-32	-34	-36	-39	-41	-42	-42	-44
PERSONNEL	15	14	13	11	10	6	6					-3	
FUEL	-12	-15	-17	-19	-22	-24	-28	-32	-34	-38	-43	-48	-53
(ROAD,SEA,AIR)	919	1023	1139	1269	1413	1573	1753	1953	2176	2369	2578	2804	3047
INVESTMENT													
INVESTMENT DIF.	27	27	-6	22	17	8	-6	-76	-1	33	101	135	121
(RAILWAY)	68	73	77	82	88	93	99	106	113	120	194	234	310
CIVIL WORK											66	98	165
SIGNAL & TELE.													
ELECT.P.& ELECTRIF.													
ROLLING STOCK	68	73	77	82	88	93	99	106	113	120	128	136	145
WORKSHOP													
LAND													
SALVAGE VALUE													
(ROAD,SEA,AIR)	41	46	83	60	71	85	105	182	114	87	93	99	189
NET FLOW	915	1017	1166	1265	1412	1577	1769	2031	2178	2336	2478	2667	2927

Case D-C

MALAYSIA RAILWAY DEVELOPMENT

(MIL. M$) PAGE 1 /PART 3

CASE D-C EIRR : 12.9%

	2010	2011	2012	2013	2014
BENEFIT					
TIME SAVING	105	112	120	128	137
COST SAVING	3206	3485	3787	4116	4470
(RAILWAY)	-105	-112	-120	-128	-140
MAINT.& REPLACE.	-45	-46	-47	-50	-51
PERSONNEL				3	
FUEL	-60	-66	-73	-81	-89
(ROAD,SEA,AIR)	3311	3597	3907	4244	4610
INVESTMENT					
INVESTMENT DIF.	49	56	60	66	-2578
(RAILWAY)	154	164	175	186	-2886
CIVIL WORK					
SIGNAL & TELE.					
ELECT.P.& ELECTRIF.					
ROLLING STOCK	154	164	175	186	
WORKSHOP					
LAND					
SALVAGE VALUE					2886
(ROAD,SEA,AIR)	105	108	115	120	-308
NET FLOW	3262	3542	3847	4178	7185

Case A-A

MALAYSIA RAILWAY DEVELOPMENT

(MIL. M$) PAGE 1 /PART 1

CASE A-A FIRR : 9.4%

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
REVENUE & EXPENSE													
REVENUE							474	538	611	694	789	897	1034
PASSENGER							285	326	374	428	491	562	659
GOODS							189	211	237	266	298	334	375
EXPENSE							353	376	404	432	464	498	539
MAINT.& REPLACE.							64	70	77	83	91	100	109
PERSONNEL							76	83	91	99	108	118	129
FUEL							57	63	71	80	90	100	113
DEPRECIATION							156	160	164	169	174	180	187
NET INCOME							121	162	207	262	325	398	495
CAPITAL INVESTMENT													
INVESTMENT	559	1148	2615	2793	2858	1256	-429	-444	-456	-470	-482	122	136
CIVIL WORK	174	548	1293	2320	1765	352							
SIGNAL & TELECOM			105	166	259	31							
ELECT.P. & ELECTRIF.			174	271	424	49							
ROLLING STOCK					312	763	71	78	88	98	110	122	136
WORKSHOP				36	98	61							
LAND	384	600	1044				-500	-522	-544	-567	-592		
SALVAGE VALUE													
CF(ROI)	-559	-1148	-2615	-2793	-2858	-1256	706	765	827	901	981	456	547

Case A-A

MALAYSIA RAILWAY DEVELOPMENT

CASE A-A FIRR . 9.4%

(MIL. M$) PAGE 1 /PART 2

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
REVENUE & EXPENSE													
REVENUE	1161	1322	1506	1717	1958	2235	2552	2915	3332	3701	4104	4546	5030
PASSENGER	741	851	970	1125	1295	1491	1718	1980	2284	2526	2787	3069	3374
GOODS	420	471	536	592	663	744	834	935	1048	1175	1317	1477	1656
EXPENSE	580	627	679	739	801	873	952	1040	1135	1221	1317	1371	1489
MAINT.& REPLACE.	119	130	141	155	170	183	200	221	240	258	277	297	318
PERSONNEL	140	153	167	182	198	218	238	260	283	303	327	352	375
FUEL	126	141	158	178	198	224	251	281	315	343	374	409	447
DEPRECIATION	195	203	213	223	235	248	262	279	297	317	340	313	349
NET INCOME	581	695	827	978	1157	1362	1599	1875	2198	2479	2787	3175	3540
CAPITAL INVESTMENT													
INVESTMENT	152	169	188	210	235	262	294	327	366	407	652	813	1102
CIVIL WORK											197	305	535
SIGNAL & TELECOM													
ELECT.P. & ELECTRIF.													
ROLLING STOCK	152	169	188	210	235	262	294	327	366	407	456	508	567
WORKSHOP													
LAND													
SALVAGE VALUE													
CF(ROI)	623	729	852	991	1156	1347	1568	1827	2129	2390	2475	2679	2787

Case A-A

MALAYSIA RAILWAY DEVELOPMENT

(MIL. M$) PAGE 1 /PART 3

CASE A-A FIRR : 9.4%

	2010	2011	2012	2013	2014
REVENUE & EXPENSE					
REVENUE	5559	6139	6774	7470	8231
PASSENGER	3703	4058	4441	4854	5298
GOODS	1856	2081	2333	2616	2933
EXPENSE	1609	1736	1879	2033	2202
MAINT.& REPLACE.	344	368	397	424	456
PERSONNEL	403	433	465	502	537
FUEL	487	530	579	631	690
DEPRECIATION	375	406	439	477	519
NET INCOME	3950	4403	4895	5437	6029
CAPITAL INVESTMENT					
INVESTMENT	633	707	787	878	-13235
CIVIL WORK					
SIGNAL & TELECOM					
ELECT.M. & ELECTRIF.					
ROLLING STOCK	633	707	787	878	
WORKSHOP					
LAND)					
SALVAGE VALUE					13235
CF(ROI)	3692	4101	4547	5035	19783

Case B-B

MALAYSIA RAILWAY DEVELOPMENT

(MIL. M$) PAGE 1 /PART 1

CASE B-B FIRR : 8.3%

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
REVENUE & EXPENSE													
REVENUE							391	445	507	578	658	751	857
PASSENGER							274	314	360	413	474	544	625
GOODS							117	131	147	165	184	207	232
EXPENSE							329	350	374	400	429	461	497
MAINT.& REPLACE.							67	73	80	88	96	105	114
PERSONNEL							71	78	84	92	101	110	121
FUEL							45	51	57	64	72	81	91
DEPRECIATION							146	149	152	156	161	165	171
NET INCOME							62	95	133	177	230	290	360
CAPITAL INVESTMENT													
INVESTMENT	558	1125	3033	3023	2601	1087	-445	-460	-475	-490	-505	97	109
CIVIL WORK	161	504	1667	2540	1575	373							
SIGNAL & TELECOM			105	166	259	31							
ELECT.P. & ELECTRIF.			182	286	446	52							
ROLLING STOCK					230	579	55	62	69	77	87	97	109
WORKSHOP				30	83	52							
LAND	397	621	1079				-500	-522	-544	-567	-592		
SALVAGE VALUE													
CF(ROI)	-558	-1125	-3033	-3023	-2601	-1087	653	703	761	824	895	350	421

Case B-B

MALAYSIA RAILWAY DEVELOPMENT

(MIL. M$) PAGE 1 /PART 2

CASE B-B FIRR : 8.3%

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
REVENUE & EXPENSE													
REVENUE	978	1118	1278	1461	1672	1914	2193	2514	2883	3198	3543	3919	4330
PASSENGER	718	826	950	1094	1260	1453	1675	1933	2231	2468	2724	3001	3299
GOODS	260	292	327	367	412	462	518	581	651	730	819	919	1030
EXPENSE	535	577	624	676	733	800	868	946	1033	1111	1197	1249	1360
MAINT.& REPLACE.	124	135	149	163	176	194	211	230	249	268	287	308	332
PERSONNEL	131	144	156	171	186	205	223	244	266	285	308	330	352
FUEL	102	114	128	143	162	181	203	227	257	280	305	332	364
DEPRECIATION	177	184	191	200	209	220	232	246	261	278	296	280	312
NET INCOME	444	541	654	785	939	1114	1324	1567	1850	2088	2346	2670	2969
CAPITAL INVESTMENT													
INVESTMENT	123	137	152	173	194	215	243	272	305	341	576	730	1007
CIVIL WORK											191	302	526
SIGNAL & TELECOM													
ELECT.P. & ELECTRIF.													
ROLLING STOCK	123	137	152	173	194	215	243	272	305	341	384	428	481
WORKSHOP													
LAND													
SALVAGE VALUE													
CF(ROI)	498	588	693	812	954	1119	1314	1541	1805	2024	2067	2219	2274

Case B-B

MALAYSIA RAILWAY DEVELOPMENT

(MIL. M$) PAGE 1 /PART 3

CASE B-B FIRR : 8.3%

	2010	2011	2012	2013	2014
REVENUE & EXPENSE					
REVENUE	4777	5266	5798	6300	7014
PASSENGER	3622	3970	4345	4750	5186
GOODS	1155	1296	1453	1630	1828
EXPENSE	1466	1585	1712	1849	2001
MAINT.& REPLACE.	356	383	413	441	474
PERSONNEL	379	408	439	471	506
FUEL	397	433	471	515	562
DEPRECIATION	334	360	389	422	459
NET INCOME	3311	3681	4086	4530	5013
CAPITAL INVESTMENT					
INVESTMENT	541	608	676	763	-12090
CIVIL WORK					
SIGNAL & TELECOM					
ELECT.P. & ELECTRIF.					
ROLLING STOCK	541	608	676	763	
WORKSHOP					
LAND					
SALVAGE VALUE					12890
CF(ROI)	3104	3433	3799	4189	18362

Case C-B

MALAYSIA RAILWAY DEVELOPMENT

CASE C-B FIRR : 8.0% (MIL. M$) PAGE 1 /PART 1

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
REVENUE & EXPENSE													
REVENUE							357	406	462	525	597	680	774
PASSENGER							232	265	304	348	398	457	524
GOODS							125	140	158	177	199	223	250
EXPENSE							296	316	337	361	387	417	449
MAINT.& REPLACE.							59	64	70	77	84	92	101
PERSONNEL							70	77	83	91	99	109	118
FUEL							37	42	48	53	59	67	75
DEPRECIATION							130	133	137	141	145	150	155
NET INCOME							61	90	125	164	210	263	325
CAPITAL INVESTMENT													
INVESTMENT	483	993	2272	2440	2476	1021	-444	-459	-473	-489	-504	100	111
CIVIL WORK	153	478	1125	2020	1537	308							
SIGNAL & TELECOM			98	152	239	28							
ELECT.P. & ELECTRIF.			153	238	374	44							
ROLLING STOCK					243	589	57	63	71	79	88	100	111
WORKSHOP				30	83	52							
LAND	330	515	896				-500	-522	-544	-567	-592		
SALVAGE VALUE													
CF(ROI)	-483	-993	-2272	-2440	-2476	-1021	635	682	734	793	858	313	370

Case C-B

MALAYSIA RAILWAY DEVELOPMENT

(MIL. M$) PAGE 1 /PART 2

CASE C-B FIRR : 8.8%

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
REVENUE & EXPENSE													
REVENUE	882	1006	1148	1310	1497	1711	1957	2240	2566	2849	3159	3497	3868
PASSENGER	601	691	794	913	1051	1211	1396	1610	1859	2055	2268	2498	2746
GOODS	281	315	354	397	446	500	561	630	707	794	891	1000	1122
EXPENSE	485	524	567	615	665	724	788	861	935	952	1022	1063	1158
MAINT.& REPLACE.	111	121	132	143	155	171	187	204	220	237	253	272	292
PERSONNEL	130	141	154	169	184	201	218	239	259	278	298	321	344
FUEL	83	94	105	118	131	147	165	186	208	172	187	203	223
DEPRECIATION	162	168	176	185	195	206	218	232	247	265	284	267	298
NET INCOME	397	483	580	696	832	987	1170	1379	1631	1898	2137	2434	2710
CAPITAL INVESTMENT													
INVESTMENT	124	141	158	177	196	222	249	279	312	351	570	722	986
CIVIL WORK											178	282	490
SIGNAL & TELECOM													
ELECT.P. & ELECTRIF.													
ROLLING STOCK	124	141	158	177	196	222	249	279	312	351	392	439	496
WORKSHOP													
LAND													
SALVAGE VALUE													
CF(ROI)	435	510	599	704	830	971	1138	1333	1566	1811	1851	1979	2022

Case C-B

MALAYSIA RAILWAY DEVELOPMENT

(MIL. M$) PAGE 1 /PART 3

CASE C-B FIRR : 8.8%

	2010	2011	2012	2013	2014
REVENUE & EXPENSE					
REVENUE	4273	4716	5201	5731	6311
PASSENGER	3013	3302	3614	3949	4312
GOODS	1260	1414	1587	1781	1999
EXPENSE	1248	1345	1457	1575	1702
MAINT.& REPLACE.	314	337	364	390	417
PERSONNEL	371	396	426	458	492
FUEL	242	265	289	315	343
DEPRECIATION	321	348	378	412	450
NET INCOME	3025	3371	3744	4156	4609
CAPITAL INVESTMENT					
INVESTMENT	553	620	696	783	-11590
CIVIL WORK					
SIGNAL & TELECOM					
ELECT.P. & ELECTRIF.					
ROLLING STOCK	553	620	696	783	
WORKSHOP					
LAND					
SALVAGE VALUE					11590
CF(ROI)	2794	3099	3426	3785	16649

Case D-C

MALAYSIA RAILWAY DEVELOPMENT

CASE D-C FIRR : 7.8% (MIL. M$) PAGE 1 /PART 1

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
REVENUE & EXPENSE													
REVENUE							358	400	448	502	562	631	708
PASSENGER							190	215	243	275	311	353	400
GOODS							167	185	205	227	251	278	308
EXPENSE							281	300	319	341	367	392	421
MAINT.& REPLACE.							55	60	66	72	79	86	94
PERSONNEL							70	77	83	91	99	108	118
FUEL							28	32	36	41	46	51	56
DEPRECIATION							128	131	135	138	143	148	153
NET INCOME							77	100	129	161	196	239	287
CAPITAL INVESTMENT													
INVESTMENT	441	882	2130	2210	2273	1058	-445	-459	-474	-490	-505	95	106
CIVIL WORK	124	386	1027	1814	1328	269							
SIGNAL & TELECOM			100	155	244	29							
ELECT.P. & ELECTRIF.			140	216	343	40							
ROLLING STOCK					275	667	55	63	70	77	87	95	106
WORKSHOP				30	83	52							
LAND	317	496	862				-500	-522	-544	-567	-592		
SALVAGE VALUE													
CF(ROI)	-441	-882	-2130	-2210	-2273	-1058	649	690	737	789	844	291	333

Case D-C

MALAYSIA RAILWAY DEVELOPMENT

CASE D-C FIRR : 7.8%

(MIL. M$) PAGE 1 /PART 2

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
REVENUE & EXPENSE													
REVENUE	795	892	1003	1127	1268	1427	1607	1812	2043	2251	2476	2721	2988
PASSENGER	454	516	586	666	757	862	981	1119	1276	1402	1537	1682	1837
GOODS	340	377	417	462	511	566	626	693	767	849	939	1040	1151
EXPENSE	454	490	530	573	621	673	729	796	861	981	1053	1091	1187
MAINT.& REPLACE.	102	112	122	133	145	160	174	190	208	225	240	259	278
PERSONNEL	130	141	154	169	184	201	218	239	259	278	298	321	344
FUEL	64	72	81	90	102	113	127	144	157	227	248	269	295
DEPRECIATION	159	165	173	181	190	200	211	223	236	252	268	242	270
NET INCOME	340	403	473	554	647	754	878	1016	1182	1269	1423	1631	1801
CAPITAL INVESTMENT													
INVESTMENT	118	132	145	161	180	198	220	246	274	303	520	659	915
CIVIL WORK													
SIGNAL & TELECOM											183	285	499
ELECT.P. & ELECTRIF.													
ROLLING STOCK	118	132	145	161	180	198	220	246	274	303	337	374	415
WORKSHOP													
LAND													
SALVAGE VALUE.													
CF(ROI)	381	436	501	574	656	755	869	992	1145	1218	1171	1214	1156

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