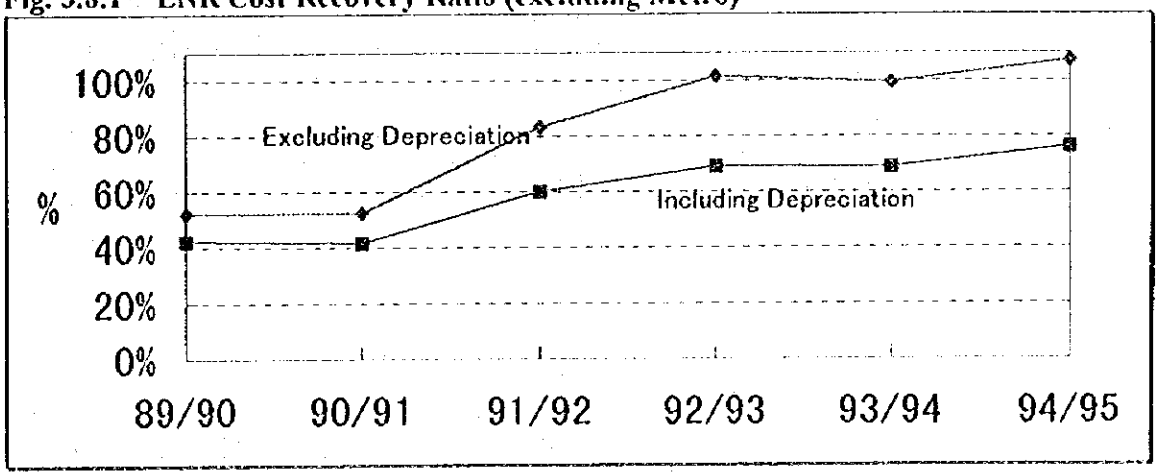
3.8 FINANCIAL STATUS

3.8.1 Financial Conditions (Excluding Metro)

One goal of this study is to achieve financial viability for ENR. To provide a good transportation service, ENR should have a solid financial base. However, the current ENR financial situation is not sufficient to achieve this purpose. Analysis of the causes of ENR's deficit is carried out from a financial analysis point of view.
Metro is one of division of ENR. However, Metro seems to be a very different entity compared with other divisions in ENR. Therefore, we think it is better to analyze ENR and Metro separately.
First, ENR excluding Metro is analyzed in 3.8.1 below, then Metro is analyzed in 3.8.2.

(1) Income statement (Table 3.8.1, 3.8.2)
Table 3.8.1 shows ENR income statements for the past 7 years. ENR has suffered from a current deficit since 1975. Its cost recovery ratio (defined as revenues divided by expenses) fell sharply to 33 - 34% in the middle of 1980's. However, its current deficit excluding depreciation has been improved gradually in the 1990's. Consequently, the cost recovery ratio went up to 107% in 94/95. On the other hand, the cost recovery ratio including depreciation in 94/95 is still 76%, far below 100%. In addition, ENR has not paid interest expenses since 91/92. If interest expenses are included in the income statement in 93/94, its cost recovery ratio would be only 43%. So ENR still faces financial difficulty, especially its large capital expense burden.
ENR's financial improvement target is to eliminate its current deficit including depreciation by fiscal year 1997/1998.

Fig. 3.8.1 ENR Cost Recovery Ratio (excluding Metro)



1) Revenue structure
Revenue consists of passenger, freight, sleeping & dining, profit from share in companies, and miscellaneous. Passenger revenue accounts for 54% of total revenues. Freight revenue consists of 25% of total revenues. Other revenue is 21%. Passenger revenue is the main revenue source of ENR. Revenue has increased 16.6% annually in the past five years. Revenue growth of freight is mainly from price increases, rather than volume increases.

(a) passenger revenue (Table 3.8.3)

Passenger revenue is impacted by 2 factors: volume and price. The volume factor is represented by number of passengers and passenger-km. The price factor is represented by fare levels and class of seat.

Passenger Revenue = (Passenger-Km) x Price
Passenger-Km = (Number of Passengers) x Distance
Price = (Total revenue) ÷ (Passenger-Km)

Passenger revenue amounted to LE 332 million in 94/95. Compound annual growth rate is 16.6% in the past five years.

a) Number of passengers

The number of passengers were 718 million in 94/95. Compound annual growth rate was 4.4% in the past five years.

The number of passengers who use season tickets in 94/95 were 110 million which accounts for 15% of total passengers. However, revenue arising from season tickets is only 3.1% of total revenues.

b) Passenger-km

Passenger-km in 94/95 was 51,282 million. Compound annual growth rate was 7.2% in the past five years. Average distance (passenger-km ÷ number of passengers) amounted to 71.4 km in 94/95. The compound annual growth rate of distance was 2.6% in the past five years. Annual growth rate of passenger-km has decreased since 1992/93. For example annual growth rates of 92/93, 93/94 and 94/95 were 5.1%, 4.4% and 3.2% respectively.

c) Price

There are various types of tickets, including first class, first class (with air conditioning), second class, second class (with air conditioning), third class, season ticket (normal, kilometer).

Passenger fares were raised 10 - 15% every year in the past five years. However, compound annual passenger prices which are calculated as revenue ÷ passenger-km was up 8.8% in the past five years.

d) Revenue by class

(Table 3.8.4)

As explained above, there are various type of tickets. Third class tickets are the major source of revenue, accounting for 53% of total revenues. Conductor tickets are 25% of total revenues. Second class tickets are 13% of total revenues. First class tickets are only 6.5% of total revenues.

(b) Freight revenue

(Table 3.8.5)

Freight revenue is composed of 2 factors: volume and price. Volume is composed of number of tons and ton-km. Prices are broken down by fare and commodity.

Freight Revenue = Ton-km x Price
Ton-km = Tonnage x Distance
Price = Revenue ÷ Ton-km

Freight revenue amounted to LE 155 million in 94/95. The compound annual growth rate was 23% in the past five years. The main cause of high growth comes from the price factor as follows :

a) Number of tons

ENR hauled 12.24 millions ton in 94/95. Compound annual growth rate was only 3.3% in the past five years.

b) Ton-km

ENR hauled 4,072 million ton-km in 94/95. Its compound annual growth rate was 6% in the past five years. Distance (ton km/ton) was 333 km in 94/95. Its compound annual growth rate of distance was 2.6% in the past five years.

c) Price

The compound annual growth rate of freight price (revenue ÷ ton-km) was up 16.5% in the past five years. The average price (revenue ÷ 1000 ton-km) was LE 38 in 94/95. The prices per 1000 ton-km of iron ore, wheat, petroleum, coal & coke are LE 60, LE 52, LE 30 and LE 27 respectively.

d) Revenue by commodity

Main commodities transported by ENR are iron ore, cereals & derivatives (wheat etc.), petroleum products, coal & coke, military cargo and authority cargo. These six commodities represent 85% of total freight revenues.

2) Expense structure

Expenses are comprised of wages, material inputs, service inputs, depreciation and miscellaneous. Wages account for 36% of total expenses of ENR. Depreciation accounts for 29% of total costs of ENR. Material inputs account for 28% of total costs of ENR. Service inputs accounts for 6% of total costs of ENR. Interest costs have not been included in expenses since 91/92. Interest cost used to be the largest cost factor.

(a) Wages

The number of employees of ENR were 74,123 in June 30, 1995. There are two definitions of the number of employees of ENR. One is the actual number at work. Another is the number estimated in the budget. 90,053 employees were in the budget in fiscal year 94/95. However, the actual number of employees working were 74,123. The difference between the number working at ENR now and the number in the budget is very large. The difference between working and budget employees are now seconded to military service, work overseas, etc. Government policy encourages government workers to go abroad to earn money. In spite of big difference between working and budget employees, there are no substantial negative effect on ENR operations. So this is a substantial reduction of employee costs of ENR.

ENR does not have to pay salary to employees not currently working. However, these employees have the right to return to ENR whenever they wish.

Wages consist of salary, bonus and other (pension, clothing, medical, housing and so on). Salaries account for 35% of total wages. Bonuses consists of 19% of total wages. Pensions account for 14% of total wages. The average annual wage paid to an ENR employee amounted to LE 4,025 (US$ 1,184).

Wages have been increased 5% at the compound annual growth rate in the past five years. However, this rate is less than the growth rate of total revenue. As a result, wages as a percentage of total revenue have fallen from 68% in 89/90 to 47% in 94/95.

(b) Material inputs

Spare parts, energy, and other costs are included in material costs. Energy costs such as fuel, oil, and electricity account for 52% of total material costs. Spare-parts and supply for maintenance consist of 41% of total material costs.

Purchase and store of material inputs are controlled by the purchase and store department. Many goods and equipment are purchased from abroad at international price levels. This is one cause of high material costs.

(c) Service inputs

Maintenance expenses by other companies is a major item of service inputs. Maintenance expenses by other companies account for 77% of total service inputs. For example, track maintenance for ENR is carried out by Egyfrail company and Egerco company which are joint venture companies of ENR.

(d) Depreciation

ENR has adopted the straight-line method of depreciation for fixed assets. The useful life of each fixed asset is decided based on government rules. For example, the useful life of a locomotive is 25 years.

Depreciation cost increased constantly every year until 93/94. However, in 93/94, depreciation decreased slightly from 93/94. The average useful life of fixed assets in ENR is estimated at 30 years. Judging from the provision for accumulated depreciation, 7.5 years out of 30 years has been depreciated. However, actual ages of fixed assets seem to be old compared with the ages shown on the financial statement. This seems to be caused by poor maintenance.

(e) Interest expense

ENR hasn't paid interest costs since fiscal year 1991/1992. Owing to an agreement between the Prime Minister and ENR in 1991, loans of ENR are converted to participation of the government to ENR. However, this agreement will expire after 1997/1998. As a result, ENR may have interest costs on its income statement from fiscal year 1998/1999, as ENR had before fiscal year 1990/1991. Interest cost was the largest cost factor from 1984 to 1990/91. In 1993/94, the government paid LE 465 million interest costs instead of ENR. This amount is far bigger than wages or depreciation. The ratio of interest cost to revenue would be 85%.

(f) Expense by service

ENR total expenses can be divided into passenger expenses and freight expenses. Passenger expenses accounted for 66% of total expenses in 1994/95. Freight expenses accounted for 34% of total expenses in 94/95. If miscellaneous revenue are excluded in calculating cost recovery ratio by service, the cost recovery ratio of passengers and freight are 61.9% and 55.7% respectively. Passenger expenses increased 16% from 1991/92 to 1994/95, but the cost recovery ratio of passenger improved slightly from 49.1% to 61.9%. On the other hand, freight expenses climbed 64% from 91/92 to 94/95, and the cost recovery ratio of freight went up from 47.2% to 55.7%.

According to ENR data, as explained above, freight service is less profitable than passenger service.

Passenger expenses divided by passenger-km were LE 0.0104 in 94/95. Freight expenses divided by ton - km were LE 0.0682 in 94/95.

3) Deficit

The current deficit including depreciation was reduced from LE 434 million in 90/91 to LE 196 million in 94/95. The current deficit excluding depreciation improved from LE 280 million deficit to 41 million profit in 94/95. However, if interest cost is included in the income statement, the current deficit would be worse, increasing from LE 359 million in 89/90 to LE 710 million in 93/94. As shown above, ENR's financial results are very poor. In spite of no interest cost, most depreciation costs still are not covered by revenues.

The ENR deficit has been carried at the Ministry of Finance, and amounted to LE 1,824 million at June 30,1995.

(2) Balance sheet

(Table 3.8.6)

Metro results are not separated on the balance sheet. At June 30, 1995, total ENR assets including Metro amounted to LE 15,663 million. Fixed assets consist of 83% of total assets. On the other hand, capital accounts for 79% of total assets. There are few liabilities. However a 1,824 million LE carried forward deficit at the Ministry of Finance is included in total assets. Consequently, fixed assets consist of 93% of total assets excluding the carried forward deficit. As explained above, all loans to ENR are converted to participation in the capital.

1) Fixed assets

Fixed assets consist of land, permanent way, machines, equipment, rolling stock, coaches, tools, buildings, etc. Permanent way and buildings account for 38% of total fixed assets. Means of transport (locomotives, coaches etc.) comprise 51% of total fixed assets. There are special cases regarding freight service related assets. At the beginning of construction, Baharia - Tebbin which is the freight line for iron ore was financed by Ministry of Industry. Later, the Baharia - Tebbin line was transferred to ENR from the Ministry of Industry. Qena - Safaga - Abutartur which is the freight line for phosphate, is financed by the Ministry of Industry. Assets of Qena - Safaga - Abutartur are owned by the Ministry of Industry.

Judging from average life time of fixed assets and accumulated depreciation rate, fixed assets of ENR seems to be too old.

Most of fixed assets which include rolling stock, machines, rail and so on has been imported at an international price level.

Moreover, all assets were re-evaluated in 1988. It took almost 5 years to complete this project. This re-evaluation of all assets was also done in 1973.

2) Capital

Major source of funds for fixed assets are local loans (National Bank of Investment), foreign loans, and credit facility. However, all loans to ENR are converted to central government debts. As a result, all loans to ENR are shown as capital of ENR on balance sheet.

Almost all capital accounts for participation of government. There are no retained earnings. Capital as a percentage of total assets is very high. However, the balance sheet of ENR is very vulnerable.

(3) Cash flow

Cash flow is defined as the sum of profit and depreciation generally. In other words, profit before depreciation is cash flow. However, profit before depreciation in ENR had been

negative for a long time. Profit before depreciation became positive in 92/93 for the first time since 1978. However, the level is still too low. So free cash flow (defined as subtracted capital expenditure from cash flow) of ENR is a huge negative. In spite of provision for depreciation, there is little cash and cash equivalents. This is a serious problem. There is not enough internal funds even for investment such as rehabilitation and replacement.

(4) Revenue and expense condition by line

Revenue and expense should be analyzed by each line. ENR management should know which line is profitable, which line is unprofitable, profit or loss by line, etc. However, such data is not available by line. The Study Team tried to get this data, but the General Manager who is responsible for revenue section of ENR finally stated it was "not available". In addition, ENR hasn't implemented an accounting system which distributes indirect costs such as depreciation to each line. Knowing each line's profitability is one of the best ways to improve the financial condition. ENR can't point out the real cause of loss owing to absence of an appropriate cost accounting system. It is very difficult to eliminate the cause of loss without an appropriate cost accounting system.
ENR performs some analysis regarding revenues and expenses. However, there is no consistency with regard to this analysis. For example, there is operating expense figure by region. However, there is no revenue figure by region. There is revenue figure by main, branch and suburban line. However, there is no operating expense figure by main, branch and suburban line. There is revenue figure by station. However, there is no revenue figure by each line.
Only Metro is calculated separately from an accounting point of view.
There are three different types of lines which consist of main line, branch line and suburban line. Details of the 3 lines are as follows.

1) Main lines
a. Cairo - Benha - Tanta - Alexandria
b.Benha - Zagzig - Ismailia - Portsaid
c. Cairo-El sad El ali

2) Suburban lines
a. Cairo - Qalyub - Shebin El Kanater - El Marg
b. Alexandria - Sidigaber - Abu Quir
c. Alexandria - Abis - El Max
d. Cairo - Imbaba - Manashi
e. Cairo - Badrashin
f. Ein Shams - Km 15
g. Cairo - Qalyub - El Kanater El Khairia

3) Branch lines
All other lines not mentioned above

(a) Revenue (Table 3.8.7)
Main lines are the major source of revenue of ENR. 80% of total revenue comes from main lines, which has only 30% of total ENR line length. Branch lines which have about 50% of total ENR line length generate only 14% of total revenue. Suburban lines generate 6% of total revenue. The compound annual growth rate of revenue of the main line is 12% in the

past 5 years. This 12% is composed of volume (passenger km) and price (revenue ÷ passenger-km) factors. Volume rose 3.6% annually, and price rose 8.6% annually. Revenue increase depended on price increases more than volume increases.

(b) Expense (Table 3.8.8)
Indirect costs such as depreciation has not been assigned to each line and region, as shown in Table 3.8.8. So profitability analysis by line hasn't been implemented.
There are 7 regions and Metro as follows: 1) Center Delta (Cairo), 2) Middle Delta (Tanta), 3) East Delta (Zagaziq), 4) West Delta (Alex.), 5) Intermediate (Asyut), 6) South Delta (Aswan), 7) North Delta (Mansoura), 8) Metro.

(5) Financial condition from a historical point of view (1968-1995) (Table 3.8.9)
ENR has produced financial losses since 1975. A history of ENR expenses shows the following main factors :

1975-79	Burden of wages
1980's	Burden of capital cost (interest & depreciation) Revenue/assets turnover ratio deteriorated
1991-97	Government assumes huge burden of interest cost

(6) Memorandum between ENR and Ministry of Finance
Based on the Prime Minister's instruction in 1991, a memorandum was written between ENR and Ministry of Finance with the following contents :

1) From fiscal year 91/92 to fiscal year 97/98
a) Deficits excluding depreciation are subsidized by Ministry of Finance.
b) Deficits arising from depreciation are not subsidized by Ministry of Finance .
c) Loans to ENR are converted to central government debts. Therefore ENR does not have obligation to repay loans and pay interest. This change occurred in 1991. This change substantially affected ENR's balance sheet from 91/92.
d) Even for debts related to ENR are covered by the government, ENR administers the debt accounts in the central bank.

2) From fiscal year 98/99
a) No deficits are subsidized by Ministry of Finance .
b) All deficits are financed by Ministry of Finance as loans.
c) Debt borrowed until fiscal year 97/98 is considered as central government debt. However, new loans from fiscal year 98/99 are considered debts of ENR. As a result, ENR has to pay interest on new debts and new debts are treated as liabilities on the balance sheet. ENR must raise funds from external sources.
d) ENR will be a more independent entity from 98/99 in terms of finance.

(7) Big change in financial condition of ENR
As explained above, ENR's financial condition will fundamentally change. If ENR is not able to produce profits from 98/99, ENR's liabilities will increase each year. ENR will face difficulty raising funds internally. ENR would have to depend on external debt as ENR did before fiscal year 90/91. This means that ENR's balance sheet would be more vulnerable. This would be the beginning of a vicious circle in terms of financial condition as experienced in the 1980's. Therefore ENR must balance revenues and expenses from 98/99 at latest.

(8) Current ENR investment plan (Table 3.8.10, 3.8.11, 3.8.12)

1) Decision making process of ENR investment plan

The decision making process for ENR's investment plan is as follows. ENR's planning department gathers investment plans from each department in ENR. Investment plans gathered by the planning department are submitted to the board to be discussed and authorized. Each department makes very strong requests for investments. Therefore, most investment plans are submitted to the Ministry of Transportation without any reduction from original plans. Investment plans approved by the Ministry of Transportation are submitted to the Ministry of Planning. After negotiating with the Ministry of Planning about ENR investment plans, ENR's investment plans are approved by the Ministry of Planning and Ministry of Finance. Investment plans approved are mainly financed by the National Bank of Investment.

ENR's investment plan is usually based on each department's request in ENR. The plan is also affected by external demands such as government instructions regarding the Sinai project.

Usually ENR investment plans are submitted to the Ministry of Planning at the beginning of the calendar year. Before the start of the coming fiscal year, ENR's investment plan is approved. In the process of negotiation, ENR's investment plan is normally reduced by the Ministry of Planning due to the shortage of funds. However, the approved initial investment plan can be revised upward. For example, the 95/96 investment plan was approved at LE 500 million at the beginning of fiscal year 95/96. The investment plan was revised upward to LE 849 million.

5 year investment plans are decided by the same process as explained above. Based on the 5 year plan, each year's investment plan is discussed and executed. The 3rd five year plan covering the period from 92/93-96/97 of ENR was LE 2,500 million initially. However, LE 2,623 million has already been invested in the first 3 years of the 3rd five year plan. Now the 4th five year plan of 97/98-2001/2002 is being prepared by the planning department.

2) Content of ENR investment project

As shown in table 3.8.11, there are 19 investment projects. The contents of the investment plan are renewal of railway line, renewal of rolling stock, improvement of signals, etc. Half of projects are related to rolling stock. 16% of projects are related to the renewal of railway lines. Laying a double track line (between Iduf and Aswan) was completed in October, 1996.

Sinai project (Ismailia-Rafah)----------planned project

The Sinai project was approved by the government in 1995. A railway between Ismailia and Rafah will be constructed by year 2001. Construction cost regarding civil work and signal system is estimated at LE 750 million. Construction cost for the bridge over the Suez canal is not included in this LE 750 million. This is a single line and will install an electronic signal system. This project will be financed by the government.

3) Productivity on investment

There are several ways to measure productivity on investment. Return on total assets is one of the most popular measures. However, ENR has no profit, so this measure is not useful. Therefore we use total assets turnover ratio (defined as revenue divided by total assets) as an alternative measure. As explained in 3.9.4, the total assets turnover ratio of ENR is very low : only 0.0527 in 1994/95. This means that it is very difficult for ENR to pay expenses, even if only interest costs. So new investment plans should be considered from an economic point of view much more than in the past. In addition, ENR should try to use existing assets more efficiently to improve its asset turnover ratio.

4) Fund raising for investment plan

ENR has had financial losses for many years. ENR depreciation hasn't been covered by revenue. Therefore ENR doesn't have internal sources of funds for investment. Most of its investment plan is financed by the National Bank of Investment.

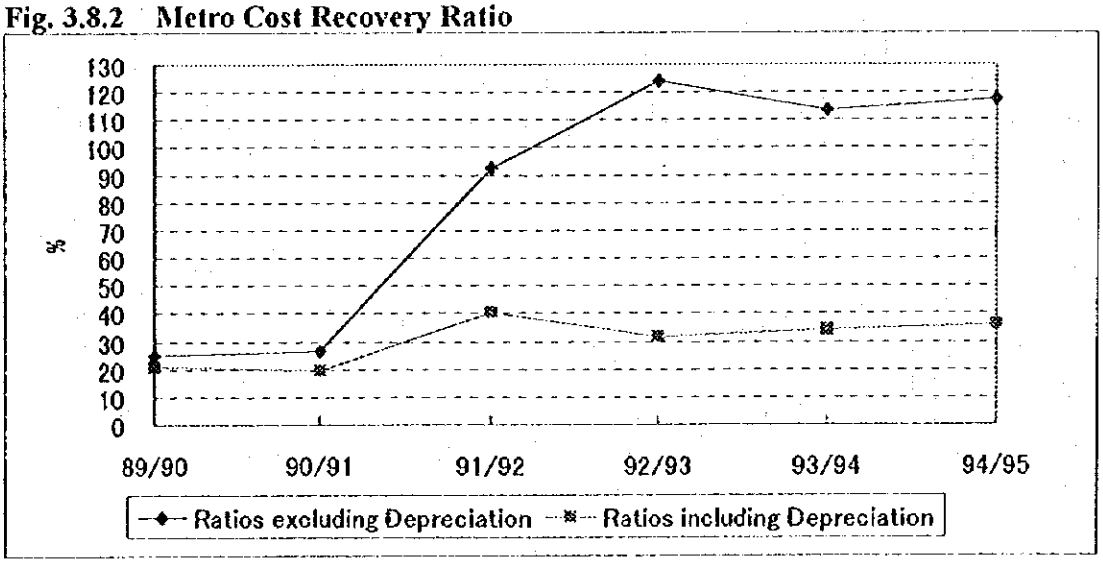
Sources of funds for its investment program are limited. Its investment program should be selective and concentrate on profitable projects. Its investment program should consider whether it will contribute to raise revenue or reduce costs.

As mentioned before, if ENR's investment plan continues to exceed the limits of depreciation even after 98/99, ENR must raise funds for investment from external sources like loans. This would create a big burden interest for ENR's vulnerable financial condition.

3.8.2 Financial Conditions (Metro) (Table 3.8.13, 3.8.14)

Financial conditions of Metro is analyzed as follows. ENR has been suffering from current deficits since the beginning of operation. Its current deficit in 94/95 was LE 132.8million. Its cost recovery ratio excluding depreciation improved from 92% in 91/92 to 117% in 94/95. However cost recovery ratio including depreciation decreased from 40% in 91/92 to 36% in 94/95 due to the huge depreciation burden.

Fig. 3.8.2 Metro Cost Recovery Ratio



(1) Revenue structure

Revenue has increased 15.8% annually in the past five years. Passenger-km which represents volume has increased 20.7% annually in the past 5 years. Distance, defined as passenger-km divided by passenger numbers, is 14 km, which hasn't changed since 88/89. The price level (defined as revenue divided by passenger-km) is still below the 89/90 level. Revenue growth of Metro is mainly arising from volume growth. The price level of Metro is much higher than other lines of ENR such as Main, Branch and Suburban Lines.

For example, price (defined as revenue ÷ passenger-km) of each line type in 94/95 are as follows.

Price (revenue ÷ passenger km)(1000 passenger km)

Main line	LE 6.165
Branch line	LE 5.605
Suburban line	LE 3.258
Metro	LE 15.426

(2) Expense structure

Expense is comprised of wages, material inputs, service inputs and depreciation. Depreciation accounts for 70% of total expenses of Metro. Depreciation cost exceeds 95% of revenue. Wages account for only 4.4% of total expenses of Metro. To improve financial condition, it is very important to cover the depreciation cost.

(3) Deficit

The deficit of 94/95 is LE 133 million. Annual deficits are around LE 130 million in the past three years. The expenses of operation and maintenance have been covered by revenue since 92/93. However, revenue did not cover depreciation cost.

(4) Investment (Table 3.8.15)

Metro line 1 (42.5 km from Helwan to El Marg) has operated since October, 1987. Now line 2 is under construction. Line 2 will operate between Shoubra El Kheima and El Giza (19.2 km). Construction will be separated into 4 phases (1A, 1B, 2A and 2B). Phase 1A (8.1 km from Shoubra El Kheima to Mubarak) was just completed in October, 1996. Phase 1B (2.8 km from Mubarak to Sadat) will finish in October, 1997. Phase 2A (5.1 km from Sadat to University) is scheduled for completion at the end of December, 1999. Phase 2B (3.19 km from University to El Giza) is under study.

As for construction cost, according to the National Authority for Tunnels which is responsible for construction of Metro line 2, Phase 1, Phase 2A and Phase 2B are estimated to cost LE 5850 million, LE 2270 million and LE 3500 million respectively. Construction cost per km of 1A and 1B is estimated to be LE 537 million. On the other hand construction cost per km in Japan range from LE 666 million to LE 883 million. In the case of the South-North line in Tokyo (construction period: 1986 through 1991), construction cost per km was LE 666 million per km. Construction cost in Egypt is similar to Japan, but this burden is difficult to bear with the low ticket prices Metro can charge.

As for rolling stock, 390 cars will be used for line 1 and 138 cars (including 90 cars for 1A/1B) will be used for line 2.

Table 3.8.1 **Income statement of ENR (excluding Metro)**

(unit:million LE)

	Actual 88/89	Actual 89/90	Actual 90/91	Actual 91/92	Actual 92/93	Actual 93/94	Actual 94/95
Total Revenues	208.7	263.6	308.6	378.7	484.2	542	618.4
Total income from operations	180.7	223.6	252.1	320.9	383.5	424	493.9
Passenger revenue	126.7	153.6	175.2	226.4	263.6	293	332.2
Freight revenue	40	54	69.8	79.8	95.5	116	154.7
ENR share in dining and sleeping	14	16	5.6	13.5	23.2	11	4.1
Profit from share in Co.'s	0	0	1.5	1.2	1.2	4	2.9
Internal operations	4	5	4	5	6.1	6	6.2
Operations for others	3	5	6	2	4.2	3	13.2
miscellaneous revenues	21	30	46.5	50.8	90.4	109	105.1
Total expenses		623	742.4	630.1	701	787	814.3
Wages		179	195.5	213.1	238.9	270	289.2
Material inputs		81	94	159.6	185.9	219	224.6
Service inputs		41	50.9	39.8	35.4	41	52.2
Interest		188	220				
Depreciation		117	154	174.7	224	241	236.6
Other expenses		17	28	42.9	16.8	16	11.7
(donations & pensions)		0	0	0	0	1	0
(compensations & fines)		0	1	1	1	1	1
(Improvement of service)		0	13.2	14.9	14.7	14	10.7
Interest(not paid)				290.9	307.8	465.4	n.a
Profit		-359.4	-433.8	-251.4	-216.8	-245	-195.9
revenue-expence(ex dep)		-242.4	-279.8	-76.7	7.2	-4	40.7
Profit(inc Interest)				-542.3	-524.6	-710.4	
Cost recovery ratio(ex.interest)							
Ratios excluding Depreciation %		52.09	52.45	83.16	101.51	99.27	107.05
Ratios including Depreciation %		42.31	41.57	60.10	69.07	68.87	75.94

Source:Financial Department,ENR

Table 3.8.2 **Income statement of ENR(including Metro)**

(unit:million LE)

	Actual 88/89	Actual 89/90	Actual 90/91	Actual 91/92	Actual 92/93	Actual 93/94	Actual 94/95
Total Revenues	230	299	350.4	429.1	545.8	610	692.2
Total income from operations	202	259	292.6	369.8	442.5	490	564.8
Passenger revenue	148	189	215.7	275.3	322.6	359	403.1
Freight revenue	40	54	69.8	79.8	95.5	116	154.7
ENR share in dining and sleeping	14	16	5.6	13.5	23.2	11	4.1
Profit from share in Co.'s	0	0	1.5	1.2	1.2	4	2.9
Internal operations	4	5	4	5	6.1	6	6.2
Operations for others	3	5	6	2	4.2	3	13.2
miscellaneous revenues	21	30	47.8	52.3	93	111	108
Total expenses	677	790	960.8	755	897	985	1020.9
Wages	168	185	202.1	220.3	246.5	278	298.3
Material inputs	56	99	108.1	195.8	216.2	258	254.9
Service inputs	45	46	57	50.9	47.2	54	75.8
Interest	263	302	350		0	0	0
Depreciation	139	141	215.6	245.1	370.3	379	380.2
Other expenses	6	17	28	42.9	16.8	16	11.7
(donations & pensions)	0	0	0	0	0	1	0
(compensations & fines)	0	0	1	1	1	1	1
(Improvement of service)	2.4	4.4	13.2	14.9	14.7	14	10.7
Interest(not paid)				423	461.1	594.6	n.a
Profit	-447	-491	-610.4	-325.9	-351.2	-375	-328.7
revenue-expence(ex dep)	-308	-350	-394.8	-80.8	19.1	4	51.5
Profit(inc interest)				-748.9	-812.3	-969.6	
Cost recovery ratio(ex.interest)							
Ratios excluding Depreciation %	42.75	46.07	47.02	84.15	103.63	100.66	108.04
Ratios including Depreciation %	33.97	37.85	36.47	56.83	60.85	61.93	67.80

Source:Financial Department,ENR

Table 3.8.3 **Passenger Revenue of ENR**

	Actual 85/86	Actual 86/87	Actual 87/88	Actual 88/89	Actual 89/90	Actual 90/91	Actual 91/92	Actual 92/93	Actual 93/94	Actual 94/95
Passenger revenue (Mil)	82.86	85.98	105.00	126.71	154.27	175.20	226.40	263.60	293.00	332.20
Passenger Km (Mil)	28340	33073	34167	34876	36253	40951	42589	44744	46731	51282
Number of Passenger (Mil)	612.624	648.402	580.03	569.127	578.21	612.76	637.27	662.761	670.299	718.282
Pass Rev/Pass Km	0.00292	0.0026	0.00307	0.00363	0.00426	0.00428	0.00532	0.00589	0.00627	0.00648
Pass Revenue (growth rate to previous year)%		3.78	22.12	20.68	21.75	13.57	29.22	16.43	11.15	13.38
Pass Km (growth rate to previous year) %		16.70	3.31	2.08	3.95	12.96	4.00	5.06	4.44	9.74
Pass Rev/Pass Km (growth rate to previous year)%		-11.08	18.21	18.22	17.12	0.54	24.25	10.82	6.43	3.32
Pass Km/Pass(km)	46.26	51.01	58.91	61.28	62.70	66.83	66.83	67.51	69.72	71.40
Passenger Km (growth rate to 85/86)	100	116.70	120.56	123.06	127.92	144.50	150.28	157.88	164.89	180.95
Pass Rev/Pass Km(growth rate to 85/86)	100	88.92	105.10	124.25	145.52	146.31	181.81	201.47	214.43	221.55

Source:Financial Department,Commercial Department,ENR

Table 3.8.5 **Freight Revenue of ENR**

	Actual 85/86	Actual 86/87	Actual 87/88	Actual 88/89	Actual 89/90	Actual 90/91	Actual 91/92	Actual 92/93	Actual 93/94	Actual 94/95
Freight revenue (Mil)	34.27	34.48	35.61	39.93	53.81	69.80	79.80	95.50	116.10	154.70
Freight Ton Km(Mil)	2909	3021	3029	2853	3045	3162	3213	3142	3621	4072
Freight Ton(Mil)	8.616	9.035	9.541	9.386	10.393	10.821	10.875	10.309	11.566	12.24
Freight Rev/Ton Km	0.01178	0.01141	0.01175	0.014	0.01767	0.02207	0.02484	0.03039	0.03206	0.03799
Freight Rev(growth rate to previous year)%		0.62	3.26	12.15	34.75	29.72	14.33	19.67	21.57	33.25
Freight Ton Km(growth rate to previous year)%		3.85	0.26	-5.81	6.73	3.84	1.61	-2.21	15.25	12.46
Freight Rev/Ton Km (growth rate to previous year)%		-3.11	2.98	19.07	26.25	24.92	12.51	22.38	5.49	18.49
Ton Km/Ton	337.63	334.37	317.47	303.96	292.99	292.21	295.45	304.78	313.07	332.68
Freight Ton Km(growth rate to 85/86)	100	103.85	104.13	98.07	104.68	108.70	110.45	108.01	124.48	139.98
Freight Rev/Ton Km(growth rate to 85/86)	100	96.89	99.79	118.81	150.00	187.39	210.84	258.02	272.18	322.50

Source:Financial Department,Commercial Department,ENR

Table 3.8.4 Passenger Revenue by Class (unit:L.E)

	89\90	90\91	91\92	92\93	93\94	94\95	(94/95)/ (89/90)	% to Total
Main Lines								
1st Class	10,366,727	10,583,339	13,108,575	14,583,710	17,511,875	20,141,406	1.94	9.30%
2nd Class	15,364,996	16,887,643	21,392,755	25,179,864	32,737,161	36,147,421	2.35	16.69%
3rd Class	73,327,286	75,519,501	90,468,286	97,498,874	108,031,255	117,172,995	1.60	54.12%
Total Main	99,059,009	102,990,483	124,969,616	137,262,448	158,280,291	173,461,822	1.75	80.11%
Branch Lines								
2nd Class	866,614	1,049,959	1,647,392	1,984,323	2,751,592	3,267,271	3.77	1.51%
3rd Class	9,725,498	11,089,257	14,452,209	17,267,020	23,334,286	26,580,459	2.73	12.28%
Total Branch	10,592,112	12,139,216	16,099,601	19,251,343	26,085,878	29,847,730	2.82	13.79%
Suburban Lines								
2nd Class	1,705,012	2,212,788	3,019,658	3,931,762	4,032,611	4,912,567	2.88	2.27%
3rd Class	2,483,297	3,893,610	5,544,582	6,917,382	6,873,730	8,294,861	3.34	3.83%
Total Suburban	4,188,309	6,106,398	8,564,240	10,849,144	10,906,341	13,207,428	3.15	6.10%
Total								
1st Class	10,366,727	10,583,339	13,108,575	14,583,710	17,511,875	20,141,406	1.94	9.30%
2nd Class	17,936,622	20,150,390	26,059,805	31,095,949	39,521,364	44,327,259	2.47	20.47%
3rd Class	85,536,081	90,502,368	110,465,077	121,683,276	138,239,271	152,048,315	1.78	70.22%
Total	113,839,430	121,236,097	149,633,457	167,362,935	195,272,510	216,516,980	1.90	100.00%
Other Revenues:								
Postage&passenge furniture,etc.	9,025,580	9,621,718	18,208,636	28,460,156	35,337,853	43,407,882	4.81	
Conductors	31,400,687	44,308,028	58,555,232	67,787,135	63,043,656	72,232,686	2.30	
Salles Tax	0	0	75	245	0	0		
Total	154,265,697	175,165,843	226,397,400	263,610,471	293,654,019	332,157,548	2.15	

Table 3.8.6 **Balance sheets of ENR(including Metro)** (unit:million L.E)

	90/91	91/92	92/93	93/94	94/95
Total fixed assets	5,885	5,917	8,489	9,820	10,604
land	10	10	10	10	8
Bldg.,structure,tracks	2,926	2,613	4,114	4,825	5,023
Machinery&equipment	702	671	841	1,149	1,275
Means of transport	2,241	2,617	3,517	3,822	4,284
Tools and supplies	1	1	1	2	2
Furniture&off,equip	4	4	5	6	6
Deferred charges	1	1	1	6	6
Projects under construction	2,475	3,180	2,328	2,174	2,318
(Capital formation)	2,071	2,686	2,077	2,006	2,140
(capital expenditure)	404	494	251	168	178
Inventory	289	359	407	427	458
(Material inputs)	138	183	211	242	252
(In-process)	4	1	11	10	15
(Finished goods)	0	0	0	0	0
(L/C's)	147	175	185	175	191
Financial investments	1	1	1	1	1
Accounts receivable	191	318	459	300	343
Cash on hand & in banks	63	83	59	72	66
Transferred loss(at MOF)	591	874	1,175	1,516	1,824
Extraordinary balances	16	16	37	29	49
(suppliers)	16	0	21	19	31
(credit bank)	0	0	0	0	0
(misc.creditors)	0	16	16	10	18
Total assets	9,511	10,748	12,955	14,339	15,663

Total capital	7,756	8,587	10,336	11,520	12,451
Capital(ENR)	7,107	7,886	8,898	9,620	10,571
(as per 1988 valuation)	817	817	817	817	817
(participations till prev.year)	1,976	1,976	1,976	1,976	1,976
(loan partn. till prev.year)	4,282	4,282	5,089	6,059	6,787
(extra loan partn. till prev. year)					
(grants till previous year)	32	32	33	42	48
(partn. for year)					
(loan partn. for year)					
(extra loan partn. for year)	-	777	974	720	894
(grants for year)	-	3	9	6	49
Capital(Metro)	649	701	1,438	1,900	1,880
(partn.till prev.year)	-	649	666	666	666
(loan partn. till prev.year)					
(extra loan partn. till prev. year)					
(grants till previous year)					
(partn.for year)	-	18	36	771	1,214
(loan partn. for year)					
(extra loan partn.for year)	-	34	736	463	
(grants for year)					
Reserves	28	16	29	24	50
Total Provisions	1,080	1,290	1,642	2,009	2,374
(depreciation)	1,076	1,289	1,627	2,004	2,370
(bad debts)	1	1	10	2	1
(other)	3	0	3	3	3
Accounts payable	587	636	749	592	560
Extraordinary balances	59	219	199	194	229
(bank,current activities)	35	160	193	190	224
(bank,capital activities)	23	57	3	0	1
(misc.creditors)	1	2	2	4	4
(finished goods)	0	0	1	0	
Liabilities&capital	9,511	10,748	12,955	14,339	15,664

Source:Financial Department,ENR

Table 3.8.7 **Passenger Revenue by Line** (unit:LE)

	Actual 89/90	Actual 90/91	Actual 91/92	Actual 92/93	Actual 93/94	Actual 94/95	% to total
Main Total Revenue	99,059,009	102,990,483	124,969,616	137,262,448	158,280,291	173,461,822	80.11
(ticket)	95,932,547	99,054,279	120,289,263	131,392,007	151,075,777	164,672,789	76.06
(season-normal)	2,673,875	3,393,633	4,006,237	5,007,283	6,160,370	7,370,979	3.40
(season-kilometer)	452,587	542,571	674,116	863,158	1,044,144	1,418,054	0.65
Branch Total Revenue	10,592,112	12,139,216	16,099,601	19,251,343	26,085,878	29,847,730	13.79
(ticket)	10,214,106	11,718,200	15,633,213	18,744,844	25,530,416	29,185,902	13.48
(season-normal)	378,006	421,016	466,388	506,499	555,462	661,828	0.31
(season-kilometer)							
Suburban Total Revenue	4,188,309	6,106,398	8,564,240	10,849,144	10,906,341	13,207,428	6.10
(ticket)	4,005,271	5,846,179	8,251,471	10,297,790	10,204,396	12,307,058	5.68
(season-normal)	183,038	260,219	312,769	551,354	701,945	900,370	0.42
(season-kilometer)							
Total	113,839,430	121,236,097	149,633,457	167,362,935	195,272,510	216,516,980	100.00
(ticket)	110,151,924	116,618,658	144,173,947	160,434,641	186,810,589	206,165,749	95.22
(season-normal)	3,234,919	4,074,868	4,785,394	6,065,136	7,417,777	8,933,177	4.13
(season-kilometer)	452,587	542,571	674,116	863,158	1,044,144	1,418,054	0.65
Conductor Revenue	31,400,687	44,308,027	58,555,232	67,787,135	63,043,656	72,232,686	
Other	9,025,580	9,621,718	18,208,711	28,460,401	35,337,853	43,407,882	
Total revenue (ex Metro)	154,265,697	175,165,842	226,397,400	263,610,471	293,654,019	332,157,548	
Metro Revenue	35,437,767	40,531,566	48,858,174	58,969,905	65,564,836	70,950,425	
Total revenue(Inc Metro)	189,703,464	215,697,408	275,255,574	322,580,376	359,218,855	403,107,973	

Source: Information Center,ENR

Table 3.8.8 **Expenses by Region** (unit: million LE)

	Actual 90/91	Actual 91/92	Actual 92/93	Actual 93/94	Actual 94/95
Total expenses	960.8	755	897	985	1020.9
Wages	202.1	220.3	246.5	278	298.3
Material inputs	108.1	195.8	216.2	258	254.9
Service inputs	57	50.9	47.2	54	75.8
Depreciation	215.6	245.1	370.3	379	380.2
Other expenses	37.8	42.9	16.8	16	11.7
Head Quarter (Inc Center Delta)					
Wages	104.3	113.7	124.4	140.9	150.7
Material inputs	73.5	128.1	145	168.2	170.8
Service inputs	45.4	34	30.3	34.4	45.8
Depreciation	154	174.7	224	241	236.6
East Delta (Zagazig)					
Wages	18.8	19.9	23.7	26.6	27.8
Material inputs	3.2	4.9	5.6	7.5	7.9
Service inputs	1	1	1	1	1
Depreciation					
West Delta (Alex)					
Wages	18.9	20.1	23.2	26	28
Material inputs	5.1	9	12.4	15	14.5
Service inputs	1	1	1	1.1	7.5
Depreciation					
Intermediate (Asyut)					
Wages	17.2	18.8	21	23.5	25.8
Material inputs	0.9	3.2	3.9	4.6	5.5
Service inputs	1	1	1	1.2	1.2
Depreciation					
South Delta (Aswan)					
Wages	14.7	16.4	18.3	20.7	21.9
Material inputs	3.4	4.2	5	6.4	7.2
Service inputs	1.5	1.8	2.1	2.4	2.6
Depreciation					
Middle Delta (Tanta)					
Wages	21.6	24.1	28.3	32.2	30.2
Material inputs	6.9	10.4	13.5	17.3	15.8
Service inputs	1	1		1	1
Depreciation					
North Delta (Mansoura)					
Wages					4.8
Material inputs					2.8
Service inputs					0.1
Depreciation					
Metro					
Wages	6.6	7.2	7.6	8	9.1
Material inputs	14.1	36.2	30.3	39	30.3
Service inputs	6.1	11.1	11.8	13	23.6
Depreciation	61.6	70.4	146.3	138	143.6

Source: Financial Department,ENR

Note:North Delta was separated from Middle Delta in 94/95.

Table 3.8.9 **Financial Data of ENR(including Metro)** (unit: million LE)

YEAR	Actual 1968	Actual 1969	Actual 1970	Actual 1971	Actual 1972	Actual 1973	Actual 1974	Actual 1975	Actual 1976	Actual 1977	Actual 1978	Actual 1979	Actual 1980	Actual 81/82	Actual 82/83	Actual 83/84	Actual 84/85	Actual 85/86	Actual 86/87	Actual 87/88	Actual 88/89
Total Revenues	36.32	37.79	44.93	49.51	49.73	50.71	52.1	51.07	47.95	55.08	54.22	66.7	82.1	93.99	97.8	116.43	113.5	146.2	162.1	182.7	231.4
Total income from operations																					
Passenger revenue	19.08	20.7	22.97	24.72	27.51	29.11	31.02	32.08	30.51	31.67	33.76	39.6	44.9	49.6	60.3	68.48	76.8	82.9	95.9	117.2	146
Freight revenue	17.24	14.8	19.12	21.26	18.64	17.45	15.92	13.73	12.19	15.43	14.63	18.9	24.4	31.3	28.7	29.07	29.2	34.3	34.5	35.6	39.9
other	0	0.31	0.75	0.77	2.87	3.32	4.54	4.26	3.86	6.36	4.23	6.5	11.5	12.2	7.2	16.82	4.1	24.8	26.3	23.4	29.5
other	0	1.98	2.09	2.76	0.71	0.83	0.62	1	1.39	1.62	1.6	1.7	1.3	0.89	1.6	2.06	3.4	4.2	5.4	6.5	14
Total expenses	31.24	35.66	48.27	49.94	58.94	48.38	50.47	51.91	60.84	68.27	83.24	99.8	118.57	154.14	177.6	257.21	339.68	428.65	443.86	509.7	677.4
Wages	16.19	18.64	19.13	19.92	21.39	23.78	24.97	29.46	33.46	36.17	42.75	50	61.5	83.37	94.1	109.7	128.3	129.5	137.3	156.7	167.9
other	8.25	8.02	20.14	20.75	26.61	14.6	13.5	10.01	13.78	14.90	14.8	17.3	27.5	22.23	19.9	21.6	31.7	50.5	75.8	80.6	107.7
Interest	2	2	2	2.5	1.8	2.4	3.7	3.64	4.3	7.2	14.39	18.2	9.27	26.94	36.62	94.99	130.88	182.43	151.76	176.7	262.9
Depreciation	4.8	7	7	6.77	9.14	7.6	8.3	8.8	9.3	10	11.3	14.3	20.3	21.6	26.98	30.92	48.8	66.22	79	95.7	138.9
Profit	5.08	2.13	-3.34	-0.43	-9.21	2.33	1.63	-0.84	-12.89	-13.19	-29.02	-33.1	-36.47	-60.15	-79.8	-140.8	-226.2	-282.5	-281.8	-327	-446
revenue-expence(ex dep&interest)	11.88	11.13	5.66	8.84	1.73	12.33	13.63	11.6	0.71	4.01	-3.33	-0.6	-6.9	-11.61	-16.2	-14.87	-46.5	-33.8	-51	-54.6	-44.2
Total Assets	297.86	235.65	255.82	277.9	306.24	337.74	362.73	396.13	422.1	535.45	710.45	857.76	1158.9	1460.3	1797.4	2119.6	2451.6	2744.5	4089.4	4712.9	6097
Fixed Assets	148.35	145.92	146.99	147.48	164.1	164.24	183.9	183.58	200.84	220.9	276.59	308.39	419.99	537.17	776.45	999.26	1103.4	1269.4	1761.9	2106.6	2963
Projects under execution	0	18.03	25.58	34.06	27.54	52.66	50.22	77.74	86.72	179.64	226.99	331.41	500.63	659.1	801.62	869.5	1042.4	1121.3	1261.3	1374.5	1594
Revenue/Fixed Assets	0.24	0.26	0.31	0.34	0.30	0.31	0.28	0.28	0.24	0.25	0.20	0.22	0.20	0.17	0.13	0.12	0.10	0.12	0.09	0.09	0.08
Revenue/Total Assets	0.12	0.16	0.18	0.18	0.16	0.15	0.14	0.13	0.11	0.10	0.08	0.08	0.07	0.06	0.05	0.05	0.05	0.05	0.04	0.04	0.04
No. of employee	41716	47573	47555	47480	47952	48000	50000	73369	76486	77787	78502	79889	79889	80764	80906	80927	82025	82161	83336	86218	86234

Source:"Performance Evaluation of the ENR with a Reform Program for the 1990s"

Table 3.8.10 **Investment Program of ENR**

(unit:million LE)

			The period of Third 5 year investment plan					The period of Fourth 5 year investment plan				
	Actual 90/91	Actual 91/92	Actual 92/93	Actual 93/94	Actual 94/95	Plan 95/96	Plan 96/97	Plan 97/98	Plan 98/99	Plan 99/00	Plan 00/01	Plan 01/02
Investment Program												
Rehabilitation	**66**	**82**	**187**	**149**	**212**	**138**	**499**	**301**	**353**	**353**	**355**	**350**
(Permanent Way)	36	13	27	47	144	67	202	122	120	120	120	115
(Signalling System)												
(Locomotives)												
(Coaches)	15	44	119	83	49	56	190	145	206	206	208	208
(Freight Car)												
(Others,including metro)	15	25	41	19	19	15	107	34	27	27	27	27
Replacement and Renovation	**190**	**293**	**374**	**402**	**293**	**316**	**817**	**725**	**851**	**851**	**851**	**854**
(Permanent Way)	107	160	102	127	131	125	250	250	250	250	250	250
(Signalling System)												
(Locomotives)												
(Coaches)	49	100	216	213	102	141	280	225	348	348	348	348
(Freight Car)												
(Others,including buildings)	34	33	56	62	60	50	287	250	253	253	253	256
Completion and Expansions	**258**	**397**	**292**	**316**	**398**	**395**	**1138**	**1115**	**838**	**838**	**838**	**838**
(Permanent Way)	108	99	20	46	76	20	430	380	180	180	180	180
(Signalling System)	63	133	89	90	57	75	408	405	335	335	336	336
(Locomotives)												
(Coaches,including Metro units)	83	165	183	180	265	300	300	300	300	300	300	300
(Freight Car)												
(Others,including containers)	4							30	23	23	22	22
Total	**514**	**772**	**853**	**867**	**903**	**849**	**2454**	**2141**	**2042**	**2042**	**2044**	**2042**
(Permanent Way)	251	272	149	220	351	212	882	752	550	550	550	545
(Signalling System)	63	133	89	90	57	75	408	405	335	335	336	336
(Locomotives)												
(Coaches,including Metro units)	147	309	518	476	416	497	770	670	854	854	856	856
(Freight Car)												
(Others,including containers)	53	58	97	81	79	65	394	314	303	303	302	305

Source: Planning Department,ENR

note:fiscal year 96/97 to2001/2002 figures are just estimation and normally to be reduced owing to available resources of funds

Table 3.8.11 the 3rd 5 year (92/93-96/97) ENR Investment Program

(unit:thousand LE)

	Item	Actual Exp. 92/93	Actual Exp. 93/94	Actual Exp. 94/95	Initial Plan 95/96	Revised Plan 95/96
1	The renewal of railway lines	103,221	123,353	152,249	125,000	125,000
2	Fixed constructions on the railway lines	54,159	48,127	63,936	50,000	50,000
3	Rolling stocks &Renewal of coaches	455,703	469,015	394,556	188,000	488,000
4	El-Wahat El-Bahreya railway line	26,544	2,250	100,753	45,000	45,000
5	Signals Improvement Arab El-rami/Alexandria railway line	6,900	8,675	2,385	5,300	5,300
6	Signal Improvement of Cairo/Qalyub railway line	7,476	448	12,949	30,000	30,000
7	Signal Improvement of Giza/Beni Suef line	43,953	57,425	17,222	3,000	3,000
8	Signal Improvement of Imbaba/Ittay El-Barud line	1,847	71	1,148	200	200
9	Signal Improvement of Domiat/Zagazig lin	158	545	134	600	600
10	Signal Improvement of Shebin El-Kanater line	416	358	205	800	800
11	Development of Control systems&insuring safety elements	16,062	34,925	42,712	40,000	40,000
12	Development of Helwan/El-Marg line	37,222	22,416	17,784	9,700	9,700
13	Development of Kabary/El-Sallom line	9,121	17,940	41,254	20,000	20,000
14	Electrifying the signals of Beni Suef/El-Minya line	0	0	0		
15	Developing & improving the Workshops	24,910	9,596	10,557	1,000	1,000
16	Developing the mechanic signals	729	1,300	160	200	200
17	Raising the efficiency of Luxor/Aswan line	19,682	9,600	72,346	20,000	20,000
18	Raising the efficiency of Qalyub/Menuf/Tanta	0	0	0	200	200
19	Construction of Ismailia/Rafah line	0	0	0	2,000	2,000
	Total	808,103	831,212	928,055	550,000	850,000

Source: TPA,Planning Department,ENR

Table 3.8.12 Fund raising for Investment of ENR

(unit:million LE)

	Actual 90/91	Actual 91/92	Actual 92/93	Actual 93/94	Actual 94/95	Plan 95/96
Investment Program						
USES	**514**	**772**	**853**	**867**	**903**	**849**
(Permanent Way)	251	272	149	220	351	212
(Signalling System)	63	133	89	90	57	75
(Locomotives)						
(Coaches,including Metro units)	147	309	518	476	416	497
(Freight Car)						
(Others,including containers)	53	58	97	81	79	65
SOURCES	**514**	**772**	**853**	**867**	**903**	**849**
(Local loans from the National Bank of Investoent)	229	372	375	534	457	296
(Semaf facilities)	183	180	202	180	270	300
(Foreign loans)	31	89	69	66	117	86
(Foreign facilities)						
(Grants & subsidies)	30	2	9	6	49	108
(others)	41	129	198	81	10	59

Source:Planning Department,ENR

Table 3.8.13 **Income statement of ENR(Metro)** (unit: Million LE)

	Actual 88/89	Actual 89/90	Actual 90/91	Actual 91/92	Actual 92/93	Actual 93/94	Actual 94/95
Total Revenues	21.3	35.4	41.8	50.4	61.6	68	73.8
Total income from operations	21.3	35.4	40.5	48.9	59	66	70.9
Passenger revenue	21.3	35.4	40.5	48.9	59	66	70.9
Freight revenue	0	0	0	0	0	0	0
ENR share in dining and sleepin	0	0	0	0	0	0	0
Profit from share in Co.'s	0	0	0	0	0	0	0
Internal operations	0	0	0	0	0	0	0
Operations for others	0	0	0	0	0	0	0
miscellaneous revenues	0	0	1.3	1.5	2.6	2	2.9
Total expenses		167	218.4	124.9	196	198	206.6
Wages		6	6.6	7.2	7.6	8	9.1
Material inputs		18	14.1	36.2	30.3	39	30.3
Service inputs		5	6.1	11.1	11.8	13	23.6
Interest		114	130				
Depreciation		24	61.6	70.4	146.3	138	143.6
Other expenses		0	0	0	0	0	0
(donations & pensions)		0	0	0	0	0	0
(compensations & fines)		0	0	0	0	0	0
(Improvement of service)		0	0	0	0	0	0
(Capital losses)		0	0	0	0	0	0
Interest(not paid)				132.1	153.3	129.2	
Profit		-131.6	-176.6	-74.5	-134.4	-130	-132.8
revenue-expence(ex dep)		-107.6	-115	-4.1	11.9	8	10.8
Profit(inc interest)				-206.6	-287.7	-259.2	
Cost recovery ratio(ex.interest)							
Ratios excluding Depreciation		24.76	26.66	92.48	123.94	113.33	117.14
Ratios including Depreciation		21.20	19.14	40.35	31.43	34.34	35.72

Source: Financial department, ENR

Table 3.8.14 **Passenger revenue of Metro** (unit: million LE)

	Actual 87/88	Actual 88/89	Actual 89/90	Actual 90/91	Actual 91/92	Actual 92/93	Actual 93/94	Actual 94/95
Passenger revenue(Mil)				40.5	48.9	59	66	70.9
Passenger Km(Mil)	733	1015	1792	2041	3928	4280	4367	4596
Number of Passenger(Mil)	48.868	72.49	127.997	146.455	280.528	305.748	311.948	328.306
Pass Rev/Pass Km				0.01984	0.01245	0.01379	0.01511	0.01543
Pass Revenue (growth rate to previous year)					20.74	20.65	11.86	7.42
Pass Km (growth rate to previous year)		38.47	76.55	13.90	92.45	8.96	2.03	5.24
Pass Rev/Pass Km (growth rate to previous year)					-37.30	10.73	9.63	2.07
Pass Km/Pass (km)	15.00	14.00	14.00	13.94	14.00	14.00	14.00	14.00
Passenger Km (growth rate to 87/88)	100	138.472	244.475	278.445	535.88	583.902	595.771	627.012
Pass Rev/Pass Km(growth rate to 90/91)				100	62.74	69.47	76.163	77.74

Source: Financial department, Commercial department, ENR

Table 3.8.15 Investment Plan of Metro

(unit: million LE)

	Length of line		open date	Total cost (mil LE)	cost/km (mil LE)	Actual 90/91	Actual 91/92	Actual 92/93	Actual 93/94	Actual 94/95	Actual 95/96	Plan 96/97	Plan 97/98	Plan 98/99	Plan 99/00	Plan 00/01	Plan 01/02
By Line																	
Cairo Line 1 Total	42.5km					118	188	129	91	21	11	3					
Helwan - Ramses		Phase 1	87.Oct														
Ramses - El Marg		Phase 2	89.Apr														
Cairo Line 2 Total	19.2 km			11,620	605		21	175	946	1368	1352	1129	1515	1790	1317	1157	850
Shoubra el Kheima - Mubarak	8.1 Km	Phase 1A	96.Oct	5,850	537		21	175	946	1368	1262	506	665	590	317		
Mubarak - Sadat	2.8 Km	Phase 1B	97.Sep														
Sadat - Cairo University	5.1 km	Phase 2A	1999.Dec	2,270	445						90	623	600	500	200	157	100
Cairo University - El Giza	3.19 km	Phase 2B		3,500	1,097								250	700	800	1000	750
USES																	
(Permanent Way)				352					30	45	40	15	25	45	32	60	60
(Signalling System)				617		8			20	25	35	50	65	187	72	75	80
(Rolling stock)				3004		42	119	122	3	22	714	105	277	380	380	480	360
(Power Supply)				1034		15	29	70	75	150	135	150	75	110	80	80	65
(Toll Equipment)				977		12	40	35	60	100	60	180	90	125	95	95	85
(Other)				6197		41	21	77	849	1047	379	632	983	943	658	367	200
SOURCES																	
(the National Bank of Investment)				4299		50	60	59	405	640	532	342	505	596	439	387	284
(Arento)				3698				157	390	296	332	315	505	596	439	385	283
(Foreign loans)				303		60	119	71	32	15	5	1					
local loan (NAB, MISR BANK)				3415						285	490	430	505	598	439	385	283
(Grants & subsidies)																	
(others)				466		8	30	17	210	153	4	44					
National authority for tunnel				12181		118	209	304	1037	1389	1363	1132	1515	1790	1317	1157	850

Source: National Authority for Tunnel

3.9 FINANCIAL ANALYSIS

Financial analysis will be conducted to identify problems of ENR from a management point view. Financial analysis will be carried out by the following methodologies which contain volume effect & price effect analysis, break even point analysis, productivity analysis (value added analysis etc.), asset turnover analysis (fixed assets evaluation) and cash flow analysis.

3.9.1 Volume Effect & Price Effect Analysis
3.9.2 Break Even Point Analysis
3.9.3 Productivity Analysis
3.9.4 Asset Turnover Analysis
3.9.5 Cash Flow Analysis

3.9.1 Volume Effect & Price Effect Analysis
(Table 3.9.1)

Revenue increase is one of the basic strategies to achieve financial viability. Volume effect and price effect analysis are conducted on ENR excluding Metro and on Metro. Increased revenue consists of volume increase and/or price increase. In terms of profit, price effect is much more important than volume effect because price effect directly increases profit. Volume increase is comprised of number of passengers or tons and traffic distance.
Volume effect is calculated as follows.
[(previous year price) x (current year volume)] - [(previous year price) x (previous year volume)]

Price effect is calculated as follows.
[(current year price) x (current year volume)] - [(previous year price) x (current year volume)]

(1) ENR (excluding Metro)

Increased revenue of each year is analyzed from the price effect and volume effect point of view as shown in table 3.9.1.

1) Passenger
Passenger revenue increased 16.6% annually in the past 5 years. Passenger revenue increased by LE 180 million from 90/91 through 94/95. LE 80 million was from price effect. LE 100 million was volume effect. Passenger tariffs rose every year since 88/89. The annual average tariff raise rate was 22.7% over the period 88/89 through 94/95.
However annual average price (defined as revenue divided by passenger-km) rose by 11.5% over the same period. In other words, only 50% of the tariff increase rate was reflected to increased revenue.
Volume effect played a big role to increase passenger revenue in the past 5 years.

2) Freight
Freight revenue increased 23% annually in the past 5 years. Freight revenue increased by LE 110 million from 90/91 through 94/95. LE 30 million was from volume effect. LE 80 million was from price effect. Freight tariff rose every year since 88/89. Annual average tariffs rose 19.9% from 88/89 through 94/95. Annual average price (defined as revenue divided by ton-km) rose 18.4% over the same period. So 93% of tariff increase rate

contributed to increased revenue.
Price effect was the main factor to increase freight revenue in the past 5 years.

3) Total
The total price and volume effect on ENR (excluding Metro) was LE 260 million over the period 90/91 through 94/95. LE 167 million was price effect. LE 93 million was volume effect. Price effect has a direct impact on profit. So tariff raise should be considered first to improve ENR's financial condition.

(2)Metro
(Table 3.9.2)

Revenue increased 15.8% annually in the past 5 years. Passenger revenue increased LE 38 million over the period 90/91 through 94/95. LE 52 million was volume effect. Price effect was negative because the price of 91/92 went down by 40% compared with 90/91 (as calculated from total revenues ÷ passenger-km). However, Metro didn't decrease prices in 91/92. The Study Team tried to investigate this data difference with ENR, but accurate data was not available.
Increased revenue of each year at Metro was also analyzed from the price effect and volume effect point of view.
Volume effect was the main factor to increase Metro revenue rather than price effect in the past five years.

3.9.2 Break Even Point Analysis

Railway operations require large capital investments for track, signals, rolling stock, etc. Fixed assets consist of 90% of total assets approximately. Railway operation also requires a large labor force. Depreciation and interest costs related to large capital investment are fixed costs. Labor is also a fixed cost. To control revenue is very important to cover large fixed costs. Therefore break even point analysis is important.
In break even point analysis, expenses are divided into fixed and variable costs. The formula for computing the break even point is as follows.

break even point = fixed cost ÷ [1-(variable cost ÷ revenue)]

In break even point analysis, the classification of fixed cost and variable cost are based on assumptions in some period or production level. Based on these assumptions, the costs which are must be paid, unrelated to production volume are defined as fixed costs. Costs which fluctuate with production volume are defined as variable costs. Over a long time such as 5 years, depreciation and personnel costs can increase or decrease as production increases or decreases. However, depreciation and personnel costs are not classified as variable cost

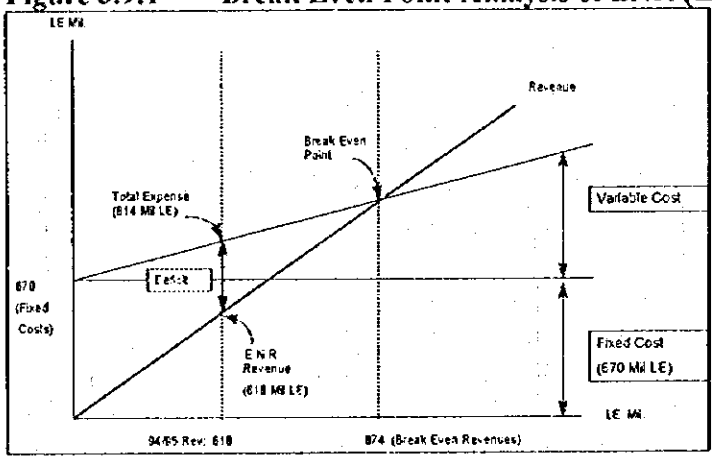
(1) Analysis of ENR (excluding Metro)

1) Calculation based on ENR standard
According to ENR data , variable and fixed costs in 94/95 were LE 380 million and LE 438 million respectively. However wage and depreciation costs in 94/95 were LE 526 million, which exceeded total fixed costs as defined by ENR, LE 438 million. These figures are

calculated based on ENR's cost accounting system developed around 15 years ago by Ross system (a Canadian consulting firm). From a cost accounting point of view, part of wages can be classified into variable cost. However, from the management analysis point of view, all wages should be considered as fixed costs. This is because it is very difficult for ENR to reduce employees in the short term. That is the reason why ENR's figure concerning fixed costs are different from the figures calculated by the Study team.
Variable and fixed costs are used for both cost accounting and management analysis.
According to ENR data based on cost accounting, its break even point is estimated at LE 1,138 million in 94/95. LE 1,138 million is 1.84 times larger than revenue in 94/95. This analysis shows that to achieve break even point revenue is very difficult at ENR in the short term.

Break even point analysis is also conducted by service. According to ENR data, variable cost is also subdivided into passenger and freight service. Variable cost for freight service in 94/95 was LE 151 million, which exceeded freight revenue. This means that the freight business is in a very difficult financial condition. Because freight revenue can't even cover variable costs. In other words, expanding freight service will expand losses.

Figure 3.9.1 Break Even Point Analysis of ENR (Excluding Metro) (94/95)



1) Calculation based on Study Team classification
(Table 3.9.3)
According to Study Team classification, wages and depreciation are classified as fixed costs from the management analysis point of view. 50% of material and service inputs are classified as fixed costs. Based on these assumptions: - Fixed cost is estimated to be 82% of total costs.

- Variable cost ratio is 23% in 94/95.
- Break even point sales are estimated at LE 874 million in 94/95.
- LE 874 million is 41% bigger than real revenue in 94/95.
- Break even point traffic units are estimated at 89,120 million.

Break even point traffic units are calculated as follows.

Break even point traffic unit =

fixed cost ÷
{(pass-rev ÷ pass-km)+(frei-rev ÷ ton-km)} -
{variable cost ÷ (pass-km + ton-km)}

This shows that to balance revenues and expenses, ENR must increase revenue by 41%, or reduce fixed costs by LE 196 million (29% reduction of fixed cost). In the short term, it is very difficult for ENR to achieve either one without a drastic plan which means a sharp tariff increase and/or huge employee reduction.

(2) Analysis of Metro
(Table 3.9.4)

According to Study Team classification, wages and depreciation are classified as fixed costs. 50% of material and service inputs are classified as fixed costs. Based on these assumptions:

- Fixed cost is estimated to equal of 87% of total costs.
- Variable cost ratio was 36.5% in 94/95.
- Break even point sales is estimated at LE 283 million in 94/95.

LE 283 million revenue is 3.83 times bigger than real revenue in 94/95. Break even point passenger-km is estimated at 17,624 million passenger-km (actual 94/95 passenger-km was 4,596 million).

Break even point passenger km = fixed cost ÷ {(pass-rev ÷ pass-km)-(variable cost ÷ pass km)}

Break even point sales in 92/93, 93/94 and 94/95 were LE 266 million, LE 278 million and LE 283 million respectively. The ratio of break even point sales to total revenue improved slightly from 4.31 in 92/93 to 3.83 in 94/95. But real revenue is still far below break even point sales because depreciation (the main component of fixed cost) is very large and exceeds revenue very much.

1) Analysis of line 2
As explained in 3.8.2, operation of line 2 will be a big financial burden due to large depreciation cost. Depreciation is estimated to increase from LE 100 million to LE 140 million annually. Marginal profit ratio (1-variable cost)÷(revenue) is estimated at 63.5% in 94/95. If this marginal profit ratio is used, revenue must increase by LE 157 million to LE 220 million to cover increased depreciation. But LE 157 million to LE 220 million is very large compared with LE 73.8 million which was the revenue of line 1 in 94/95.

From the break even point analysis point of view, reducing fixed costs and increasing revenue are the main solutions to cover line 2 cost. There are two ways which contain price effect and volume effect to increase revenue. But raising price can decrease volume, price rises must be analyzed to make sure they do not reduce volume too much. In other words, tariff raise has limitations. On the other hand, to reduce fixed costs, treatment of depreciation is important. If some fixed assets such as permanent way are owned by the government, depreciation cost would be reduced.
In the case of line 2, some action regarding treatment of depreciation should be considered.

(3) Financial impact of separation of infrastructure and train operation

According to the break even point analysis above, fixed costs, especially depreciation, are relatively large. So reducing depreciation cost is one method to improve the break even point. To do this, separating infrastructure and train operation should be considered. Infrastructure is defined as track, buildings, bridges, tunnels, signaling, etc. The cost of related infrastructure accounts for depreciation, interest and maintenance, a large part of expenses. The

depreciation of infrastructure in 94/95 was LE 102 million which accounts for 43% of total depreciation cost. The maintenance cost of infrastructure in 94/95 is estimated to have been LE 102 million. Therefore total cost related infrastructure is estimated at LE 204 million. The current deficit of ENR in 94/95 was LE 196 million. If cost related infrastructure in 94/95 was borne by government, ENR would have eliminated its deficit.
As for Metro, the depreciation cost of infrastructure in 94/95 was LE 60 million which accounts for 42% of total depreciation cost. The maintenance cost of infrastructure in 94/95 is estimated to be LE 87 million. As a result, total cost related Metro infrastructure is estimated to have been LE 147 million. The current deficit of Metro in 94/95 was LE 133 million. If cost related infrastructure in 94/95 was borne by the government, Metro would have avoided a deficit. Total cost related infrastructure of ENR (including Metro) is LE 351 million, which accounts for 34% of total cost. If total cost related infrastructure was borne by government, ENR (including Metro) would see a profit of LE 22 million in 94/95. As analyzed above, separating infrastructure and train operation has a big impact on financial improvement of ENR.

Table 3.9.5 Composition of Fixed assets (94/95) (units: million LE)

Item	ENR		Metro		Total	
Fixed assets	7,097	100 %	3,604	100 %	10,701	100 %
Infrastructure	2,713	38 %	2,303	64 %	5,016	47 %
Other	4,384	62 %	1,301	36 %	5,685	53 %

There are big differences between ENR and Metro in terms of composition of fixed assets. As for ENR excluding Metro, infrastructure-related fixed assets accounted for 38% of total fixed assets in 94/95. As for Metro, infrastructure-related fixed assets accounted for 64% of total fixed assets in 94/95. In addition, ENR excluding Metro may face replacement of many locomotives after 2003. Therefore, separating infrastructure and train operation seems to be more suitable for Metro than for ENR.

3.9.3 Productivity Analysis

(1) Value added analysis
(Table 3.9.6)

Value added analysis is conducted in order to analyze the productivity. There are several ways to calculate value added. Value added is one important measure for management. Value added is value produced in the process of making goods and services. In general, value added consists of personnel cost, interest cost, depreciation cost, and profit. Value added is distributed to each management resource such as labor, capital, and assets. Therefore the main purpose of a company should be increase value added. If a company can't produce enough value added, the company can't distribute enough value added to each management resource. Productivity of employees is analyzed by using value added analysis. Value added of ENR is very low due to the deficit. Value added of ENR in 94/95 was LE 330 million, which is only 14% higher than personnel cost. In other words, 88% of value added of ENR is distributed to labor. The share of wages to revenue was 47% in 94/95. The share of wages to total cost was 36% in 94/95. Although both ratios are relatively low from an international comparison point of view, the ratio of wages to value added is high.

The share of each component of value added to the total in both ENR and JR East are as follows.

Table 3.9.7 The ratio of each factor to value added

Item	ENR	JR East
wages	88%	46%
interest charge	0	21%
taxes	0	5%
depreciation	72%	19%
profit	-59%	8%
TOTAL	100%	100%

There are many differences between ENR and JR East in terms of value added. First, ENR is losing money, so ENR's value added is eroded by deficit. Second, ENR hasn't been paying taxes and interest. That is why ENR's value added distribution to wages is very high.

From the management point of view, the share of ENR's value added distribution to wages should be reduced. On the other hand, real wages per employee should be kept above the current level. To meet both requirement, ENR should increase labor productivity (defined as value added divided by employee). According to the study team, the consumer price index is estimated to increase 8% in 95/96, 7.5% annually over the period 96/97 through 2000/2001, 7% in 2001/2002. If real wages increase 1% annually, nominal wages must increase 9% in 95/96, 8.5% annually over the period 96/97 through 2000/2001, and 8% in 2001/2002. To increase labor productivity, the annual rate of labor productivity should rise more than wages increase. As known by definition of labor productivity, there are two ways to increase labor productivity : (1) increase value added ; (2) reduce the number of employees. In regard to the number of employees, according to study team predictions, the number of employees can decrease 4.5% and 3% annually in "Case 1/2 -1 and 1/2 -2 respectively by curbing recruitment. If so, value added would be increased by over 4% annually. In the "Case 1-1" shown in table 9.1.16, value added is estimated to increase 12.8% annually and labor productivity is estimated to increase 17.2% annually. In this case, traffic unit per employee is estimated to increase 6.3% annually. As a result, the share of value added distribution to wage will be reduced from 88% in 94/95 to 51% in 2001/2002. The share of value added distribution to wages will approach toward the same level as the current situation of JR East.

(2) Traffic units per employee
(Table 3.9.8)

Traffic units are defined as the sum of passenger-km and ton-km. Staff productivity measured by traffic units per employee has improved. Traffic unit per employee (actual) amounted to 746,786 in 94/95. Traffic unit per staff has improved 5.7% annually in the past 2 years (data on actual employee numbers are available only for 92/93, 93/94, and 94/95). Traffic units per staff (estimate) improved 4.7% annually in the past 4 years. According to the railway gazette yearbook in 1995, the level of 576,000 traffic units per employee of ENR in 1992 is much higher than African countries level and is comparable with Western Europe Countries as shown in table 3.9.8.
According to the table 3.9.8, the level of traffic unit per staff of ENR isn't low compared with African countries and some Western Europe Countries. However if this figure is compared with developed countries, there are many differences.

(3) Fixed assets/employee

For the purpose of increasing productivity efficiently, employees need appropriate equipment and facilities. Optimal distribution of management resources such as staff and equipment are important. Fixed assets per employee is one way to measure how much equipment is distributed to each employee.
Labor productivity is calculated by the following formula.

Value added ÷ staff = (value added ÷ fixed assets) x (fixed assets ÷ staffs)

Labor productivity which is represented as value added divided by staff is broken down into (value added)÷(fixed assets) and (fixed assets)÷(staffs). The level of (fixed assets)÷(staffs) is important to increase labor productivity.

3.9.4 Asset Turnover Analysis
(Table 3.9.9, 3.9.10, 3.9.11)

Return on assets is a main indicator of profitability. Return on assets is calculated as follows.

Return on assets = (profit ÷ revenue) x (revenue ÷ assets)

To improve return on assets, the asset turnover ratio (revenue ÷ assets) should be increased. The asset turnover ratio is a good indicator to measure asset productivity. Asset turnover is defined as (revenue ÷ assets). The assets turnover ratio of ENR in 94/95 was very low both from a historical point of view and by international comparison, and hasn't improved in the past several years.

The low asset turnover ratio is from 2 factors : (1) low revenues ; (2) relatively large assets. Low revenue is because of low prices. Relatively large assets result from low utilization of fixed assets and low accumulated depreciation. Fixed asset evaluation could be conducted by using asset turnover ratio analysis.

(1) Asset turnover ratio in the past

1) ENR (excluding Metro)
Total assets turnover ratio in 94/95 was 0.053. According to " Performance Evaluation of the ENR with a Reform Program for the 1990's " shown in table 3.8.9, this ratio was 0.18 in 1970 and 1971. The asset turnover ratio was above 0.1 until 1977. However, this ratio decreased partly because of huge capital expenditures in the 1980's, and partly because of slow tariff increases.

2) Metro
The asset turnover ratio is extremely low due to huge investments and relatively low ticket prices. Total assets turnover ratio in 94/95 was 0.019. Fixed assets turnover ratio in 94/95 was 0.02.

(2) Asset turnover ratio in the future

As explained before, ENR's current asset turnover ratio is very low. In 94/95, the total asset turnover ratio of ENR was 0.053, and the fixed assets turnover ratio was 0.087. Future asset turnover ratios will be determined by future revenues and assets. If the asset turnover ratio and fixed asset turnover ratio remain at the current level, total assets and fixed assets will be LE 22,195 million and LE 13,424 million respectively in 2001/2002, assuming "Case 1-1". Consequently total assets and fixed assets will increase by LE 10,461 million and LE 6,327 million respectively over the period 95/96 through 2001/2002.
Assume ENR sets targets for its fixed assets turnover ratio in 2001/02. Annual revenue growth rate is forecast at 9.5% for the period 95/96 through 2001/02 in "Case-1-1". Therefore, as shown in the table below, target ratios of 0.1 and 0.115 require target fixed assets of LE 11,690 million and LE 10,165 million respectively.
Total fixed assets will change depending on fixed assets turnover ratio as follows.

Table 3.9.12 Fixed asset turn over ratio = (Revenue) ÷ (Fixed Assets)

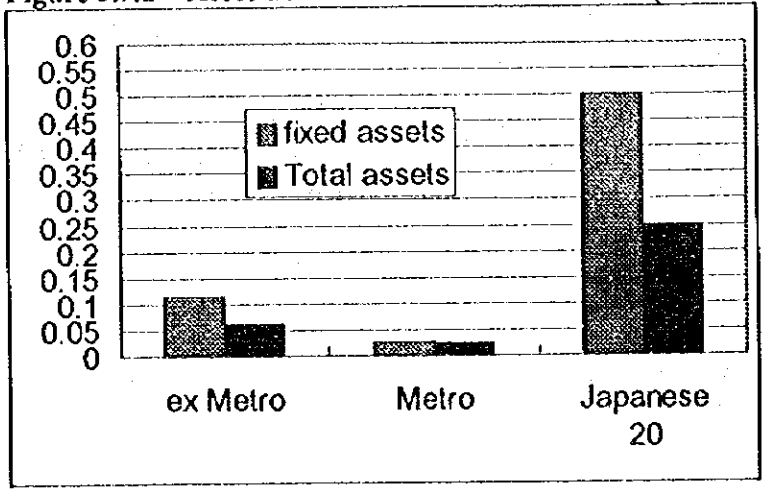
fixed assets turnover ratio	estimated fixed assets in 2001/2002	fixed asset increase from 94/95 to 2001/2002	annual average increase
Case 0.087	13,424	6,327	904
Case 0.100	11,690	4,593	656
Case 0.115	10,165	3,068	438

(unit: million LE)

(3) Comparison with Japan Railway East (JR East)

The assets turnover ratio of JR East was 0.29 in 1995. The average asset turnover ratio of 20 Japanese railway companies on the Tokyo stock exchange was 0.25 in 1995. The fixed asset turnover ratio of JR East was 0.32. Average fixed asset turnover ratio of 20 Japanese railway companies was 0.5.
As explained above, the asset turnover ratio and fixed asset turnover ratio of ENR were 0.053 and 0.087 respectively in 94/95.
Some differences between ENR and Japanese railway companies in respect to the asset turnover ratio are the following factors.

Figure 3.9.2 Asset Turnover of ENR 1994/95 (Units: millions)



1) Accumulated depreciation

The ratio of accumulated depreciation to fixed assets (historical cost) is analyzed. Accumulated depreciation means the amount of cost which has built up through the depreciation method. In the case of JR East, this ratio was 48% at the end of March, 1995. In the case of ENR it was 25% at the end of 94/95. ENR's lower ratio suggests that ENR has relatively new equipment or ENR doesn't take faster depreciation methods such as double declining (ENR's depreciation method is straight-line), or useful equipment life is longer. In the case of ENR, although ENR's figure is low, equipment is fairly old. Therefore, ENR's low ratio of accumulated depreciation to fixed assets results from a slow depreciation method, longer useful life, and other factors. The average useful life of a locomotive is estimated on table 3.9.13. According to this table, the average useful life of a locomotive (2475 HP, 1650 HP) is estimated to be 12.52 years and 13.82 years respectively. Useful life of a locomotive is set at 25 years in Egypt. The percentage of 12.52 years and 13.82 years to 25 years are 50% and 55% respectively. In the case of this calculation, the price factor of each locomotive hasn't been considered. However, the rough estimation conducted above is good enough to measure average useful life of a locomotive.

There are big differences between Egypt and Japan in terms of useful life of fixed assets. For example, useful life of a locomotive and coach are 25 years and 35 years in Egypt and 18 years and 13 years in Japan. Useful life in Egypt is much longer than in Japan. In general, shorter is better from the useful time point of view as understood in accordance with definition of depreciation. ENR should collect the cost of fixed assets through depreciation as soon as possible from the management point of view.

There is a special reason for the low ratio of accumulated depreciation to fixed assets in ENR. Because of the depreciation of the Egyptian pound in the 1980's, acquisition cost was revised upward from the beginning of acquisition as shown on table 3.9.14. For example, in the case of locomotive number 3606, the initial cost was LE 766,811 in 1983. However, the cost has been revised upward to LE 1,554,750 in 1993 due to depreciation of the Egyptian pound. Consequently, the ratio of accumulated depreciation to cost is lower than the theoretical figure which is 40%. ENR relies on imported goods such as rolling stock. So stability of the Egyptian pound against foreign currency is very important for management.

Table 3.9.14 Depreciation of Locomotive number 3606

First service year	initial cost (LE)	additional cost	Total (A)	accumulated depreciation (LE) (B)	annual depreciation (LE) (C)	% (C) ÷ (A)	% (B) ÷ (A)
1983	766,811		766,811		30,672	4.0	
1983		443	767,254				
1983		140	767,394				
1984		30,000	797,394				
1984		5,000	802,394				
1987		115,962	918,356				
1988		459,805	1,378,161				
1989		111,477	1,489,638				
1990		61,614	1,551,252				
1993		3,498	1,554,750	522,395	71,208	4.6	33.6

2) Fares
ENR season ticket prices are very low, and the difference between season ticket and normal ticket prices is relatively large, compared with Japanese railway companies.

3) Assets
The ENR asset utilization rate seems low, due to the following factors : (1) low rolling stock availability ; (2) many accidents ; (3) many unprofitable lines.

3.9.5 Cash Flow Analysis (Tables 9.1.20, 9.1.21, 9.1.22, 9.1.23, 9.1.24)

Cash flow analysis is also very important for management. Cash flow is the sum of profit and non-cash charges, principally depreciation. In other words, cash flow represents profit before depreciation. Cash flow in 94/95 was LE 40.7 million. Free cash flow is defined as cash flow available after financing all worthwhile capital expenditure. Free cash flow in 94/95 was minus LE 862 million. Cash flow is the main internal fund resource of capital expenditure and/or reducing liability. If cash flow is not large enough, ENR's capital expenditure is limited and ENR must depend on external funds such as government participation or debt. Free cash flow is the main resource for future business expansion.
Cash flow of ENR was negative from 1978 to 91/92 and 93/94. Even so, capital expenditure was higher than depreciation. As a result, free cash flow was negative for a long time. Consequently, external debts expanded rapidly in the 1980's. Instead of debt, government participation increased since 90/91.

(1) Financial impact of the change of government support
As shown in 3.8.1, government support for ENR capital expenditure will change from 98/99. The primary resource for capital expenditures will be internal funds (cash flow). But according to our financial forecast, ENR will lose money even in 2001/02. Even in 2001/02, cash flow will remain below LE 290 million in "Case 1-1", as shown in tables 9.1.21 to 9.1.24. If ENR continues its large capital expenditures, ENR must use external debt to finance the gap between capital expenditure and cash flow as shown in table 9.1.20 to 9.1.24. For example, even in "Case 1-1", debt would be around LE 981 million in 2001/2002.

(2) Lesson from Japan Railway East
The example of JR East is relevant. JR East is the biggest railway company among JR companies established after separation of JNR in April, 1987. JR East established a financial policy that investments should be below depreciation. For example, depreciation and capital expenditure were ¥1,958 billion and ¥1,447 billion respectively from fiscal year 1987 through 1994. This means that cash flow and free cash flow was positive. Positive free cash flow was used to reduce external debts. Long-term debt fell from ¥3,030 billion in March, 1988 to ¥2,085 billion in March, 1995. Consequently, financial condition improved much more than before separation of JNR.

(3) Metro line 2
(Table 9.1.25, 9.1.26)
Line 2 will be operated in October, 1996. Construction cost of line 2 will be financed by the government. According to the income statement forecast of Metro, cash flow and free cash flow will continue to be negative in both "with case" and "without case".

Table 3.9.1 Price & Volume Effect Analysis of ENR(ex Metro)

		Actual 90/91	Actual 91/92	Actual 92/93	Actual 93/94	Actual 94/95
Passenger						
price in current year		0.00428	0.00532	0.00589	0.00627	0.00648
volume in current year		40951	42589	44744	46731	51282
	(A)	175.2703	226.573	263.542	293.003	332.307
price in previous year		0.004255	0.00428	0.00532	0.00589	0.00627
volume in current year		40951	42589	44744	46731	51282
	(B)	174.2588	182.281	238.038	275.246	321.538
price effect	(A)-(B)=(C)	**1.01149**	**44.2926**	**25.5041**	**17.7578**	**10.7692**
price change rate	(C)/(A)	1%	20%	10%	6%	3%
price in previous year		0.004255	0.00428	0.00532	0.00589	0.00627
volume in current year		40951	42589	44744	46731	51282
	(D)	174.2588	182.281	238.038	275.246	321.538
price in previous year		0.004255	0.00428	0.00532	0.00589	0.00627
volume in previous year		36253	40951	42589	44744	46731
	(E)	154.2674	175.27	226.573	263.542	293.003
volume effect	(D)-(E)=(F)	**19.9914**	**7.01064**	**11.4646**	**11.7034**	**28.5348**
	(C)+(F)=(G)	**21.00289**	**51.3032**	**36.9687**	**29.4612**	**39.304**
price effect	(C)/(G)	**5%**	**86%**	**69%**	**60%**	**27%**
volume effect	(F)/(G)	**95%**	**14%**	**31%**	**40%**	**73%**
Freight						
price in current year		0.02207	0.02484	0.03039	0.03206	0.03799
volume in current year		3162	3213	3142	3621	4072
	(A)	69.78534	79.8109	95.4854	116.089	154.695
price in previous year		0.017671	0.02207	0.02484	0.03039	0.03206
volume in current year		3162	3213	3142	3621	4072
	(B)	55.87444	70.9109	78.0473	110.042	130.548
price effect	(A)-(B)=(C)	**13.9109**	**8.90001**	**17.4381**	**6.04707**	**24.147**
price change rate	(C)/(A)	20%	11%	18%	5%	16%
price in previous year		0.017671	0.02207	0.02484	0.03039	0.03206
volume in current year		3162	3213	3142	3621	4072
	(D)	55.87444	70.9109	78.0473	110.042	130.548
price in previous year		0.017671	0.02207	0.02484	0.03039	0.03206
volume in previous year		3045	3162	3213	3142	3621
	(E)	53.80698	69.7853	79.8109	95.4854	116.089
volume effect	(D)-(E)=(F)	**2.06746**	**1.12557**	**-1.76364**	**14.5568**	**14.4591**
	(C)+(F)=(G)	15.97836	10.0256	15.6745	20.6039	38.606
price effect	(C)/(G)	**87%**	**89%**	**111%**	**29%**	**63%**
volume effect	(F)/(G)	**13%**	**11%**	**-11%**	**71%**	**37%**
price effect(pass+Frei)		14.92239	53.1926	42.9422	23.8049	34.9162
volume effect(pass+Frei)		22.05886	8.13621	9.70096	26.2602	42.9938
Total		36.98125	61.3288	52.6431	50.0651	77.91
price effect(pass+Frei)		**40%**	**87%**	**82%**	**48%**	**45%**
volume effect(pass+Frei)		**60%**	**13%**	**18%**	**52%**	**55%**

Table 3.9.2 **Price & Volume Effect Analysis of ENR(Metro)**

		Actual 90/91	Actual 91/92	Actual 92/93	Actual 93/94	Actual 94/95
price in current year		0.02048	0.01283	0.01439	0.01557	0.01606
volume in current year		2041	3928	4280	4367	4596
	(A)	41.79968	50.39624	61.5892	67.99419	73.81176
price in previous year		0.01975	0.02048	0.01283	0.01439	0.01557
volume in current year		2041	3928	4280	4367	4596
	(B)	40.30975	80.44544	54.9124	62.84113	71.55972
price effect	(A)-(B)=(C)	**1.48993**	**-30.0492**	**6.6768**	**5.15306**	**2.25204**
price change rate	(C)/(A)	4%	-60%	11%	8%	3%
price in previous year		0.01975	0.02048	0.01283	0.01439	0.01557
volume in current year		2041	3928	4280	4367	4596
	(D)	40.30975	80.44544	54.9124	62.84113	71.55972
price in previous year		0.01975	0.02048	0.01283	0.01439	0.01557
volume in previous year		1792	2041	3928	4280	4367
	(E)	35.392	41.79968	50.39624	61.5892	67.99419
volume effect	(D)-(E)=(F)	**4.91775**	**38.64576**	**4.51616**	**1.25193**	**3.56553**
	(C)+(F)=(G)	**6.40768**	**8.59656**	**11.19296**	**6.40499**	**5.81757**
price effect	(C)/(G)	23%	-350%	60%	80%	39%
volume effect	(F)/(G)	77%	450%	40%	20%	61%

Table 3.9.3 **Break Even Point Analysis of ENR (excluding Metro)**

(unit: million L.E)

		Actual 89/90	Actual 90/91	Actual 91/92	Actual 92/93	Actual 93/94	Actual 94/95
Total Revenues	(A)	263.6	308.6	378.7	484.2	542	618.4
Total expenses	(B)	623	742.4	630.1	701	787	814.3
Wages		179	195.5	213.1	238.9	270	289.2
Material inputs		81	94	159.6	185.9	219	224.6
Service inputs		41	50.9	39.8	35.4	41	52.2
Interest		188	220	0	0	0	0
Depreciation		117	154	174.7	224	241	236.6
Other expenses		17	28	42.9	16.8	16	11.7
Fixed cost	(F)	553.5	655.95	508.95	581.95	649	670.05
Variable cost	(G)	69.5	86.45	121.15	119.05	138	144.25
Variable cost/Revenue	(G)/(A)	0.263657	0.280136	0.31991	0.245869	0.254613	0.233263
1-(variable cost/revenue)	1-(G)/(A)=(H)	0.736343	0.719864	0.68009	0.754131	0.745387	0.766737
Break Even Point Sale	(F)/(H)=(I)	751.69	911.21	748.36	771.68	870.69	873.90
Current Deficit		-359.4	-433.8	-251.4	-216.8	-245	-195.9
BEP/Total Revenue	(I)/(A)	2.85	2.95	1.98	1.59	1.61	1.41

Source: JICA Study Team

Table 3.9.4 **Break Even Point Analysis of Metro**

(unit: million L.E)

		Actual 89/90	Actual 90/91	Actual 91/92	Actual 92/93	Actual 93/94	Actual 94/95
Total Revenues	(A)	35.4	41.8	50.4	61.6	68	73.8
Passenger Km(Mil)	(B)	1792	2041	3928	4280	4367	4596
Number of Passenger(Mil)	(C)	127.997	146.455	280.528	305.748	311.948	328.306
Pass Rev/Pass Km	(D)	0.019754	0.02048	0.012831	0.014393	0.015571	0.016057
Total expenses	(B)	167	218.4	124.9	196	198	206.6
Wages		6	6.6	7.2	7.6	8	9.1
Material inputs		18	14.1	36.2	30.3	39	30.3
Service inputs		5	6.1	11.1	11.8	13	23.6
Interest		114	130	0	0	0	0
Depreciation		24	61.6	70.4	146.3	138	143.6
Other expenses		0	0	0	0	0	0
Fixed cost	(F)	155.5	208.3	101.25	174.95	172	179.65
Variable cost	(G)	11.5	10.1	23.65	21.05	26	26.95
Variable cost/Revenue	(G)/(A)	0.324859	0.241627	0.469246	0.341721	0.382353	0.365176
1-(variable cost/revenue)	1-(G)/(A)=(H)	0.675141	0.758373	0.530754	0.658279	0.617647	0.634824
Break Even Point Sale	(F)/(H)=(I)	230.32	274.67	190.77	265.77	278.48	282.99
Fixed cost/Pass Km	(F)/(B)=(J)	0.086775	0.102058	0.025776	0.040876	0.039386	0.039088
Variable cost/Pass Km	(G)/(B)=(K)	0.006417	0.004949	0.006021	0.004918	0.005954	0.005864
P-(variable cost/Pass Km)	(D)-(K)=(L)	0.013337	0.015532	0.00681	0.009474	0.009618	0.010194
Break Even Point Pass Km	(F)/(L)=(M)	11659.25	13411.37	14867.66	18465.75	17883.9	17623.72
Current Deficit		-131.6	-176.6	-74.5	-134.4	-130	-132.8
BEP/Total Revenue	(I)/(A)	6.51	6.57	3.79	4.31	4.10	3.83
BEP/Pass Km	(M)/(B)	6.51	6.57	3.79	4.31	4.10	3.83

Source: JICA Study Team

Table 3.9.6 **Productivity Analysis of ENR(ex Metro)** (unit: million LE)

		Actual 90/91	Actual 91/92	Actual 92/93	Actual 93/94	Actual 94/95
Value Added total	(A)	135.7	136.4	246.1	266	329.9
(Personnel Cost)	(B)	195.5	213.1	238.9	270	289.2
(Interest)	(C)	220				
(Depreciation)	(D)	154	174.7	224	241	236.6
(Profit)	(E)	-433.8	-251.4	-216.8	-245	-195.9
Number of Employee	(F)			68996	70187	71374
Per-Head Value Added	(A)/(F)			0.00356687	0.00378988	0.00462213
Personnel Cost / Value Added	(B)/(A)			97%	102%	88%
Interest / Value Added	(C)/(A)					
Depreciation / Value Added	(D)/(A)			91%	91%	72%
Profit / Value Added	(E)/(A)			-88%	-92%	-59%
Revenue	(G)	308.6	378.7	484.2	542	618.4
Per-Head Value Added	(A)/(F)			3567	3790	4622
Per-Head Sales	(G)/(F)			7018	7722	8664
Value Added / Sales	(A)/(G)	44%	36%	51%	49%	53%
Personnel Cost / Sales	(B)/(G)	63%	56%	49%	50%	47%
Personnel Cost / Value Added	(B)/(A)	144%	156%	97%	102%	88%
Per-Head Labor Cost	(B)/(F)			3463	3847	4052

Table 3.9.8 **Productivity comparison**

	(A)Traffic unit per employee(1992)	(B)wage/revenue %	(C)wage/employee, US$	(D)GNP per capita, 1992 $	(C)/(D)
Egypt	576	56	876	640	1.37
Belgium	370	271	55572	20880	2.66
Britain	343	95	34351	17790	1.93
Finland	576	81	33593	21970	1.53
France	566	102	41296	22260	1.86
Greece	206	249	17197	7290	2.36
Holland	639	99	38365	20480	1.87
Morocco	505	48	5874	1030	5.70
Poland	325	50	2660	1910	1.39
Portugal	373	149	13728	7450	1.84
Spain	539	128	37640	13970	2.69
Sweden	980	70	44524	27010	1.65
Turkey	312	205	12433	1980	6.28
Romania	277	51	3179	1130	2.81
Bulgaria	189	76	3220	1330	2.42
Hungary	178	81	4329	2970	1.46
South Africa	1005	87	13400	2670	5.02

source:Railway Gazette Yearbook

Table 3.9.9 Assets turn over of ENR (Including Metro)unit:million LE)

	90/91	91/92	92/93	93/94	94/95
Total Revenues	350.4	429.1	545.8	610	692.2
Total fixed assets(gross)	5885	5917	8489	9820	10604
Projects under construction	2475	3180	2328	2174	2318
Total assets(gross)	9511	10748	12955	14339	15663
Provision(depreciation)	1076	1289	1627	2004	2370
Total fixed assets(net)	4809	4628	6862	7816	8234
Total assets(net)	8435	9459	11328	12335	13293
Asset turn over ratio					
fixed assets(gross)	0.059541	0.07251986	0.064295	0.062118	0.065277
Total assets(gross)	0.036842	0.03992371	0.04213	0.042541	0.044193
fixed assets(net)	0.072863	0.09271824	0.079539	0.078045	0.084066
Total assets(net)	0.041541	0.0453642	0.048181	0.049453	0.052073

Table 3.9.10 Assets turn over of ENR 1994/95(unit:million LE)

	Metro	ENR Ex.Metro
Total Revenues	73.9	618
Total fixed assets(gross)	3604.1	7097.1
Projects under construction		2234.2
Total assets(gross)	3952.5	11733.5
Provision(depreciation)	709.5	1654.7
Total fixed assets(net)	2894.6	5442.4
Total assets(net)	3243	10078.7
Turn over ratio		
fixed assets(gross)	0.0205	0.08708
Total assets(gross)	0.01867	0.05267
fixed assets(net)	0.0255	0.11355
Total assets(net)	0.02276	0.06132

Table 3.9.11 International comparison of assets turnover ratio (Units: Local Currency,%)

	Fixed assets(net)(A)	accumulated depreciation(B)	total fixed assets(C)	total assets (D)	revenue (E)	revenue/fixed assets(F/A)	revenue/total assets(F/D)	(B)/{(A)+(B)}
Egypt	5,442	1,655	7,097	11,733	618	0.11	0.05	23.32%
Belgium	189,228	155,333	225,940	277,326	132,713	0.70	0.48	45.08%
Britain	6,941	3,210	7,563	8,278	3,934	0.57	0.48	31.62%
Hnland	4,326	390	4,779	6,987	3,731	0.86	0.53	8.27%
France	150,025	88,424	195,976	231,380	78,818	0.53	0.34	37.08%
Greece	201,555	29,240	254,459	484,016	31,515	0.16	0.07	12.67%
Holland	9,784	6,070	13,264	15,435	3,984	0.41	0.26	38.29%
Morocco	7,712	3,031	8,711	10,418	1,527	0.20	0.15	28.21%
Poland	80,841,955		81,425,603	98,968,865	44,584,741	0.55	0.45	0.00%
Portugal	153,532	28,809	257,547	290,633	58,081	0.38	0.20	15.80%
Spain	897,495	686,999	1,006,411	1,727,307	333,185	0.37	0.19	43.36%
Sweden	12,598		16,503	22,955	17,511	1.39	0.76	0.00%
Turkey	16,591,245	10,148,115	21,031,735	26,292,311	6,147,679	0.37	0.23	37.95%
Romania	1,389,273	152,450	1,446,473	1,803,433	552,077	0.40	0.31	9.89%
Bulgaria	3,069	222	3,903	8,045	7,758	2.53	0.96	6.75%
Hungary	424,407	3,961	441,174	476,014	82,854	0.20	0.17	0.92%
South Africa	21,014	3,022	21,365	22,321	8,531	0.41	0.38	12.57%
Average						0.60	0.35	

Source : World Railway Statistics, UIC

Table 3.9.13 **Number of locomotives by first service year**

Type	2475 HP			1650HP			Old American			shunting		
first service year	number(A)	years(B)	(C)=(A)*(B)	number(A)	years(B)	(C)=(A)*(B)	number(A)	years(B)	(C)=(A)*(B)	number(A)	years(B)	(C)=(A)*(B)
1970							137	25	3425	38	25	950
1971									0			0
1972									0			0
1973							17	22	374	29	22	638
1974									0			0
1975									0	24	20	480
1976	22	19	418				14	19	266			
1977	27	18	486									
1978	13	17	221	31	17	527						
1979	29	16	464			0						
1980	25	15	375	63	15	945						
1981	21	14	294	20	14	280						
1982	45	13	585	83	13	1079						
1983	17	12	204	59	12	708						
1984	32	11	352									
1985	41	10	410									
1986		9	0									
1987		8	0									
1988	15	7	105									
1989		6	0									
1990	6	5	30									
1991		4	0									
1992	11	3	33									
1993	13	2	26									
1994	3	1	3									
1995												
Total	320		4006	256		3539	168		4065	91		2068
average service years (C)/(A)		12.52			13.82			24.20			22.73	
(D)Total (C)			13678									
(E) Total (A)			835									
(F)Total average service years,(D)/(E)			16.38									
(G)useful time of locomotves			25									
F=(F)/(G)estimated accumulated depreciation/cost			66%									

3.9.6 Cost Recovery Ratio for Each Line/Segment

(1) Estimation method of "Cost Recovery Ratio"

As mentioned before, to know the profitability of each line/segment is one of the most important factors to improve railway management. Namely, by the cost recovery ratio, the efficiency of upgrading and changes on each line can be measured. With this in mind, the cost recovery ratio in 1994/95 was estimated.
Essentially, the estimation of the cost recovery ratio of each line needs appropriate data. Accurate estimation of revenues requires the following data for each line: revenues; number of passengers and passenger-km; freight tons and ton-km loaded and unloaded; etc. Estimation of expenses requires data for each line on wages, material inputs, service inputs, fixed assets, train operating situation, etc.
However, existing data for revenue and expenses are not separated into each line. Therefore, the cost recovery ratio is estimated with some assumptions as follows. The estimation process is shown in Figure 3.9.1.

1) Passenger revenue
Available data on passenger revenues are primarily the total revenues from each kind of passenger, not broken down by line. These revenues are allocated to each line in the following way.

a. Passenger kilometers
Data on passenger revenues from each line should consist of the share of boarding, arriving, and passing passengers on each line, but such accurate data is not available. Since these factors are closely related to the passenger kilometers on the line, the passenger revenues from each line were estimated from the passenger kilometers on each line, which were estimated by the Study Team.

b. Adjusted passenger revenue on each line
The unit of passenger revenues are not uniform by each line, because it consists of normal tickets with 1st, 2nd, and 3rd class, season tickets, kilometer tickets, and conductor tickets. The relative numbers of each type of ticket are different for each line. But this data is not broken down for each line. So the relative numbers of tickets are estimated for main lines, branch lines, suburban lines, and suburban/branch lines. The revenues of conductors on each line are estimated in proportion to the revenues on each line calculated above. Other passenger revenues on each line are also estimated in proportion to the passenger-km on each line.

2) Freight revenues
Freight revenue on each line is estimated in proportion to the freight train kilometers on each line. This is because if revenues are allocated to each line based on the loading, unloading, and passing tonnage, the many empty trains of ENR will create an unbalanced estimation. The empty trains, which deliver empty wagons, also play a part in freight revenue. The Study Team's allocation of freight revenue to each line also considered the characteristics of freight transport of each line, such as the heavy loading train on Baharia line.

3) Other revenues

Other revenues consist of revenues in previous yeas, conductors fines, later fines and others. So, it is allocated to each line in proportion to the train kilometers (passenger + freight) on each line.

4) Direct expenses

Direct expenses consist of infrastructure maintenance cost, rolling stock maintenance cost, train operation cost, and general & miscellaneous cost.

Infrastructure maintenance cost is divided into fixed cost and variable cost. Fixed cost of maintenance is allocated to each line in proportion to the track kilometer of each line. Variable cost of maintenance is allocated to each line in proportion to the train kilometers (passenger + freight) of each line. Also, the allocation of maintenance expenses considered the situation of mechanical maintenance.

Rolling stock maintenance and train operation cost is mostly related to the train kilometers, even though there are differences between passenger trains and freight trains. So rolling stock maintenance cost and train operation cost are divided into costs for passengers and cost for freight. Respective cost is allocated to the each line in proportion to the respective train kilometers (passenger train and freight train) on each line.

General & miscellaneous costs are allocated to each line, proportionate to the amount of expenses on each line.

5) Depreciation cost

Depreciation costs are divided into fixed costs and variable costs. Fixed costs are primarily from infrastructures assets, and variable costs mostly consist of rolling stock. So fixed costs are allocated to each line in proportion to track kilometers, and variable costs in proportion to train kilometers.

(2) Result of "Cost Recovery Ratio" of each line/segment

By the estimation method mentioned above, the cost recovery ratio of each line/segment was estimated as shown in Table 3.9.15, Figure 3.9.2, and Figure 3.9.3.

Further details of the estimation process and data are shown in Appendix 3.9.6

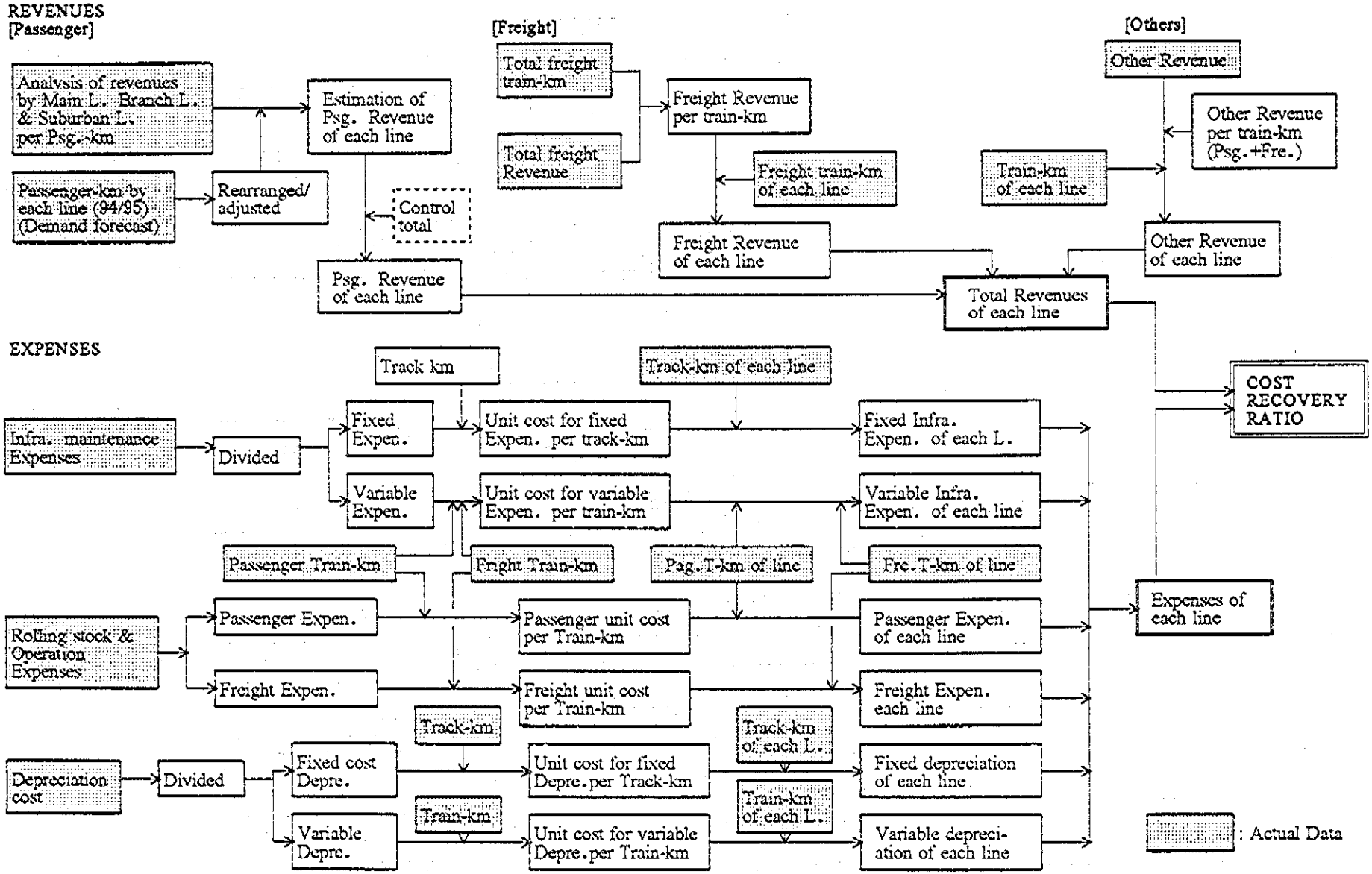


Fig. 3. 9. 3 Estimation Flow of Revenue/Expenses (Cost Recovery Ratio) of Each Line/Segment

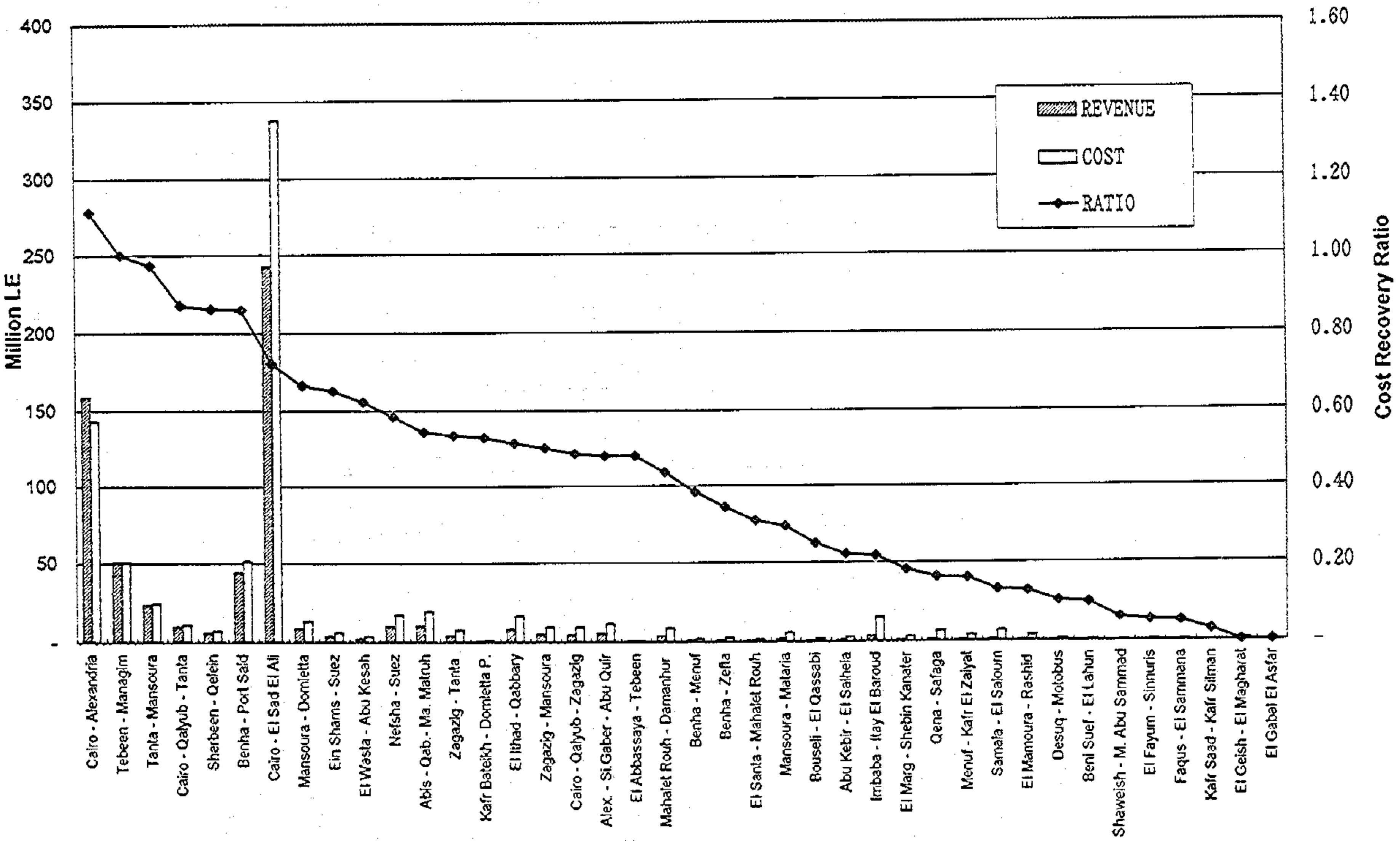
Table 3.9.15 Estimation of Cost Recovery Ratio

No.	Section/line	Route L. (km)	Revenue (1000 L.E.)				Cost Total (1000 L.E.)	Cost Recov. Ratio
			Passen.	Freight	Other	Total		
1	Cairo - Alexandria	209	110,418	12,528	35,910	158,857	142,959	1.11
2	Cairo - El Sad El Ali	898	131,073	53,645	58,052	242,770	337,703	0.72
3	Benha - Ismailia - Port Said	191	24,640	9,391	9,940	43,971	51,096	0.86
4	Tanta - Mansoura	54	14,658	3,868	5,411	23,938	24,604	0.97
	Main Line	1,352	280,790	79,433	109,314	469,536	556,361	0.84
7	Nefsha - Suez	88	2,348	5,572	2,313	10,233	17,546	0.58
8	El Mansoura - Domietta	63	4,039	3,098	2,085	9,222	13,864	0.67
9	Zagazig - Tanta	57	3,178	155	974	4,307	8,068	0.53
10	Imbaba - Itay El Baroud	120	928	1,661	756	3,346	15,433	0.22
11	Alex. - Sidi Gaber - Abu Quir	22	4,304	3	1,258	5,565	11,635	0.48
12	Cairo - Qalyub - Tanta	107	7,810	-	2,281	10,092	11,574	0.87
13	Ein Shams - Suez	129	3,019	199	940	4,158	6,392	0.65
14	El Wasta - Abu Kesah	61	1,818	25	538	2,381	3,829	0.62
15	El Marg - Shebin Kanater	21	250	156	118	524	2,892	0.18
16	El Mamoura - Rashid	66	349	12	105	466	3,684	0.13
17	Mansoura - Mataria	71	1,291	-	377	1,668	5,660	0.29
18	Cairo - Qalyub - Zagazig	77	2,761	848	1,054	4,663	9,626	0.48
19	Zagazig - Mansoura	69	3,522	254	1,103	4,878	9,753	0.50
20	Abu Kebir - El Salheia	34	446	-	130	576	2,599	0.22
21	Benha - Zefta	34	707	-	207	914	2,650	0.34
22	Faqus - El Sammana	10	28	-	8	36	704	0.05
23	Menuf - Kafr El Zaiyat	49	469	-	137	606	3,782	0.16
24	El Santa - Mahalet Rouh	19	343	-	100	443	1,430	0.31
25	Mahalet Rouh - Damanhur	74	3,009	12	882	3,903	8,964	0.44
26	Benha - Menuf	25	635	-	185	820	2,140	0.38
27	Abis - Qabbary - Marsa Matruh	304	4,719	3,528	2,409	10,656	19,617	0.54
28	Sherbeen - Qelein	82	4,835	47	1,426	6,308	7,317	0.86
29	Bouseli - El Qassabi	29	321	6	95	422	1,691	0.25
30	El Fayum - Sinnuris	12	31	-	9	40	753	0.05
31	Desuq - Motobus	27	105	6	32	144	1,401	0.10
32	El Abbassaya - Tebeen	20	-	371	108	480	1,003	0.48
33	El Geish - El Magharat	24	-	-	-	-	441	-
34	Samala - El Salourn	260	22	664	200	886	6,789	0.13
35	Tebeen - Managim	346	-	50,671	-	50,671	50,671	1.00
36	El Ithad - Qabbary	108	-	6,675	1,950	8,625	16,800	0.51
37	Beni Suef - El Lahun	25	66	-	19	85	870	0.10
38	Shaweish - M. Abu Sammad	12	15	-	5	20	333	0.06
39	El Gabal El Asfar	7	-	-	-	-	129	-
40	Kafr Saad - Kafr Silman	3	2	-	0	2	71	0.03
41	Kafr Bateikh - Domietta Port	15	-	465	136	600	1,138	0.53
42	Qena - Safaga	233	-	841	246	1,087	6,693	0.16
	Branch/Suburban	2,703	51,369	75,268	22,188	148,826	257,939	0.58
	TOTAL	4,055	332,159	154,701	131,502	618,362	814,300	0.76

Note: As for No.33, No.39 line, these data could not be available.

Fig. 3. 9. 4

COST RECOVERY RATIO OF EACH LINE (All Line)



COST RECOVERY RATIO (Less than 0.7)
Million LE
Cost Recovery Ratio
REVENUE
COST
RATIO
Mansoura - Domietta
Ein Shams - Suez
El Wasta - Abu Kesah
Nefsha - Suez
Abis - Qab.- Ma. Matruh
Zagazig - Tanta
Kafr Baleikh - Domietta P.
El Ithad - Qabbary
Zagazig - Mansoura
Cairo - Qalyub - Zagazig
Alex. - Si.Gaber - Abu Quir
El Abbassaya - Tebeen
Mahalet Rouh - Damanhur
Benha - Menuf
Benha - Zefta
El Santa - Mahalet Rouh
Mansoura - Matania
Bouseli - El Qassabi
Abu Kebir - El Sahleia
Imbaba - Itay El Baroud
El Marg - Shebin Kanater
Qena - Safaga
Menuf - Kafr El Zayat
Samala - El Salhum
El Mamoura - Rashid
Desuq - Motobus
Beni Suef - El Lahun
Shawerish - M. Abu Sammad
El Fayum - Sinnuris
Faqus - El Sammana
Kafr Saad - Kafr Sliman
El Geish - El Maghariat
El Gabal El Astar

Fig. 3.9.5

3.10 TRAIN OPERATION

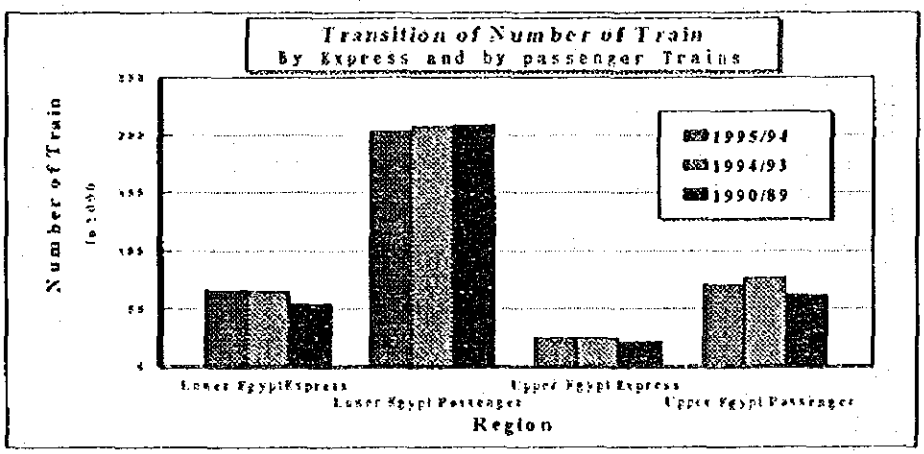
3.10.1 Transport Condition of ENR

By observing actual operation of passenger transport and analyzing relevant data, the Study Team concludes that ENR faces the following obstacles to improvement of its financial situation :

Political issues of discount system, especially for students and public workers.
Obligation to defense of the nation.
Governmental need for freight transport.
Low social income of GNP per each population.
Delayed modernization of train operation facilities.
Severe competition with road traffic.
Roads parallel to each railway line.

These issues, mentioned above, form are some of the causes of ENR's deficit. ENR is striving to improve passenger service by increasing the number of Air Condition Cars, improving its freight train operation system, etc. Bus competitors have deluxe air conditioned buses with reclining seats. ENR should increase air condition service.
A major problem is that ENR may lose competitiveness with road transport. Relatively few passengers can pay reasonable prices for 1st and 2nd air conditioned class. Most of such passengers use more convenient private cars and taxis.
Major international ports increasingly use containers transported by truck.

Fig. 3.10. 1 Express and ordinary passenger trains



Competition from road transport is having fatal effects in various regions of the Delta, as the highway network is largely completed. Competition is also spreading to Upper Egypt, with the desert road. ENR must compete based on basic factors of speed and tariff.

3.10.2 Passenger Transport

ENR transports over 30% of Egypt's passenger-km, which is comparable to the larger Japan Railways companies, and is larger than the average market share of all Japan Railway Companies.
ENR transports a large volume of passengers and passenger-km. The main line passenger

trains between Alexandria, Cairo, Luxor, and Aswan compete well with road traffic, carrying many passengers, but still have many problems from growing competition with developing road transport, and from lack of facilities and rolling stock.
The Metro in Cairo is creating a new age of urban transport, and serves as a main tool to solve the serious congestion and public annoyance of road traffic in the city center. The Metro Subway is regarded as the most important transport system for development of the city, and further lines are being constructed.

Table 3.10. 1 ENR passenger transport

Year	Number of passengers		Growth
	millions	%	
89/90	5.65	100.0%	
94/95	7.35	130.1%	5.4%

Table 3.10. 2 Passenger-Km growth

Year	Growth (all lines)
89/90	4.0%
90/91	4.2%
91/92	4.1%
92/93	4.0%
93/94	4.7%
94/95	5.4%

Source : Annual report of ENR, 1995

The following table shows running km of passenger trains from regular trains in the ENR train 199495 time table.

Table 3.10. 3 ENR passenger daily train km (regular operation, both directions)

Lower Egypt	73,223
Upper Egypt	48,633
TOTAL	121,856

Table 3.10. 4 Train Km in Lower Egypt
(from ENR Passenger Time Table, 1995)

Operation Line No.	Name of Route Between Stations	Sub Total Train Lm (both directions)	Train Km (both directions)
1	Cairo - Alexandria		17,531
1	Cairo - Tanta		518
1	Tanta - Alexandria		1,036
1	SUBTOTAL	19,085.464	0
2	Cairo - Port Said		5,836
2	Benha - Ismailia		1,661
2	SUBTOTAL	7,496.742	0
3	Suez - Ein Shams		1,576
4	Ismailia - Suez		1,649
5	Cairo-Tanta-Mansura-Damietta		2,500
5	Tanta - Mansura - Damietta		2,668
5	SUBTOTAL	5,167.900	0
6	Damietta - Kafr Saad - K. Silman		243
7	Cairo - Qalyub - Shibin - Zagazig		2,645
7	Zagazig - Abu Kebir - Mansura		1,933
7	SUBTOTAL	4,578.714	0
8	Abu Kebir - Faqus - El Salhaiya		820
9	Faqus - El Sammana included in 8		216
10	El Mansura - El Matariya		1,671
11	Cairo - Qalyub - Minuf - Tanta		3,992
12	Minuf - Kafr El Zayat		1,197
13	Benha - Minuf		698
14	Benha - Zefta - Mit Ghamr		849
15	Tanta - Zefta - Mit Ghamr - Zagazig		1,619
16	Mahalet Roh - El Santa		449
17	Tanta - Qutur - Qallin -Sherbeen		3,840
18	Tanta - Qutur - Disuq - Damanhur		2,663
19	Disuq - Fuwa - Boseley		564
20	Boseley - Motobus - El Kasabi		288
21	El Mamoura - Rashid		1,059
21	Alexandria - Abu Quir		4,328
	SUBTOTAL	5,387.020	
22	Alexandria - El Hamen - Marsa Matruh		3,555
23	Marsa Matruh - El Sallum		520
24	Etai El Barud - El Hatabi - Cairo		4,171
25	Shebeen El Kanater - El Marg		930
Total			**73,223**

Note: Line numbers shown above and in following tables are from the ENR passenger service timetable.

Table 3.10. 5 Train Km in Upper Egypt
(from ENR Passenger Train Time Table in 1995)

Operation Line No.	Name of Route Between Stations	Sub Total Train Km (both directions)	Train Km (both directions)
26	Cairo - Asyut		21,415
26	Cairo - El Wasta		736
26	El Wasta - Minya		1,632
26	Minya - Asyut		1,284
26	Asyut - El Sad El Ali		15,588
26	Asyut - Sohag		1,287
26	Sohag - Qena		2,154
26	Qena - Idfu		1,709
26	Idfu - Aswan - El Sad El Ali		1,013
	SUBTOTAL	46,818,486	
27	El Wasta - Abu Kesah		1,113
28	Fayum - Sinnuris		235
29	Beni Suef - Nazalet - El Lahoon		341
30	Monshaat Abu El Samad-Nazalet Shawish		93
31	El Roda - El Balad - El Roda El Mowasla		32
	TOTAL		**48,633**

3.10.3 Freight Transport

In Egypt, the railway share of freight ton-km is relatively small, like in Japan. To recover freight transport market share, various efforts have been made in recent years, which have had good results.

By concentrating efforts on freight of large customers and changing the freight transport system to block trains from shunting operations, the traffic volume of freight goods has begun to increase. But the competitive situation for rail freight transport is very severe, although some possibilities for increasing rail freight traffic still exist.

Table 3.10. 6 Freight Train Operations

Number of Freight Trains Operated	93/94	94/95
Loaded	10,448	10,459
Empty	9,364	9,598
Total	19,812	20,057
Mean Value of Number of trains per day		
Loaded	28.6	28.7
Empty	25.7	26.3
Total	54.3	55.0
Freight Train running Km		
Loaded	3,121,100	3,270,765
Empty	2,474,552	2,482,090
Total	5,595,652	5,752,855
Average value of Freight Train running Km		
Loaded	298.7	312.7
Empty	264.3	258.6
Total	563.0	571.3

Table 3.10. 7 Freight Wagons

Category	93/94	94/95
Number of Freight Cars Operated		
Loaded	241,402	252,568
Empty	239,166	266,433
Total	480,568	519,001
Mean Value of Number of cars operated per day		
Loaded	661.4	692.0
Empty	655.2	730.0
Total	1,316.6	1,421.9
Mean Value of formation of freight train		
Loaded	23.1	24.1
Empty	25.0	27.8
In General	24.3	25.9
Freight Car running Km		
Loaded	67,742,225	72,501,064
Empty	67,214,391	76,461,678
Total	134,956,616	148,962,742
Mean value of Freight Car running Km		
Loaded	281	287
Empty	281	287
In General	281	287

Table 3.10. 8 Number of Freight Trains Operated from the zones

	Actually Operated			Required
	92/93	93/94	94/95	94/95
West Delta	2,696	3,123	3,791	3,901
Middle Delta	2,295	1,533	941	947
North Delta	0	293	1,273	1,273
East Delta	1,378	2,536	2,763	2,772
Central	7,474	7,736	7,518	7,576
Middle	1,519	1,898	1,744	1,747
The South	2,057	2,307	2,027	2,017
Total	17,519	19,426	20,057	20,233

Table 3.10. 9 Freight Train Operation

Category	93/94	94/95
Number of trains operated in one year	19,812	20,057
Number of trains operated in one day	54	55
Number of trains arrived in time	19,510	19,627
Number of trains delayed in departure	156	213
Number of trains delayed during the trip	146	217
Number of trains delayed in departure during the trip	302	430
Number of trains arrived in time	98.5%	97.9%
Delayed hours departing and during the trip	3,522	3,284
Delayed hours / Train	0.18	0.16
Tons - Total transported (1000)	11,566	12,350
Ton kilometers (1000)	3,621,000	4,129,541
Locomotive hours in operation	642,672	517,570
Locomotive hours / train	32.44	25.80
Average km of freight trains	281	287
Ton-km / Locomotive hours	5,634	7,979
Train-km of freight trains	5,595,652	5,752,855
Locomotive hours / Train-km	0.115	0.090
Ton / Number of trains	583.79	615.77
Ton Km / Train-km	647.11	717.82
Average speed of freight trains (km/h)	8.696	11.111

3.10.4 Train Operation Diagram

As seen in the train-km data, the following 4 trunk lines play the main role in providing inter-city passenger transport of ENR. The most important commercial lines are the lines between Cairo and Alexandria, Cairo and Aswan, metro lines in Cairo, and the urban line in Alexandria.

(1) Cairo - Alexandria line

The income of this line is covers its costs, and this line is the only ENR line which operates without financial support of the Government. Peak hours are 6:00 - 8:00 in the morning, and 14:30 - 18:00 in the evening. The peak hours in the evening are longer than in the morning.
Figure 3.10.2 is the current Train Diagram on Cairo - Alexandria line (Double track line)

(2) Cairo - Benha - Zagazig - Ismailia - Port Said line

The trunk line of Cairo - Benha - Zagazig - Ismailia - Port Said, and among Cairo, Tanta, Mansura and Damietta is essentially different from other lines of Cairo - Alexandria and Cairo - Aswan, and confronts severe competition with road transport because of the slow train speed and competition from the desert highway which connects to Cairo directly.
The cities between Benha and Ismailia should be connected by rapid trains with shorter travel times.
Figure 3.10.3 Current Train Diagram on Cairo - Benha - Zagazig - Ismailia - Port Said

(Double track line on Cairo - Benha - - Zagazig - Ismailia section and single line between Ismailia and Port Said)

(3) Cairo - Tanta - Mansura - Damietta

This line has two roles: (1) connect the cities between Mansura and Tanta to Cairo and Alexandria; (2) transport freight goods from Damietta port. The cities between Tanta and should be connected by rapid trains with much shorter travel times.

Figure 3.10.4 Current Train Diagram on Cairo - Tanta - Mansura - Damietta
(Double line on Cairo - Tanta - Mansura. Single section between Mansura and Damietta)

(4) Cairo - Asyut - Luxor - Aswan

This line has a very important role for inter-city transport among cities in Upper Egypt and for tourist transport by long journey sleeper trains of deluxe sleeper cars and AC deluxe cars. The train speed on the section between Luxor and Aswan where a single track section remains is too slow, but in the near future will be improved by completion of a double-tracking project. This line is also important for transport of freight such as agricultural, chemical and mineral products. The freight trains are operated without regular train diagrams, and many freight trains are waiting for the permission of operation by train dispatchers in intermediate stations.

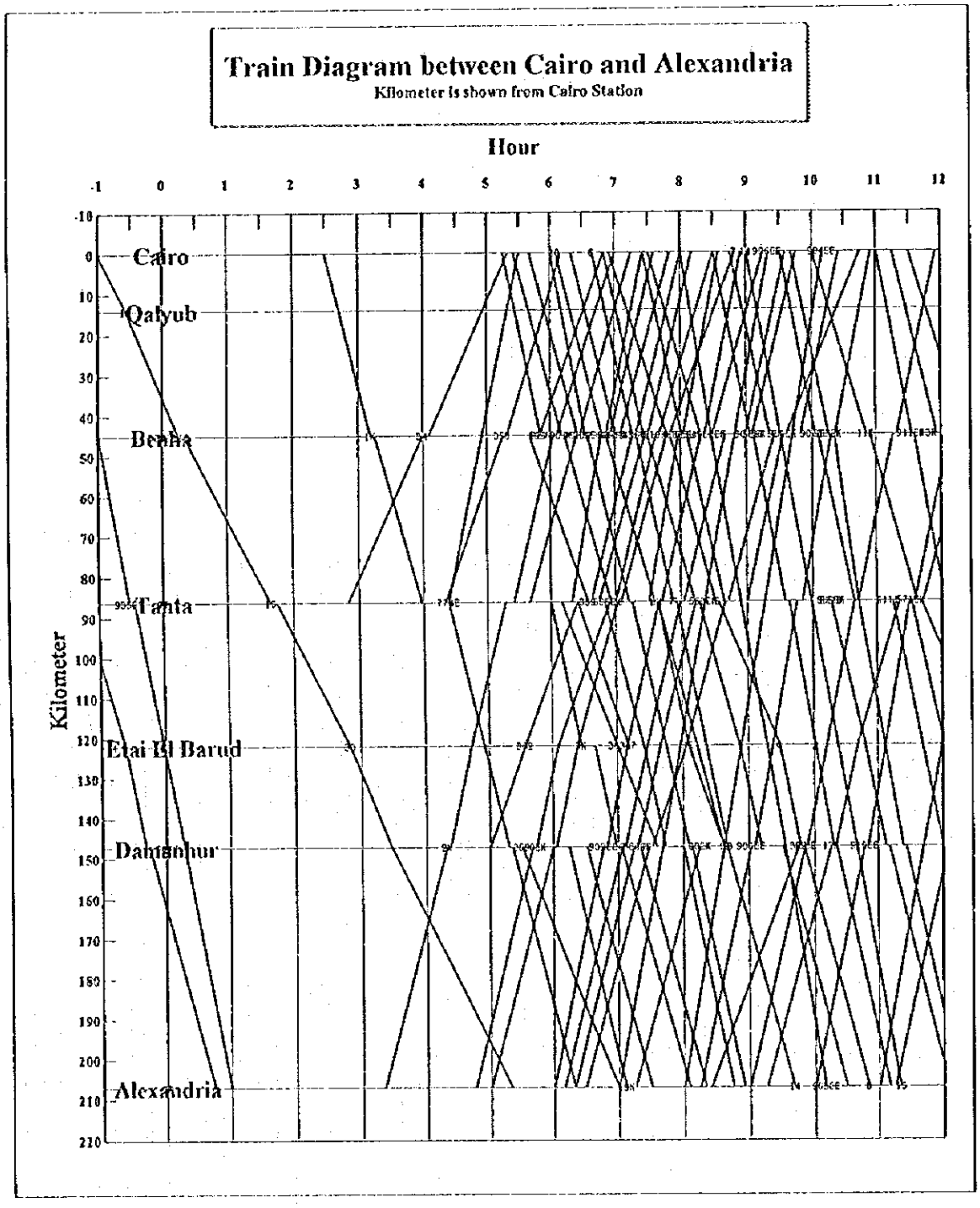
Figure 3.10.5 Current Train Diagram Cairo - Asyut - Aswan line
(Main double track line, with single line section remaining near Aswan)

Appendix 3.10.1 : Train numbers and directions on major lines

(5) Alexandria - Abu Quir Line

Huge numbers of passengers use this suburban line train. The train formation of this line is 6 cars and a 1650 HP locomotive by push-pull system. In peak hours, trains run at 10 minute intervals.

Fig. 3.10. 2 Actual Train Diagram On Cairo - Alexandria Line (Double Track Line)



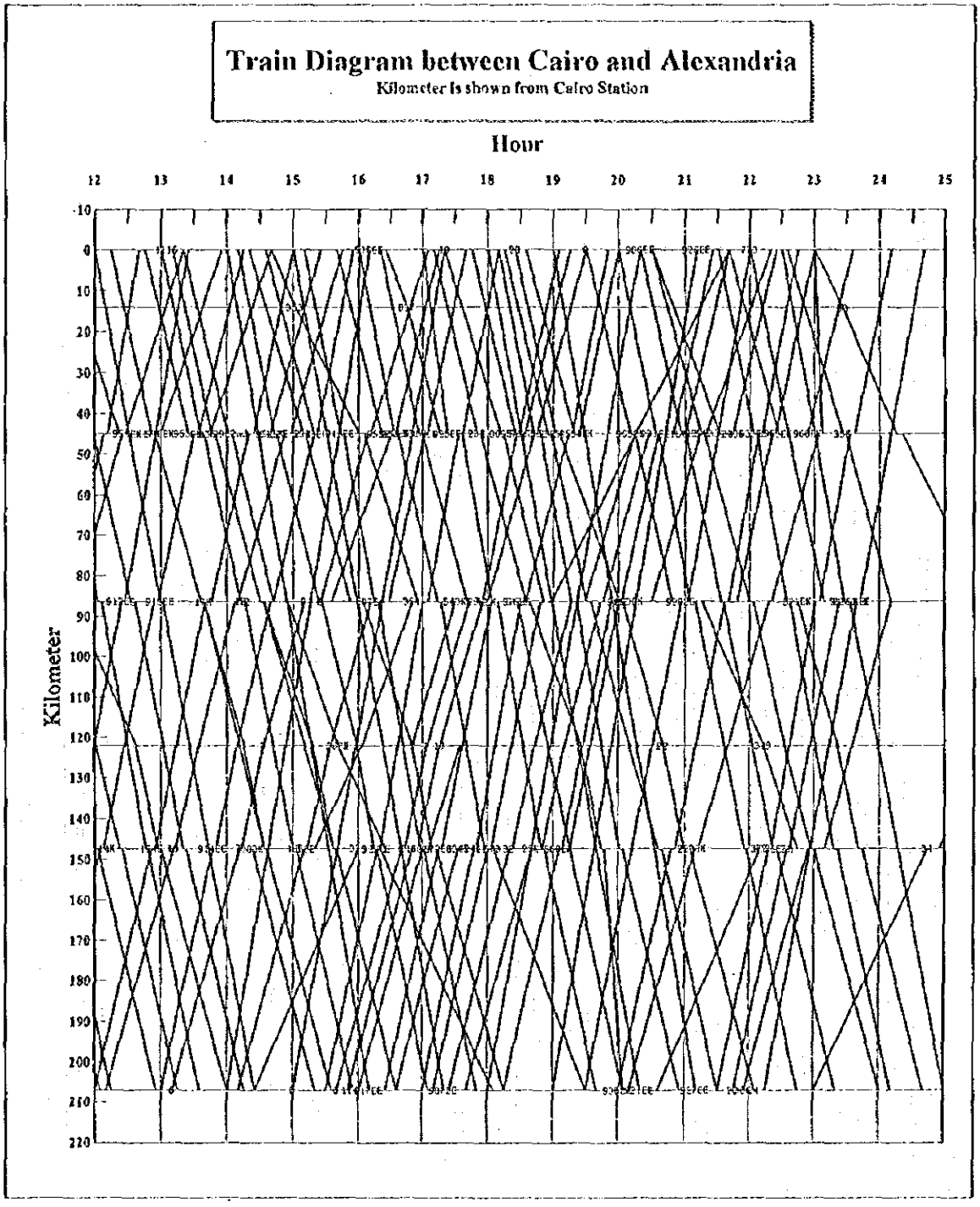

Train Diagram between Cairo and Alexandria
Kilometer is shown from Cairo Station
Hour
12
13
14
15
16
17
18
19
20
21
22
23
24
25
Kilometer
10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220

Fig. 3.10. 3 Actual Train Diagram On Cairo - Benha - Zagazig - Ismailia - Port Said
(Double Track Line On Cairo - Benha - Zagazig - Ismailia Section
And Single Line Section Between Ismailia And Port Said)

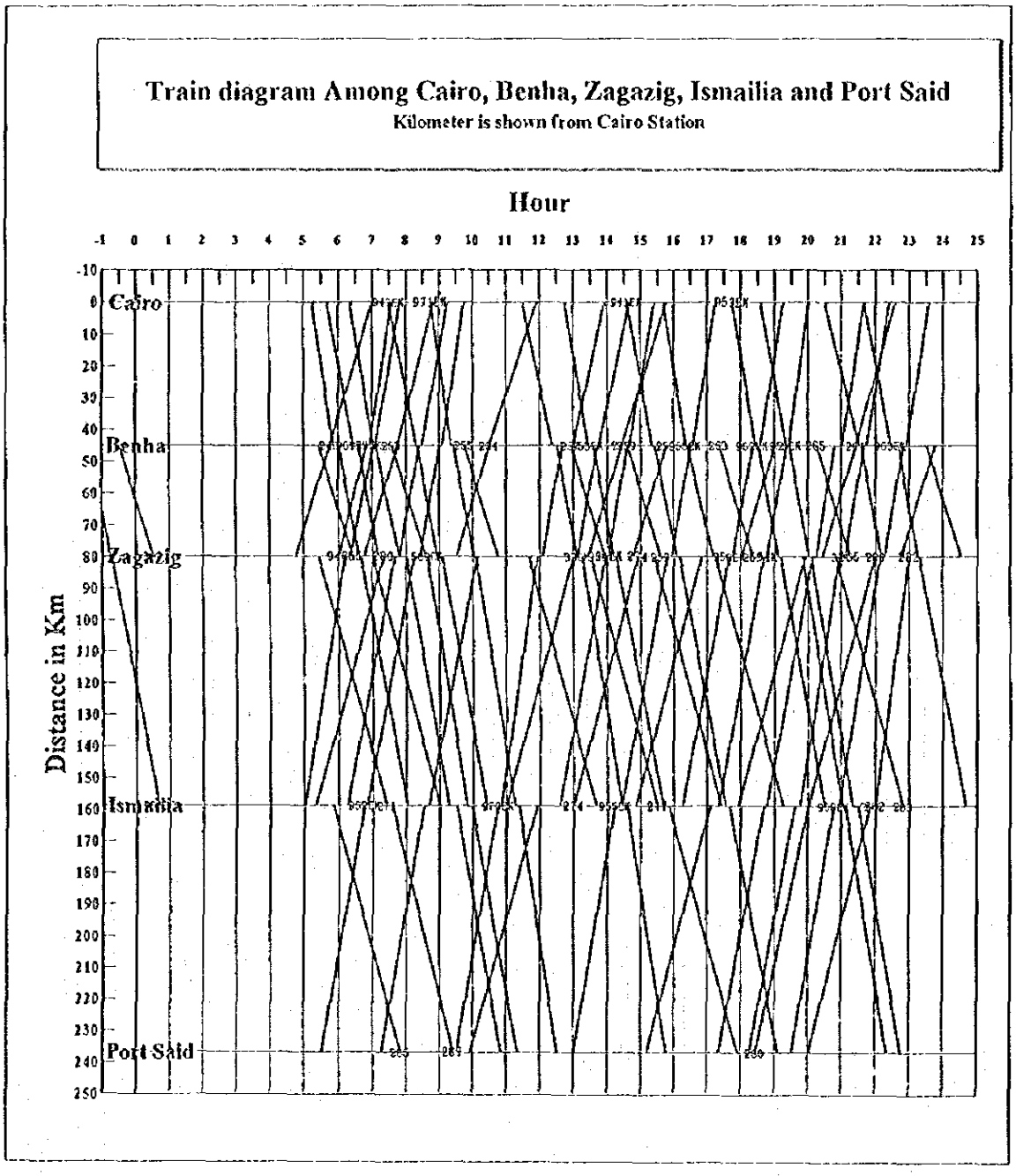


Fig. 3.10. 4 Actual Train Diagram on Cairo - Tanta - Mansura - Damietta
(Double track line section on Cairo - Tanta - Mansura and single line section between Mansura and Damietta)

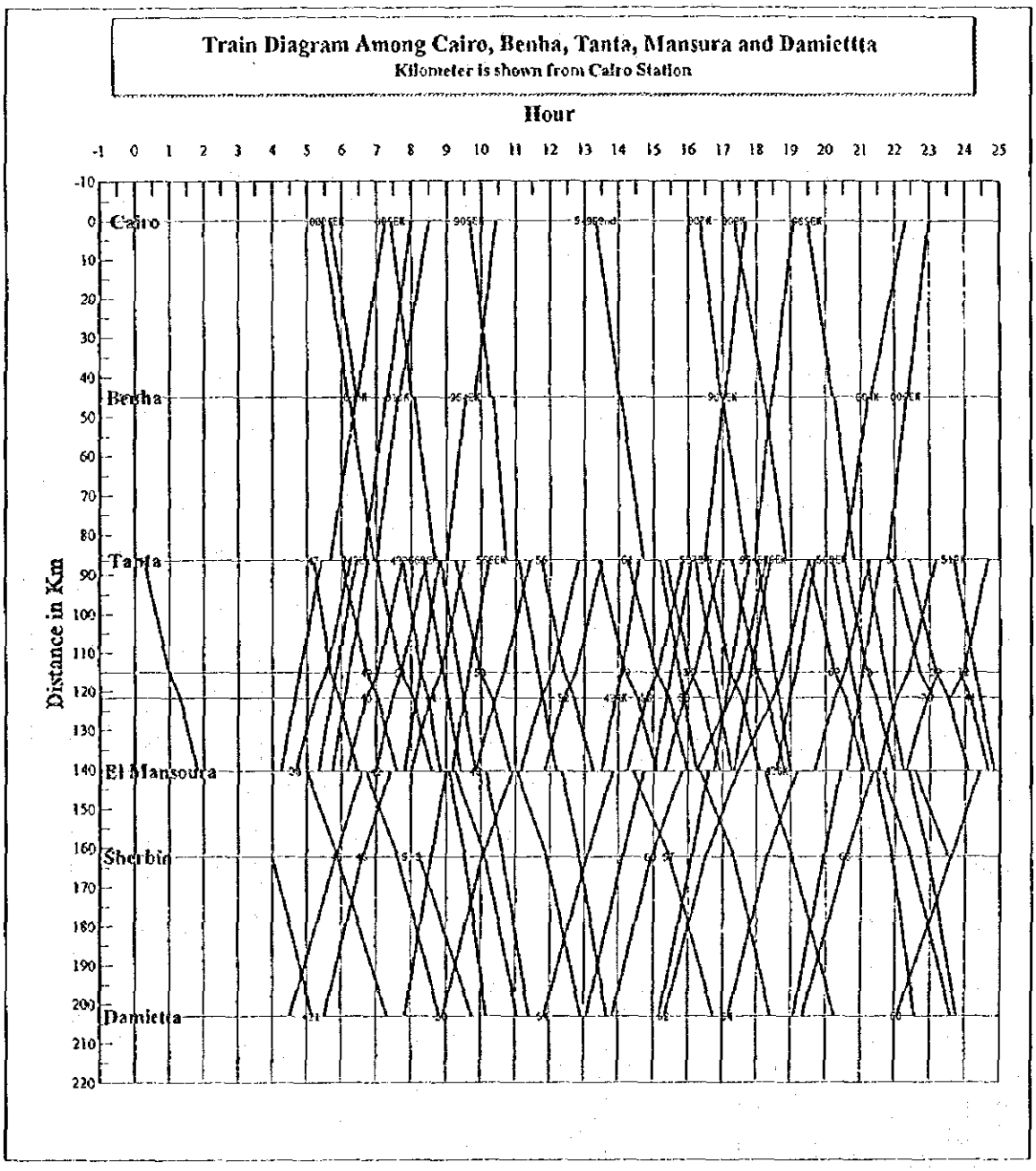
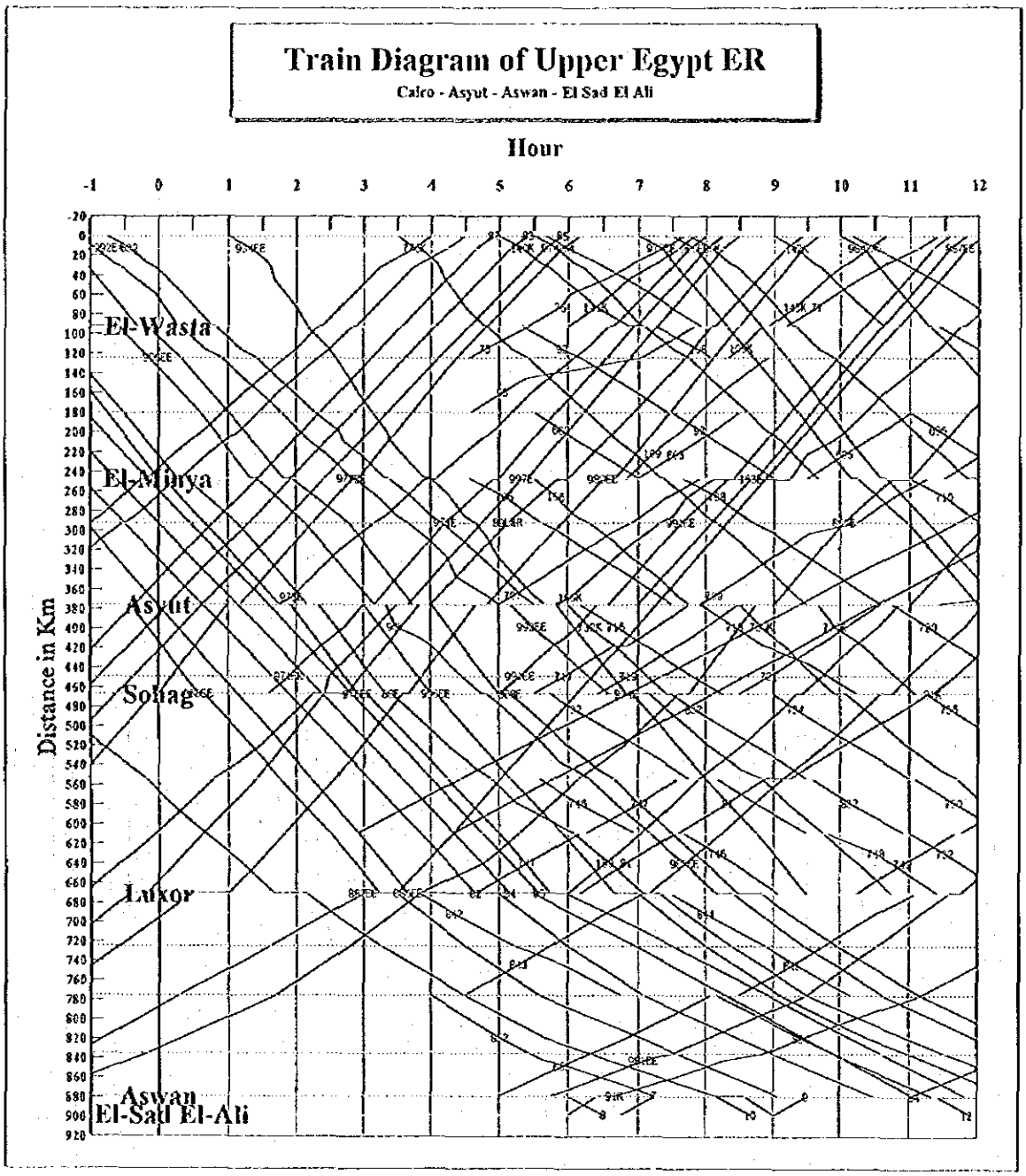
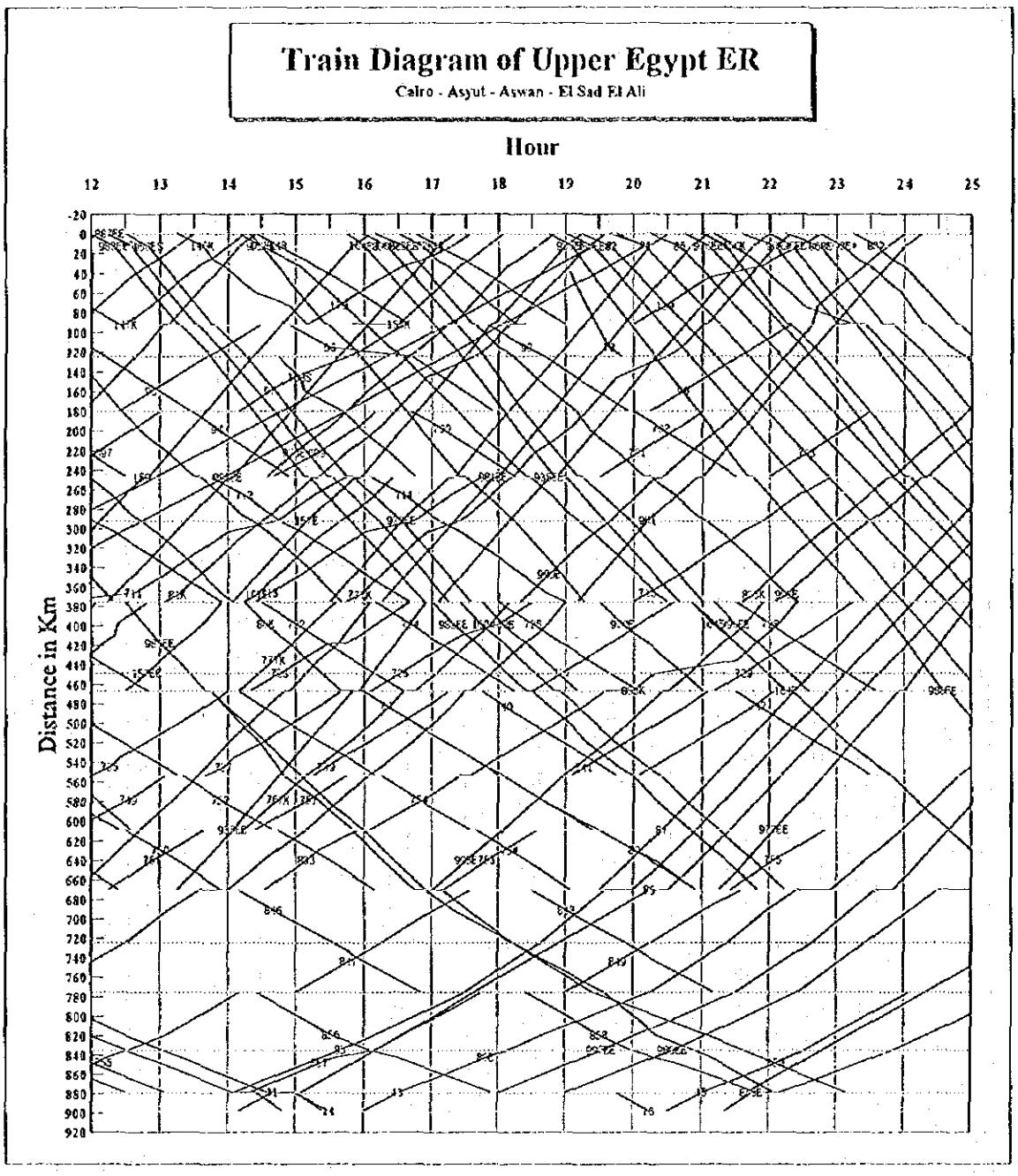


Fig. 3.10. 5 Actual Train Diagram On Cairo - Asyut - Aswan Line
(Mainly Double Track Line And Single Line Section Remaining Near Aswan)




Train Diagram of Upper Egypt ER
Cairo - Asyut - Aswan - El Sad El Ali
Hour
12
13
14
15
16
17
18
19
20
21
22
23
24
25
Distance in Km

3.10.5 Travel Time and Track Facilities for Train operation

(1) Theoretical maximum speed on trunk lines

High speed and shorter transit time can be achieved at relatively small cost by followings methods:

Increased maximum speed
Higher acceleration and deceleration
Increased limiting speed on curves
Elevation of super-elevation and re-standardization of transition curve regulation
Speedup on gradient sections by improved braking
Elevation of passing speed on turnout
Improved signal system
Introduction of rapid train service with fewer stops

The train operation system, including railway track facilities at big terminals, stations, and rolling stock, should be improved for the 21st century, although most track alignment, curvature, and gradient, are suitable.
The running speed on curves will be decided by various factors of super-elevation on curves, the length of transition curves, the characteristics of rolling stock running gears, etc. But the possible speed on curves can be estimated by the super-elevation and deficiency of super-elevation calculated by the centrifugal forces of curvature and passing speed. The following figures for each line are calculated by the actual track figure inputted into a computer.

(2) Cairo - Alexandria line

The rapid trains between Cairo and Alexandria are slowed down dramatically by low speeds near Cairo and Alexandria.
The averaged train speed from Cairo to major cities between Cairo and Alexandria are shown in the following figures.
Fig. 3.10. 1 - Average speed from Cairo to major cities of Cairo - Alexandria line.
Fig. 3.10. 2 - Average speed between stopping stations of Cairo - Alexandria line.

The stopping time at Benha, Tanta, Damanhur and Sidi Gaber decreases the average travel speed dramatically, although the rapid trains on Cairo - Alexandria line maintain approximate average speed of 70 - 80 Km/h. For greater utilization of train sets and for more frequent departures, the operation system of rapid trains should be reformed.
(Fig. 3.10. 3 Train Average speed between stopping stations of Cairo - Alexandria line)

Table 3.10.10 Speed limit on Cairo - Alexandria line in Km/h

Section	Maximum speed of rapid train	Future possible maximum speed
Cairo - Km 6	60	100
Km 6 - Shubra	90	160
Shubra - Sidi Gaber	140 - 120	160 - 200 (note 1)
Sidi Gaber - Alexandria	105	120

Note 1 - Speed limit at curves near major stations. (See figures of speed limit by curves)
Note 2 - Speed limit at curves of ordinary type cars

As shown in the following figures, the track facilities of Cairo and Alexandria line are suitable for 160 Km/h operation and sections which can handle between 112 km/h and 200 km/h may be able to handle 200 km/h operation. By introducing ATC safety devices, 200 km/h operation can be achieved by reducing speed at Qalyub, Benha, Birket El Sab, Tanta, near Kafr El Zayat, and on the Sidi Gaber - Alexandria Section. The potential of ENR's track alignment is a valuable asset of ENR and of Egypt. Introducing pendulum type rolling stock will not have a large effect, although the maximum speed of 200 km/h or 160 km/h would be restricted on fewer sections near Cairo, Benha, sections of Sidi Gaber-Alexandria, etc.

(3) Benha - Zagazig - Ismailia - Port Said line

Although trains arrive at Benha station approximately at 75 km/h from Cairo station, the average speed decreases to 50 - 60 Km/h, because of the low speed in the section Benha - Zagazig - Ismailia line, although the section is constructed as double track line. The double track lines between Benha - Zagazig and between Zagazig - Ismailia can handle 140 km/h. At 120 Km/h, the travel time between Cairo and Zagazig can be reduced to 1 hour, and the travel time between Cairo and Ismailia will fall below 2 hours. Zagazig will have better transport to Greater Cairo if this project is enacted. Road traffic between Ismailia and Cairo runs in 2 hours by desert road. Railway traffic will be arranged to target regional traffic among cities between Benha and Ismailia, and for inter-city service on the Cairo - Benha - Zagazig section, by utilizing the double track line.

(Fig. 3.10. 4 Limiting speed by Curves for Ordinary Type trains of Benha - Zagazig - Ismailia - Port Said line)

Table 3.10.11 Speed limit on Benha - Zagazig - Ismailia - Port Said line in Km/h

Section	Maximum speed of rapid train	Future possible maximum speed
Benha - Zagazig	90	140 (note 1)
Zagazig - Ismailia	90	140-160 (note 2)
Ismailia - El Kape	90	140
El Kape - Port Said	70	140 (note 3)

Note 1 - Speed limit exist at curve near Zagazig station.
Note 2 - There exist strict speed limit nearby Abu Hamad station.
Note 3 - Speed limit 90 Km/h exists at the entrance of Port Said line
(See figures of speed limit by curves)

(4) Tanta - Mansura - Damietta line

Trains between Tanta and Mansura run at 65 - 78 km/h, have potential to run at 140 - 160 km/h operation, although current maximum speed of rapid trains is 90 Km/h. The train between Cairo and Mansura could run at average 90 km/h, like the train between Cairo and Alexandria. If so, the travel time between Cairo and Mansura would be decreased to 1 hour 40 minutes, from the current 2 hours 25 minutes, by passing Tanta station. This shows that the trains between Cairo and Mansura stations have potential to compete with road transport.
As for 120 km/h operation, the track configuration creates few speed restrictions on the Tanta, Mansura and Damietta lines. Current express trains run at a maximum 90 km/h, and other passenger trains run at 70 km/h. Shorter travel time between Cairo and Mansura can be achieved by greater speed, passing Tanta station, etc. 140 km/h operation can be achieved by

maintaining a strict safety system between Tanta and Mansura. Trains to Zagazig or Mansura decrease their average speed to 45 - 60 km/h by long stops at Benha or Tanta.

(Fig. 3.10.5 Train average speed from Cairo to major cities of Cairo - Tanta - Mansura - Damietta line

(Fig. 3.10.6 Train average speeds between stopping stations of Cairo - Tanta - Mansura - Damietta line, by km between stations)

(Fig. 3.10. 7 Train average speeds between stopping stations of Cairo - Tanta - Mansura - Damietta line, by km from Cairo station)

Table 3.10.12 Speed limit on Tanta - Mansura - Damietta line in Km/h

Section	Maximum speed of rapid train	Future possible maximum speed
Tanta - Mansura	90	140 - 160 (note 1)
Mansura - Damietta	90	120 - 140

Note 1 - Speed limit exist at curves near major stations (see figures of speed limit by curves).
Note 2 - Speed limit at curves calculated by ordinary type cars

(5) Cairo - Asyut - Luxor - Aswan line

Fig. 3.10.8 Train average speed from Cairo to major cities in Upper Egyp

Fig. 3.10.9 Train Average speed between stopping stations in Upper Egypt *(Km between stations)*

Fig. 3.10.10 Train Average speed between stopping stations in Upper Egypt (Km from Cairo station)

Currently, rapid train run at a maximum 120 km/h to Asyut, at an average 80 - 85 Km/h. From Asyut to Luxor, average speed from Cairo gradually falls to approximately 70 km/h. From Luxor to Idfu, average speed from Cairo decreases to about 65 km/h because average speed of rapid trains between stopping stations is only 45 - 55 km/h. The average speed between Idfu and Aswan is about 24 - 39 km/h and the average speed from Cairo station drops to 53 - 62 km/h. Rapid sleeper trains between Cairo and Aswan take about 15 hours. This means that locomotives and luxurious sleeper cars can operate one time and one way each day, waiting to return the next day. Travelers of sleeper trains can spend only a half day at their destination, because passengers who depart Cairo or Aswan at 19:00 - 21:00 arrive at Aswan or Cairo at 10:00 - 12:00.

Average running speed between Cairo and Aswan might be raised to 80 - 85 Km/h. If so, the trains earning very profitable revenues for ENR can run in less than 11 hours, after completion of the double tracking project between Idfu and Aswan. The train sets of night sleeper luxury cars can be utilized in the destination for day time medium distance transport between Aswan and Luxor or between Cairo and El Minya. Passengers who use the night trains can enjoy a full day in the destination, because the trains departing at 19:00 - 21:00 will arrive at 6:00 - 8:00 in the morning at the destination. Rapid trains can run at 140 km/h between Cairo and Asyut or Luxor by using more powerful locomotives, reducing future travel time to within 10 hours. The current 2475 HP locomotives are running about 120 km/h.

Achieving this speed is not very difficult because the necessity of replacing locomotives is approching, and the friction coefficient between rail and driving axle has enough allowance for increasing traction power. Travel time within 10 hours might become possible then. Then trains will start after peak hour in the evening, and arrive before morning rush hour. Facilities

for efficient rotation of train sets will require some appropriate facilities for passenger service and for operation work at both terminal stations.

Table 3.10.13 Speed limit on Cairo - Asyut - Luxor - Aswan - El Sad El Ali line in Km/h

Section	Maximum speed of rapid train	Future possible maximum speed
Cairo - Giza	90	120
Giza - Asyut	120	140 - 160 (note 1)
Asyut - Luxor	110	120 - 140
Luxor - Idfu	90	100 - 120
Idfu - Aswan	70	100 - 120
Aswan - El Sad El Ali	60	*(note 2)

Note 1 - Speed limit at curves near major stations. (See figures of speed limit by curves)
Note 2 - Calculated from data of the track alignment of curves and gradient

Travel hours can be decreased to 9 hours 30 minutes after the completion of signal improvements. By utilizing locomotives of sleeper trains in the day, service can be improved between Aswan and Luxor, between Cairo and El Minya, etc. Service for tourists can be expanded, as there are now very few services on this very important single line section in Upper Egypt.
Between 15 km near Giza station to 670 km near Luxor station, 140 km/h operation can be easily achieved by raising speed restrictions to 100 km/h nearby major stations of Kafr Amar, El Rapa, near El Wasta, Beni Suef, Biba, Mahagha, near Samalut (75 Km/h), El Minya, El Mahras, Al Rupa, Deirut, Asyut etc. From Luxor to Deraw, 120 km/h operation is suitable by restricting speed at major stations, which can be seen in the following figure. Sections between 765 km and 813 km, and between 838 km and Aswan (880 km) might be restricted to 100 Km/h operation, for easy maintenance work of track and for driving trains.

The system of train operation planning is mostly old fashioned, but the staff in the train operation department are beginning to introduce a computerized train operation planning system for the improvement of train operations.

These projects should be completed as soon as possible, to prepare for increasing competition.

Fig. 3.10. 6 Train average speed from Cairo to major cities of Cairo - Alexandria line

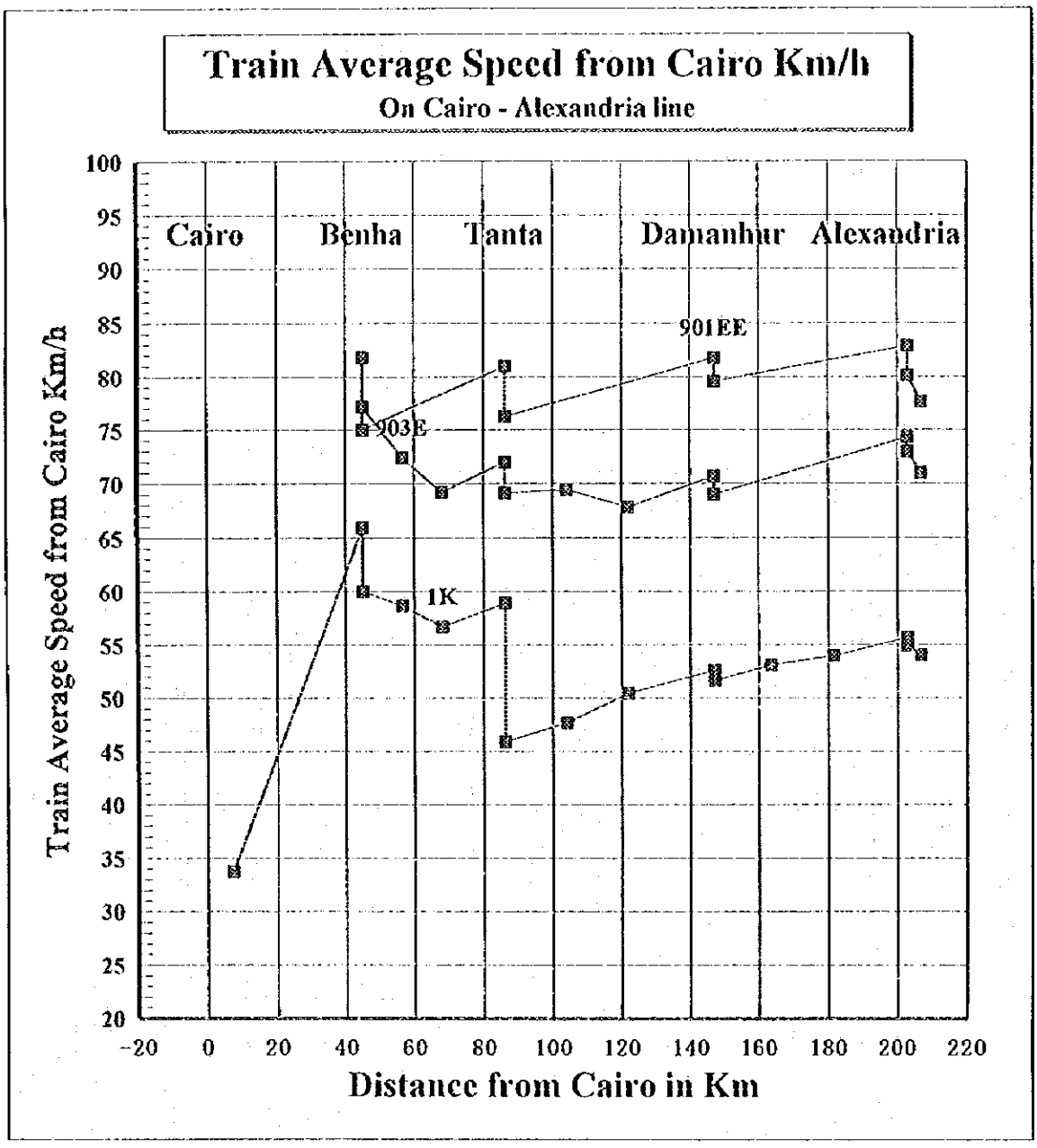


Fig. 3.10. 7 Train average speeds between stopping stations of Cairo - Alexandria line

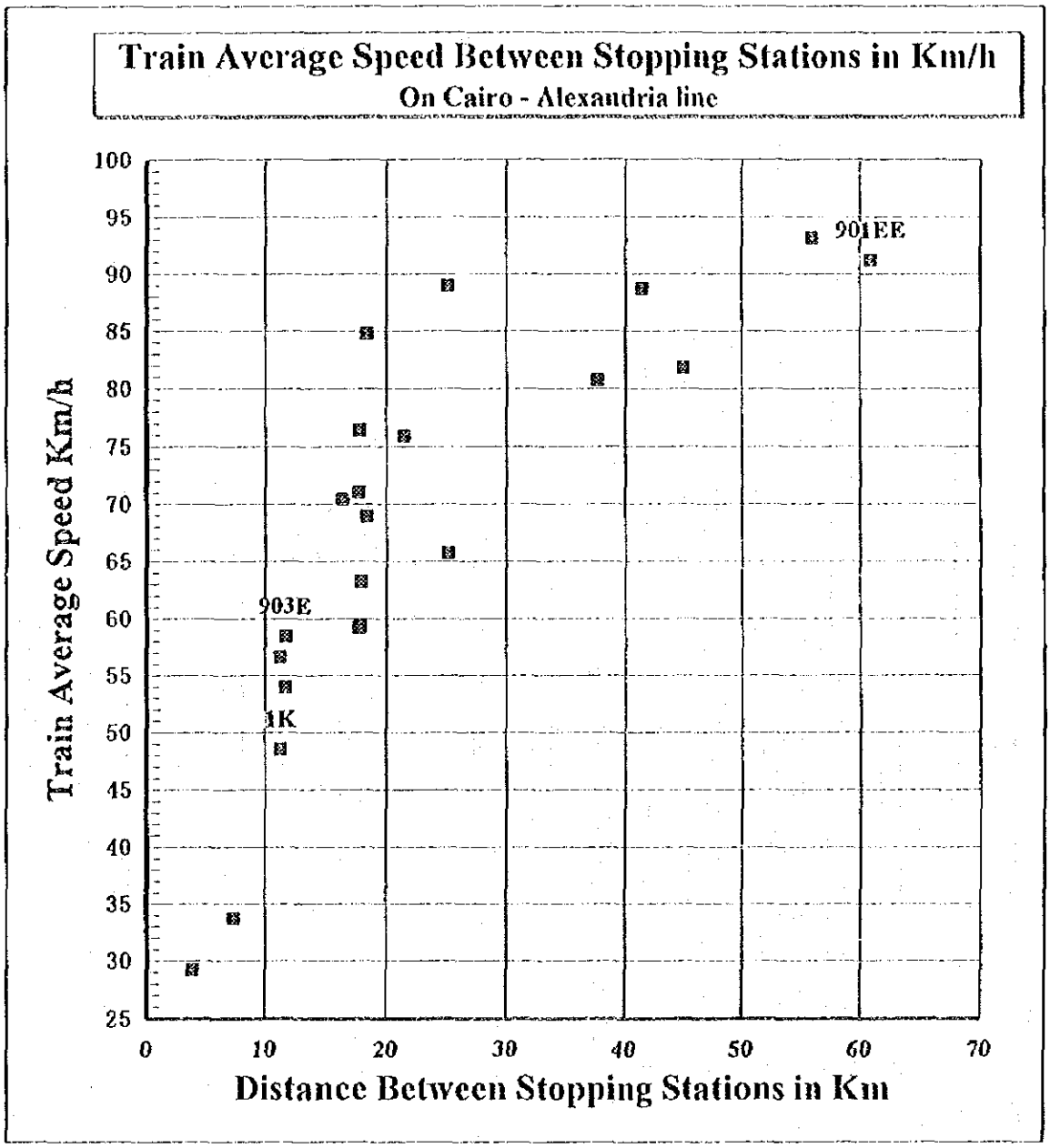


Fig. 3.10. 8 Train Average Speed Between Stopping Stations Of Cairo - Alexandria Line
(Km From Cairo Station)

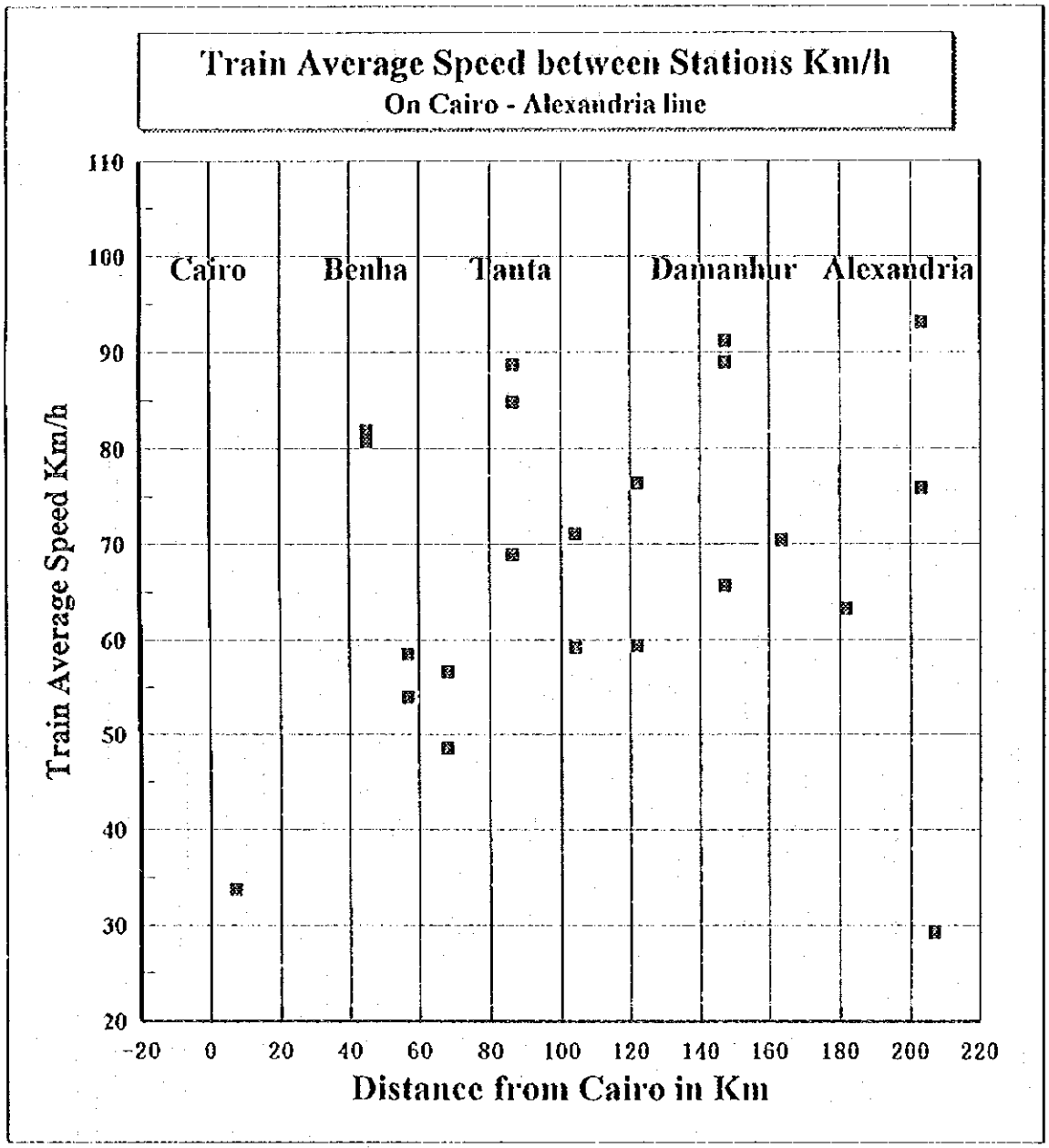


Fig. 3.10. 9 Limiting speed by curves for ordinary type trains of
Cairo - Benha - Tanta - Alexandria line

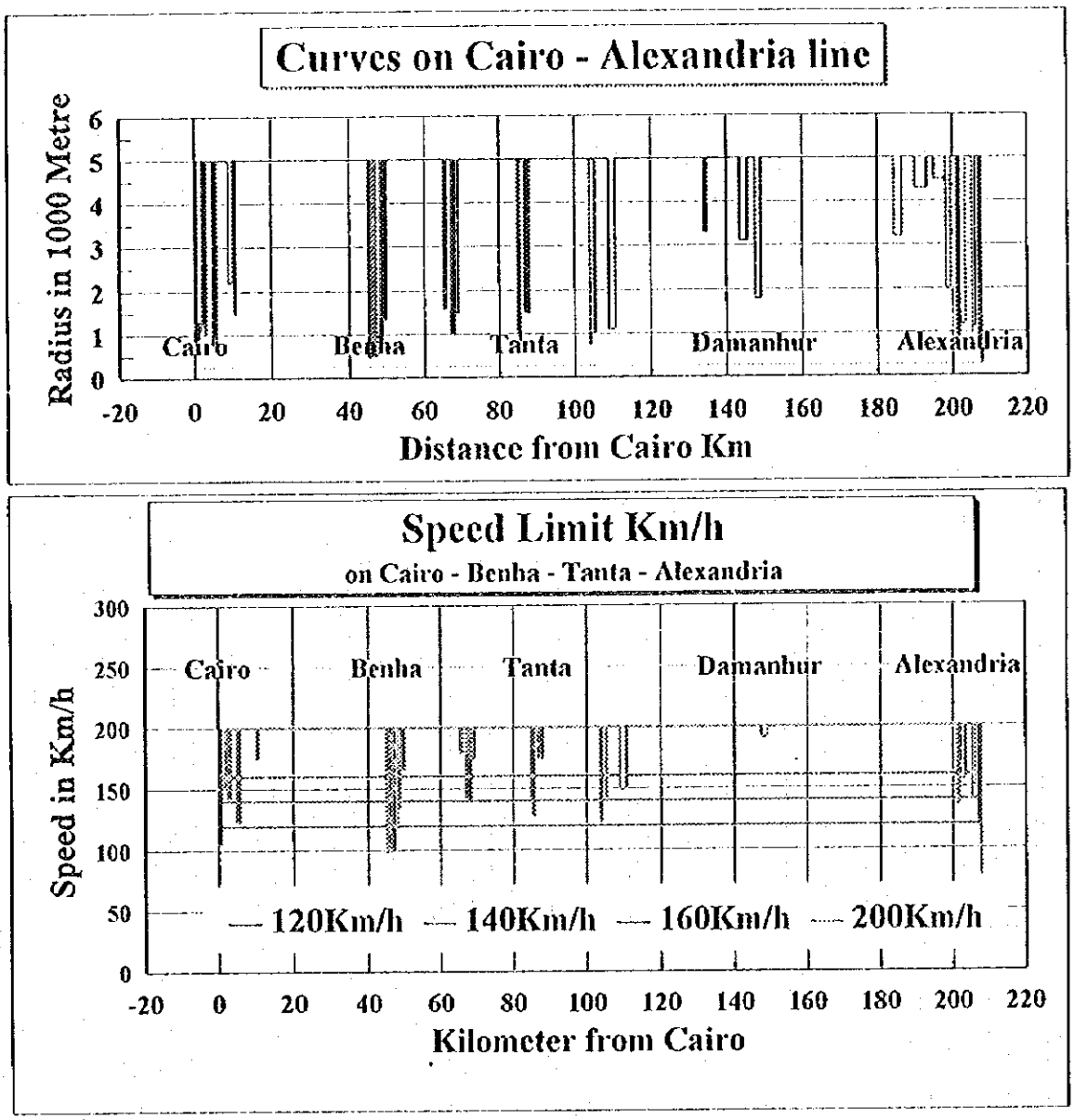


Fig. 3.10. 10 Limiting speed by curves for ordinary type trains of
Benha - Zagazig - Ismailia - Port Said line

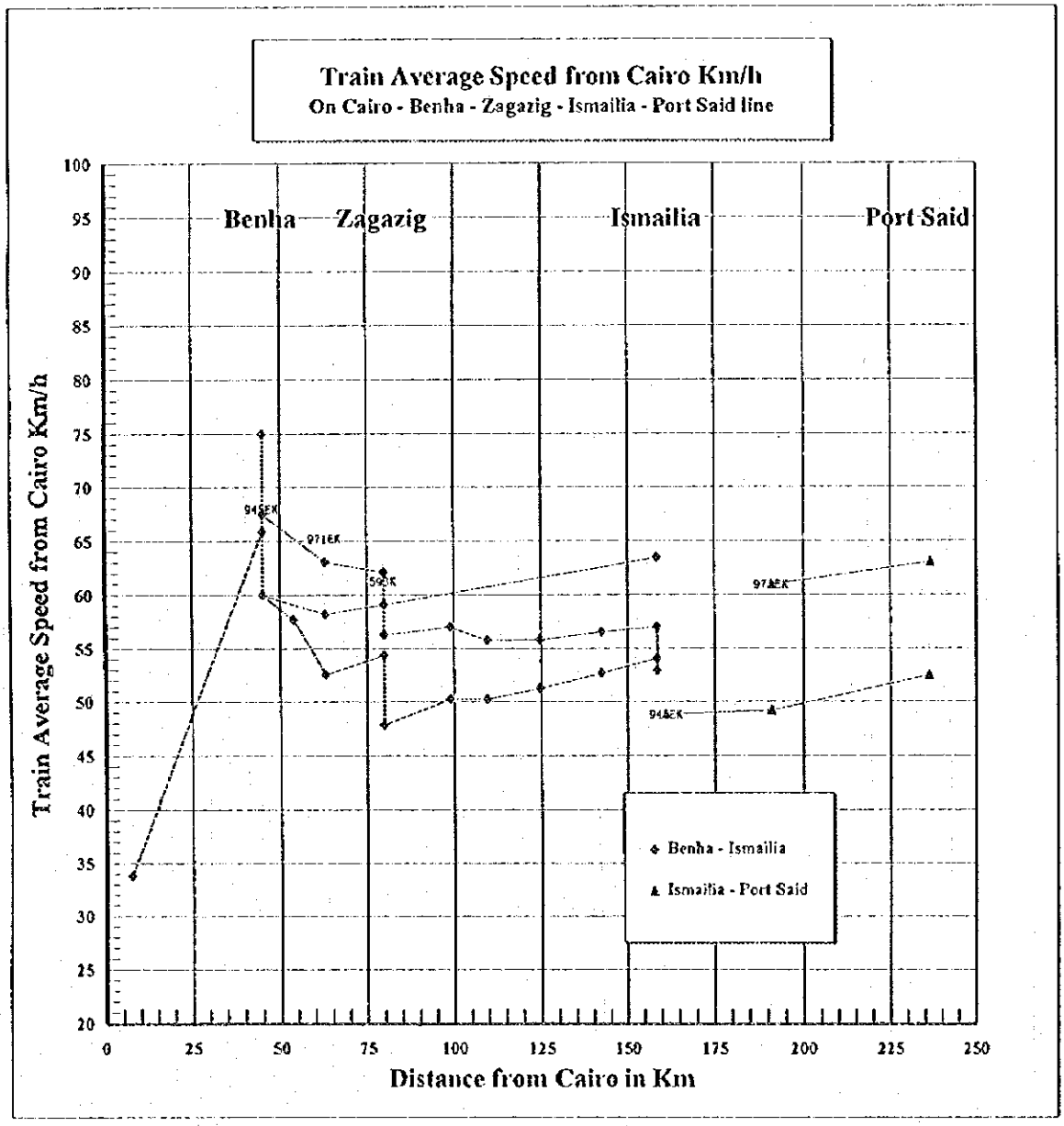


Fig. 3.10. 11 Train average speeds between stopping stations of
Benha - Zagazig - Ismailia - Port Said line

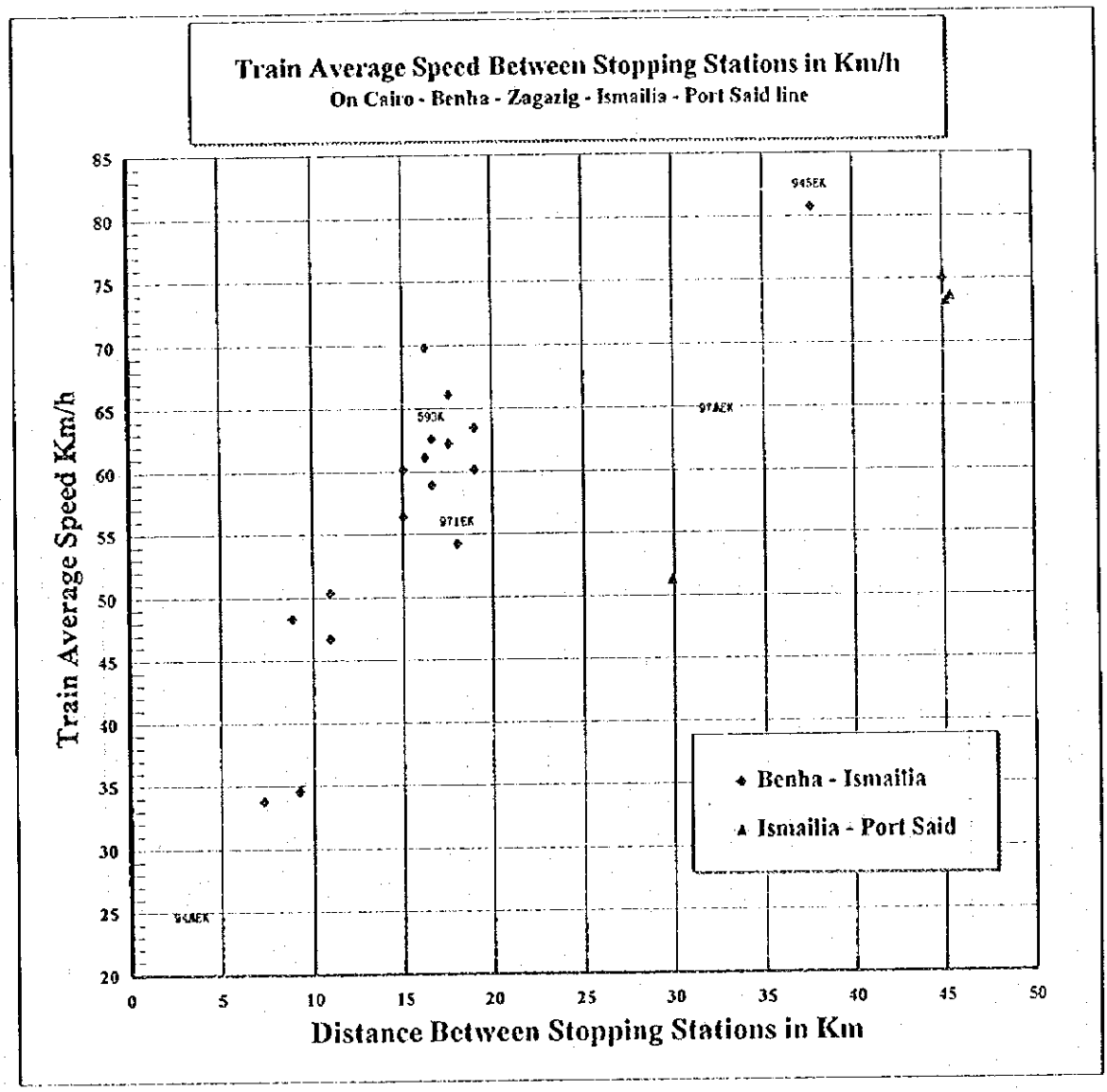


Fig. 3.10. 12 Train average speed between stopping stations of
Benha - Zagazig - Ismailia - Port Said line (Km From Cairo Station)

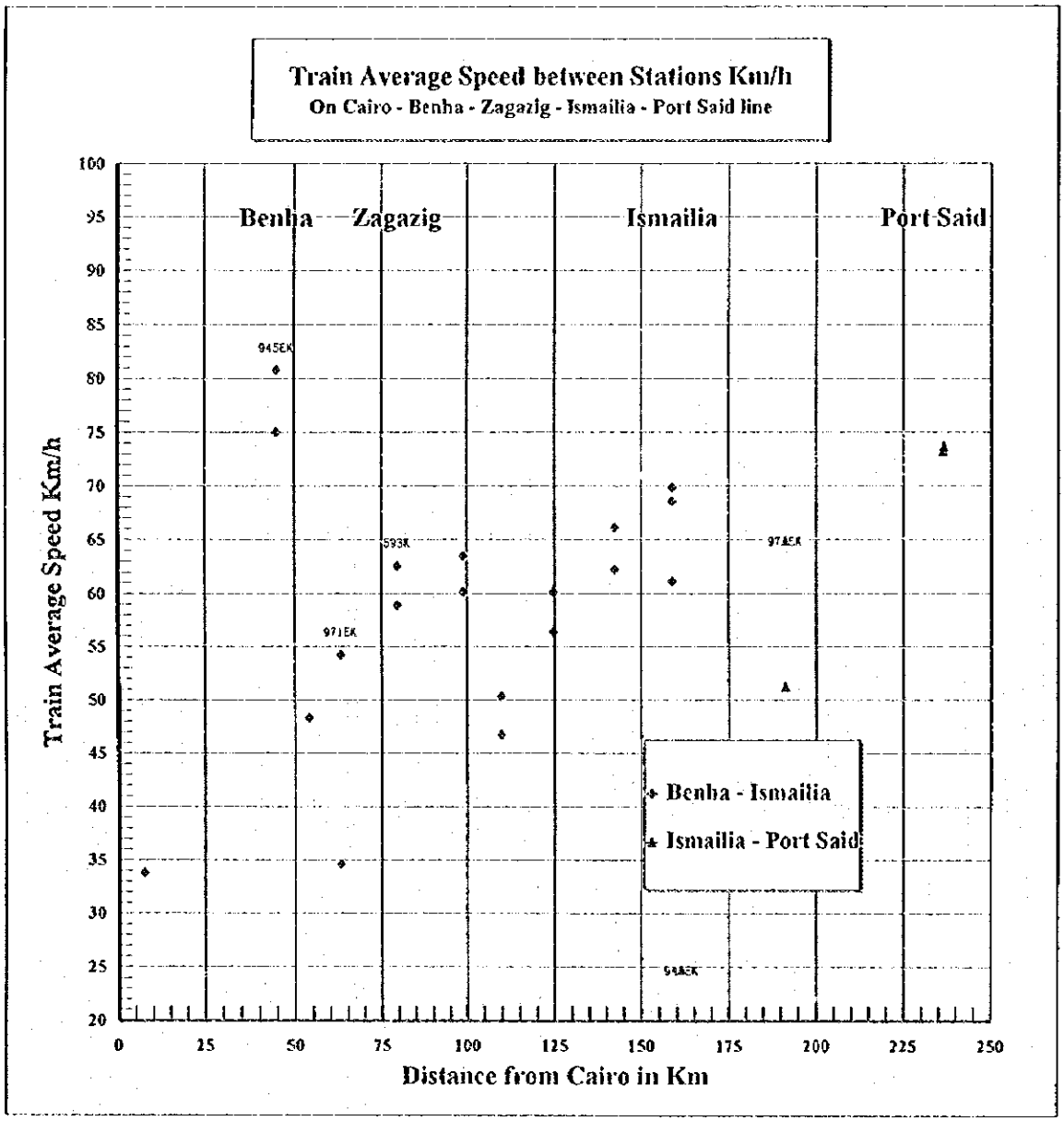


Fig. 3.10. 13 Limiting speed by curves for ordinary type trains on
Benha - Zagazig - Ismailia - Port Said line

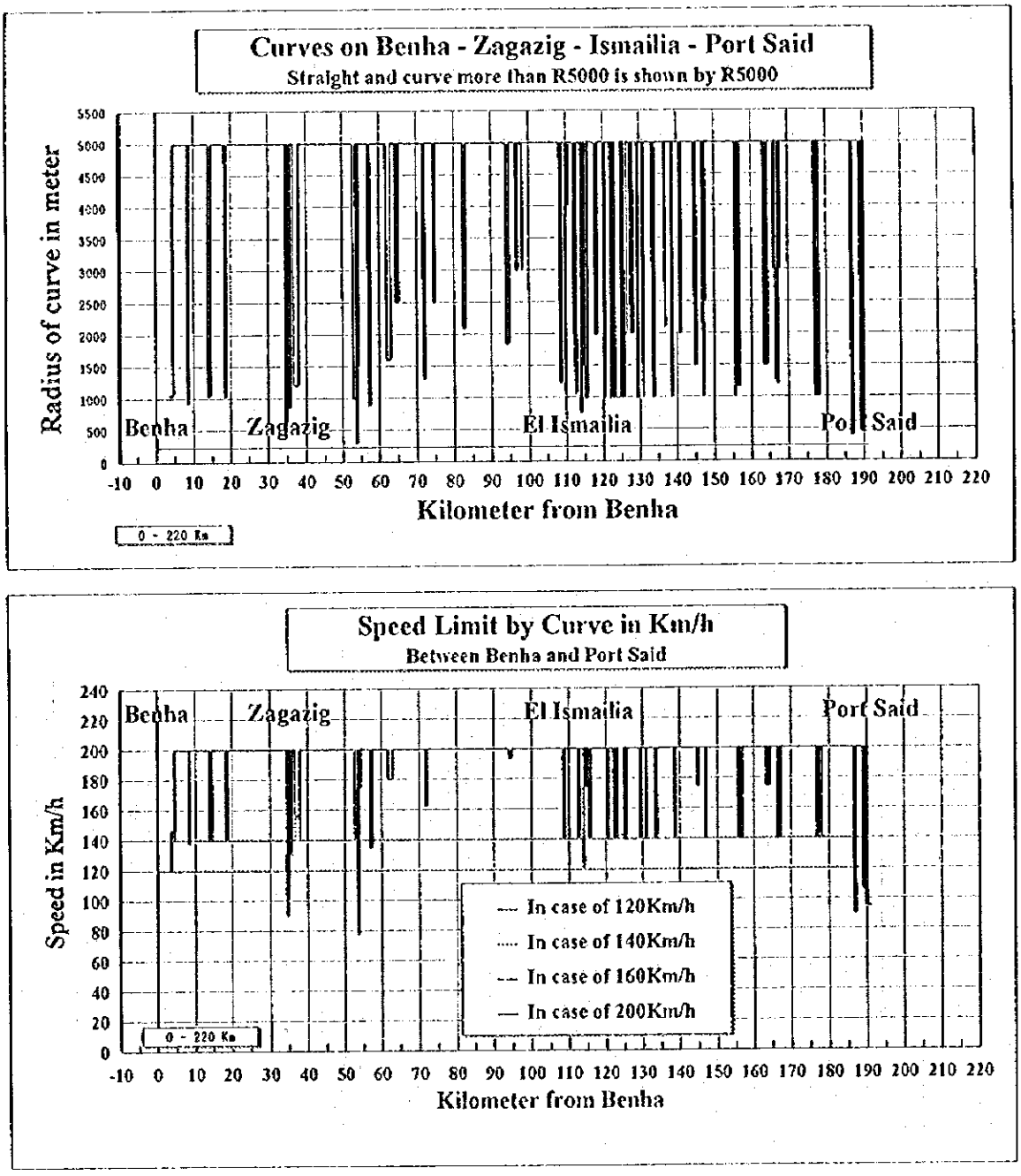


Fig. 3.10. 14 Train average speed from Cairo to major Cities of
Cairo - Tanta - Mansura - Damietta line

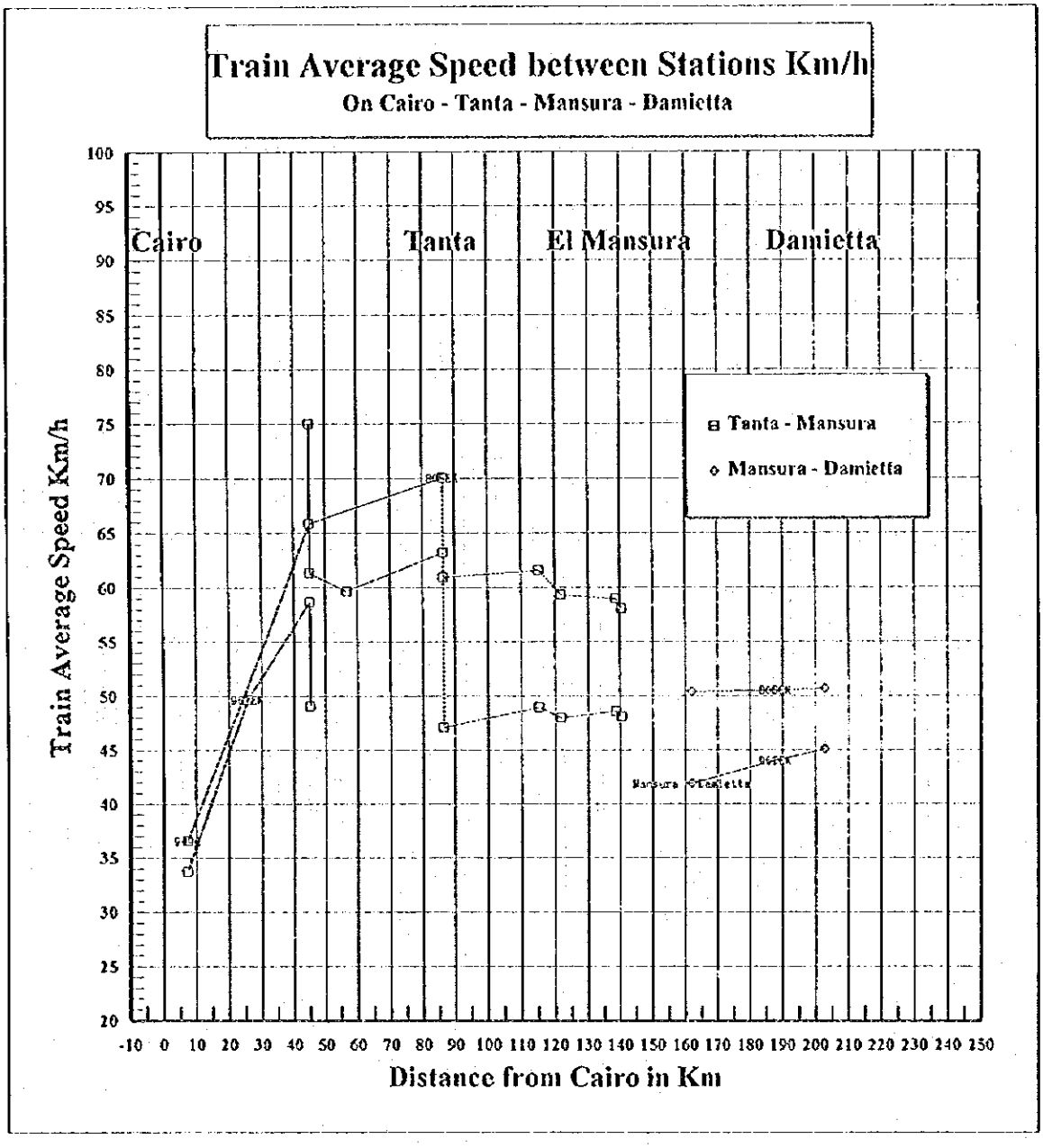


Fig. 3.10. 15 Train average speeds between stopping stations of
Cairo - Tanta - Mansura - Damietta line (Km between Stations)

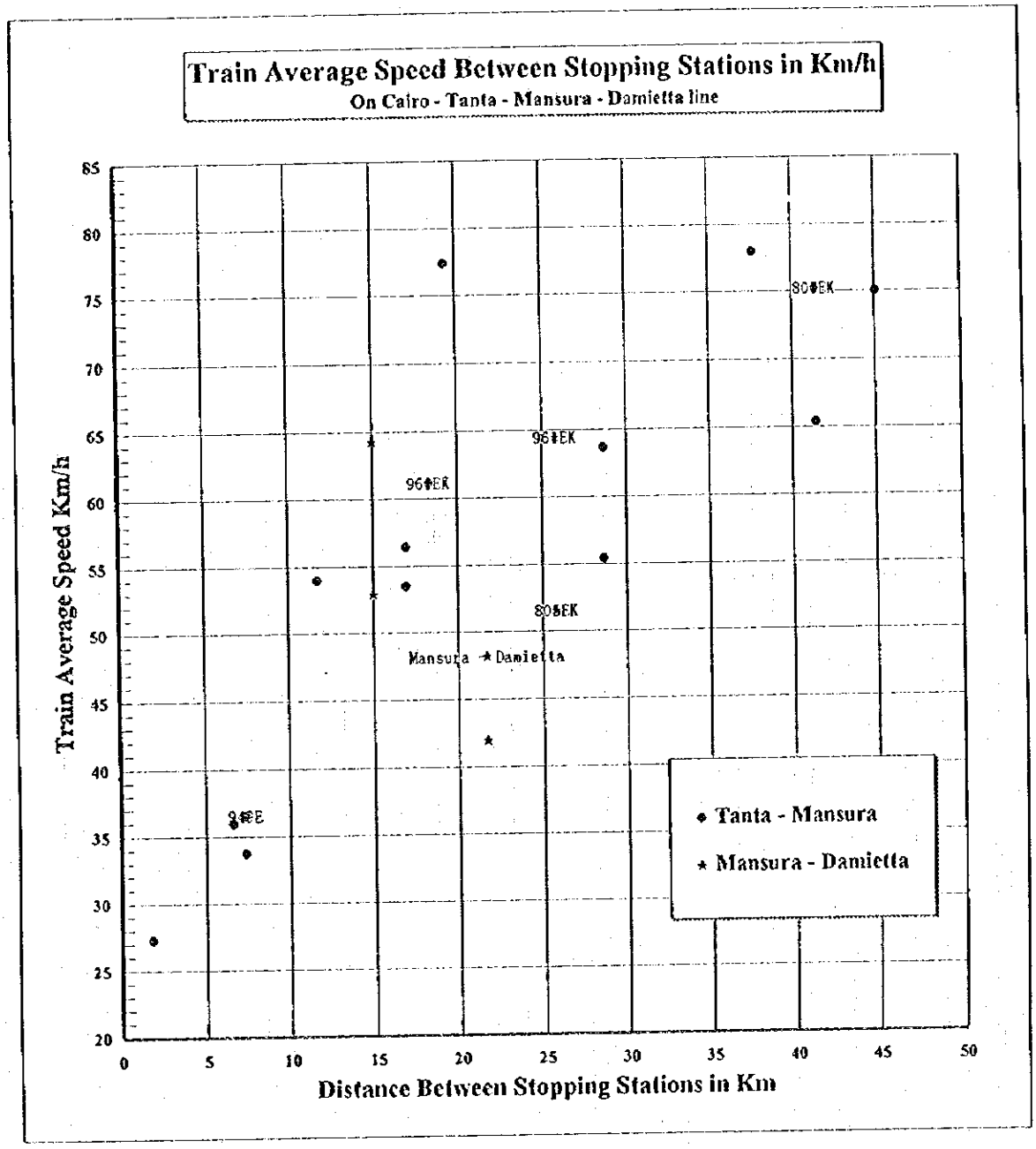


Fig. 3.10. 16 Train average speeds between stopping stations of
Cairo - Tanta - Mansura - Damietta line (Km from Cairo Station)

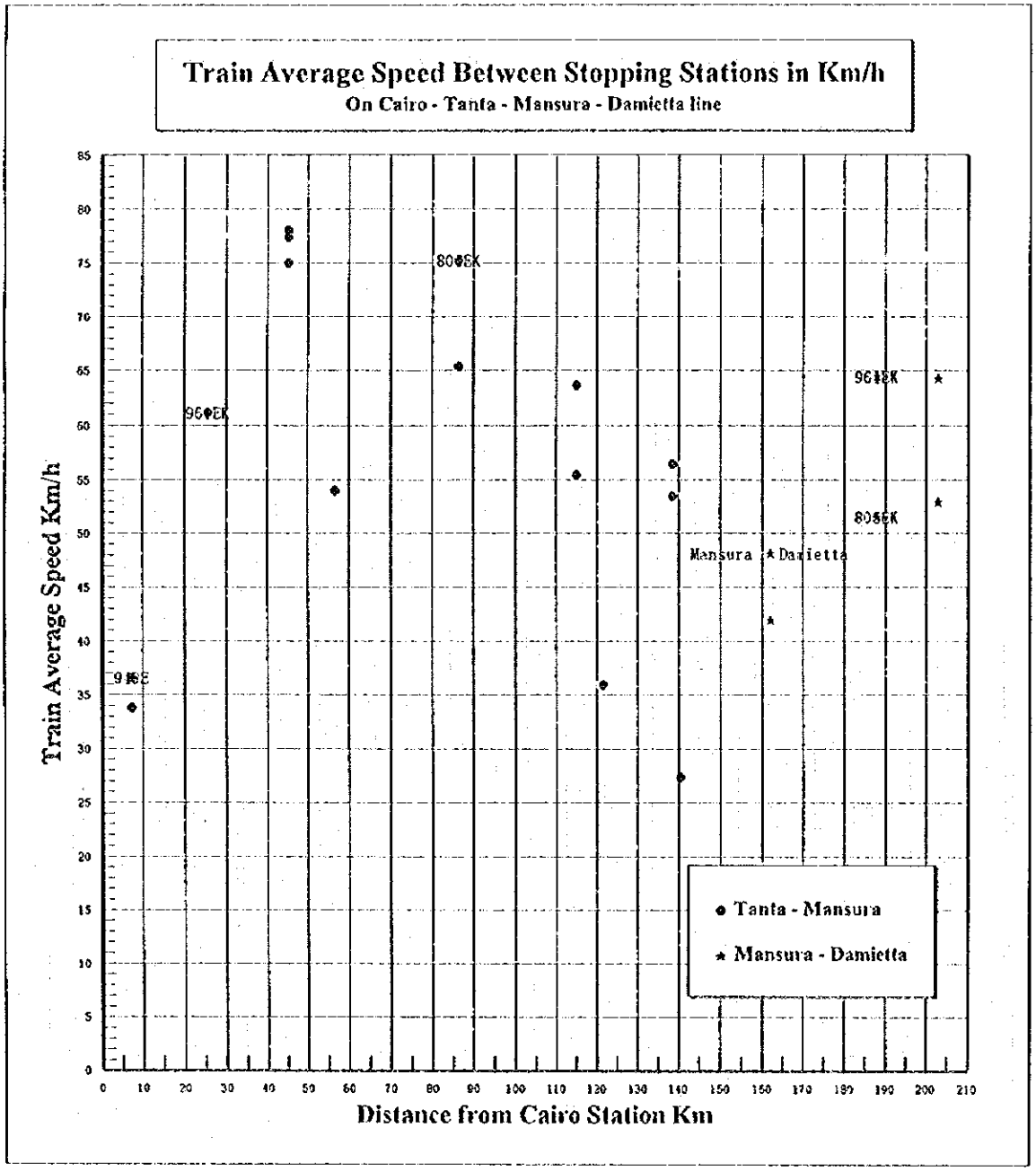


Fig. 3.10. 17 Limiting speed by curves for ordinary type trains on Tanta - Mansura - Damietta line

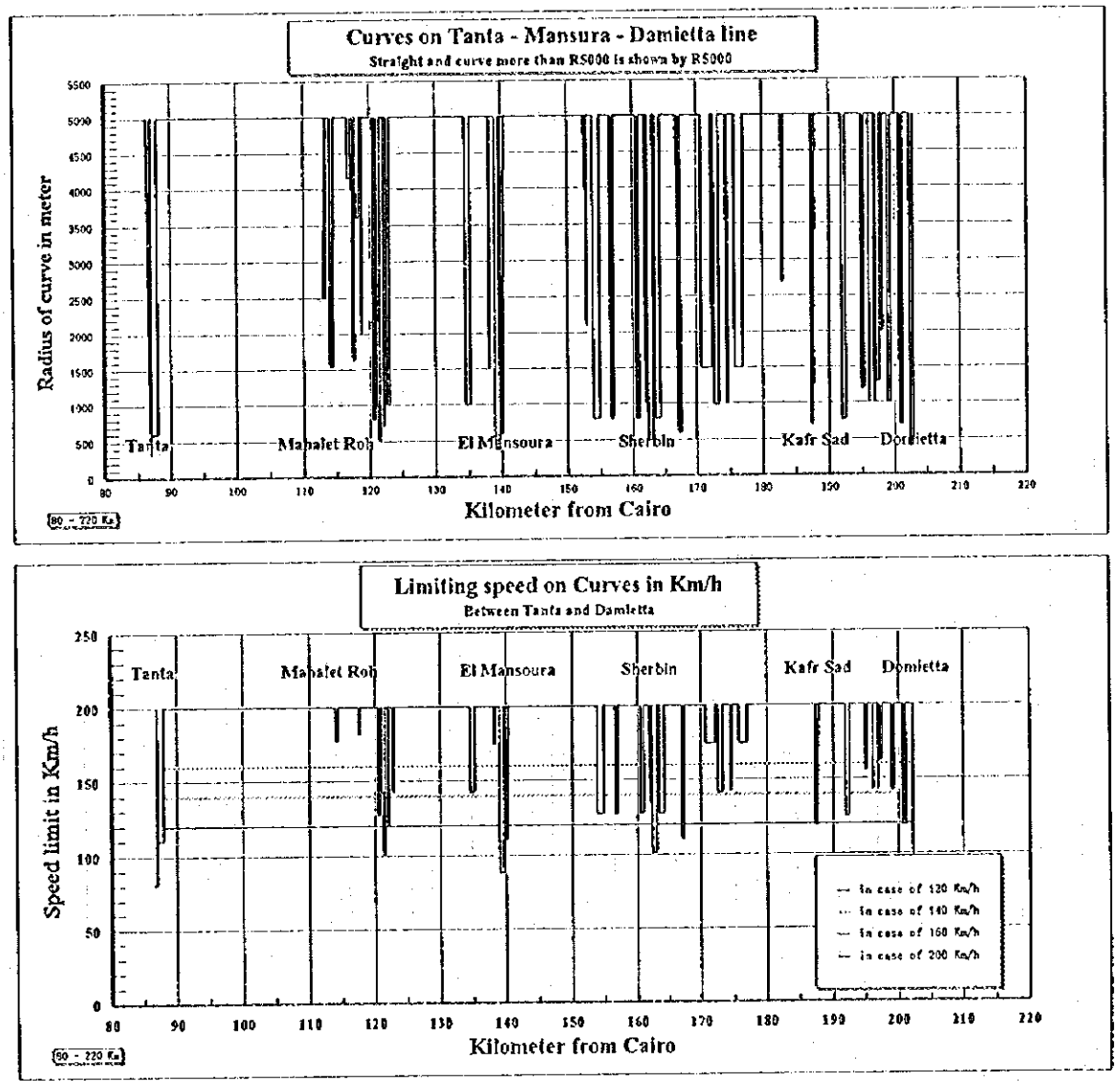


Fig. 3.10. 18 Train Average Speed From Cairo To Major Cities In Upper Egypt

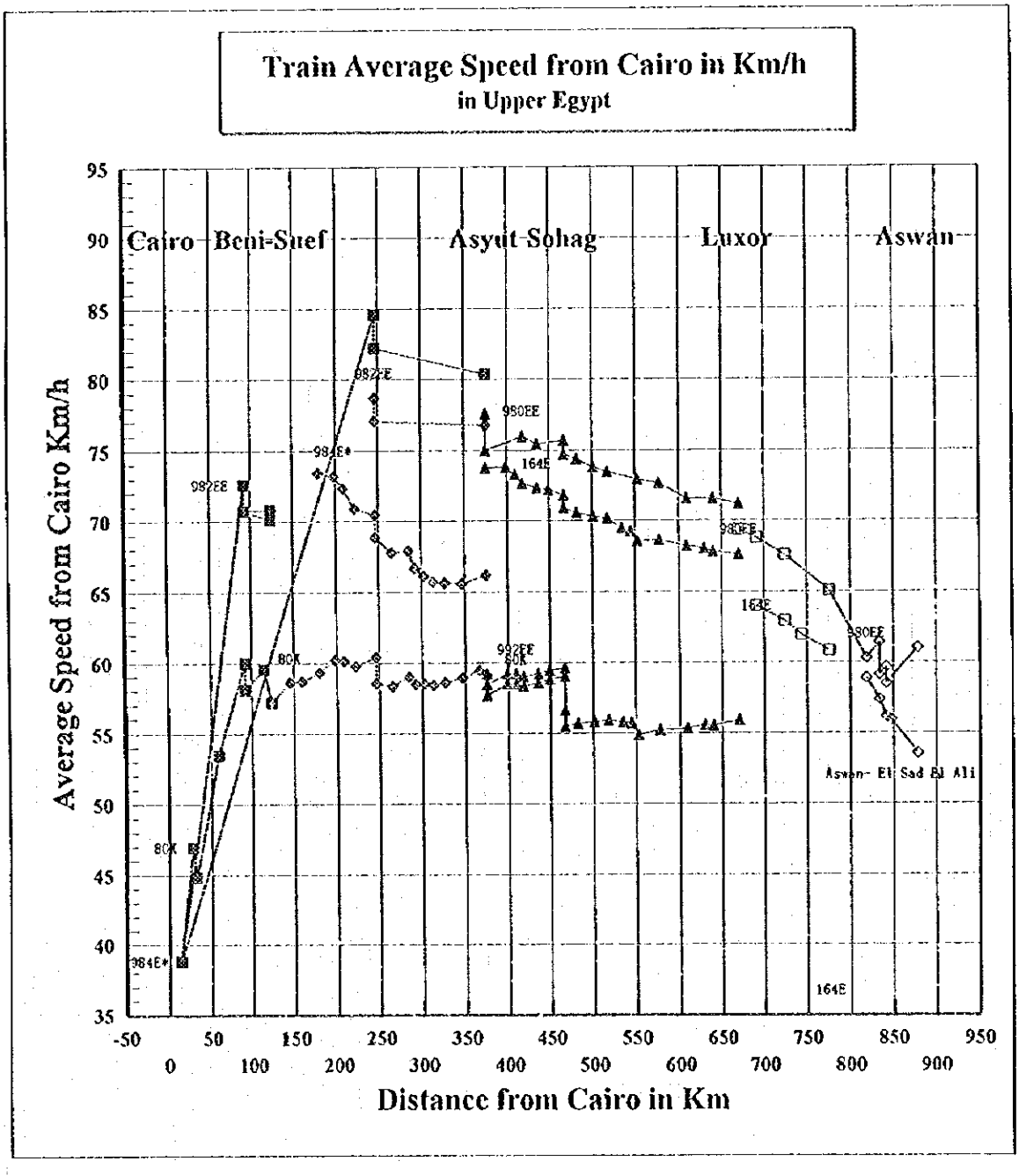


Fig. 3.10. 19 Train Average Speed Between Stopping Stations In Upper Egypt
(Km Between Stations)

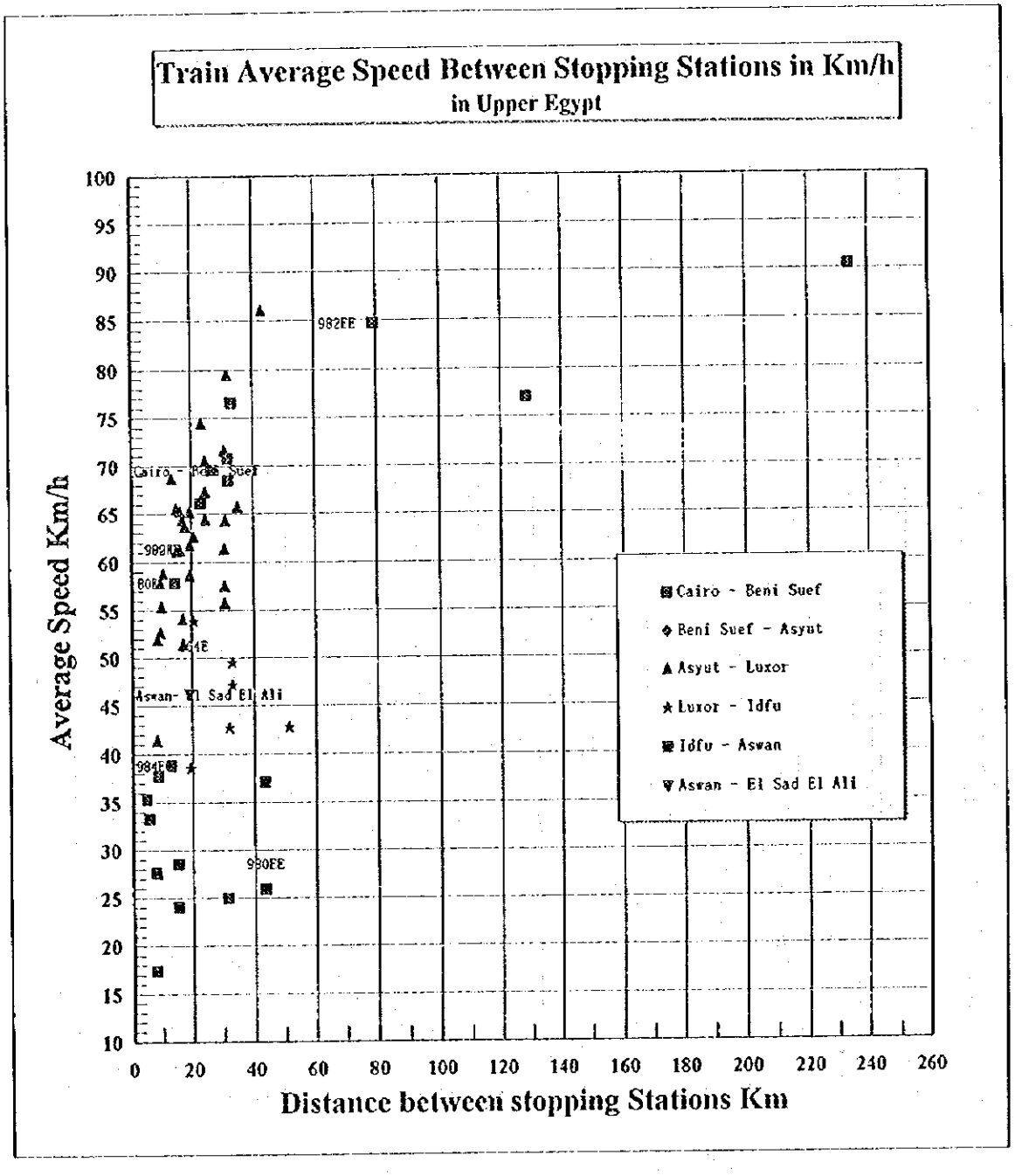


Fig. 3.10. 20 Train Average Speed Between Stopping Stations In Upper Egypt
(Km From Cairo Station)

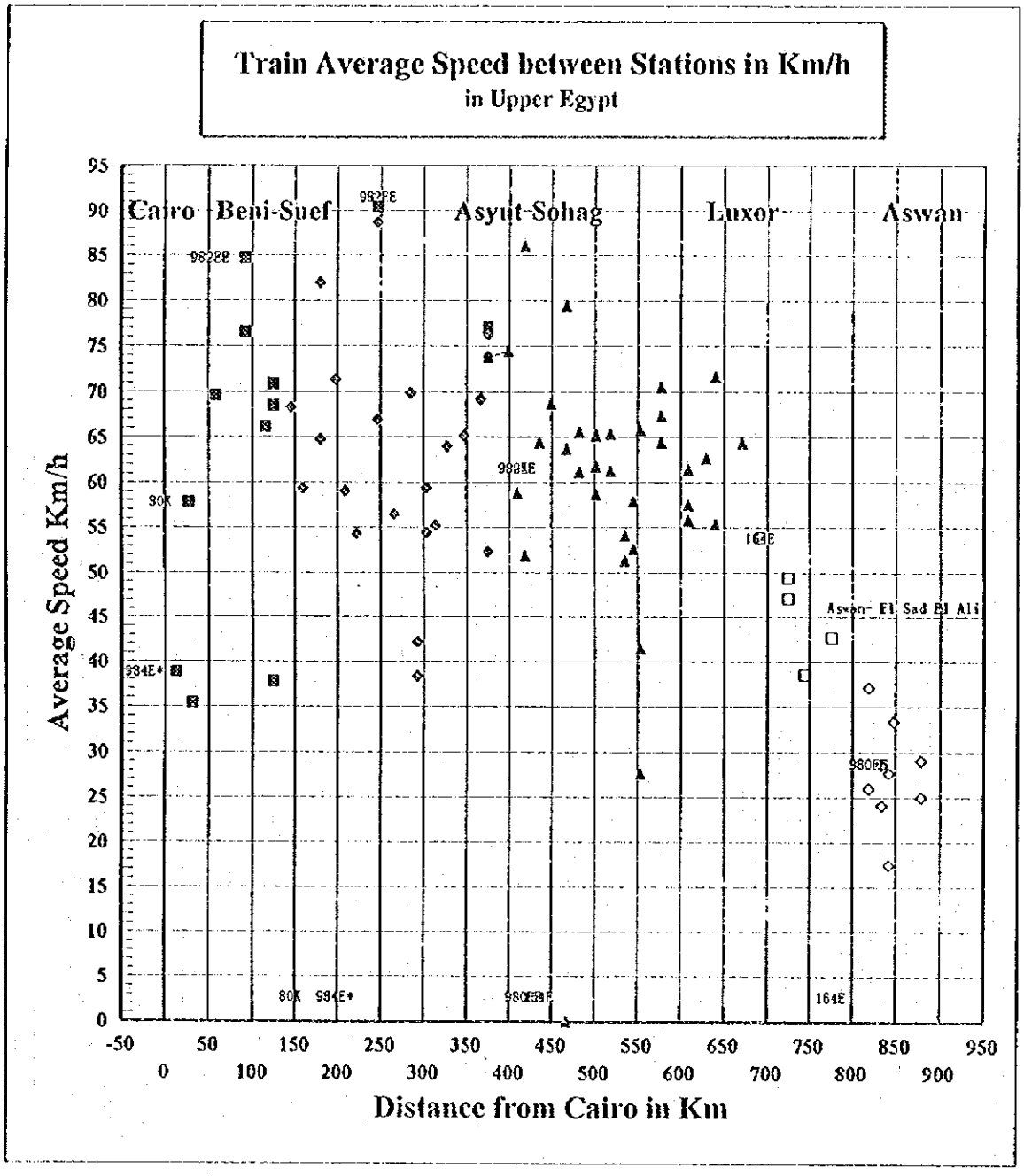
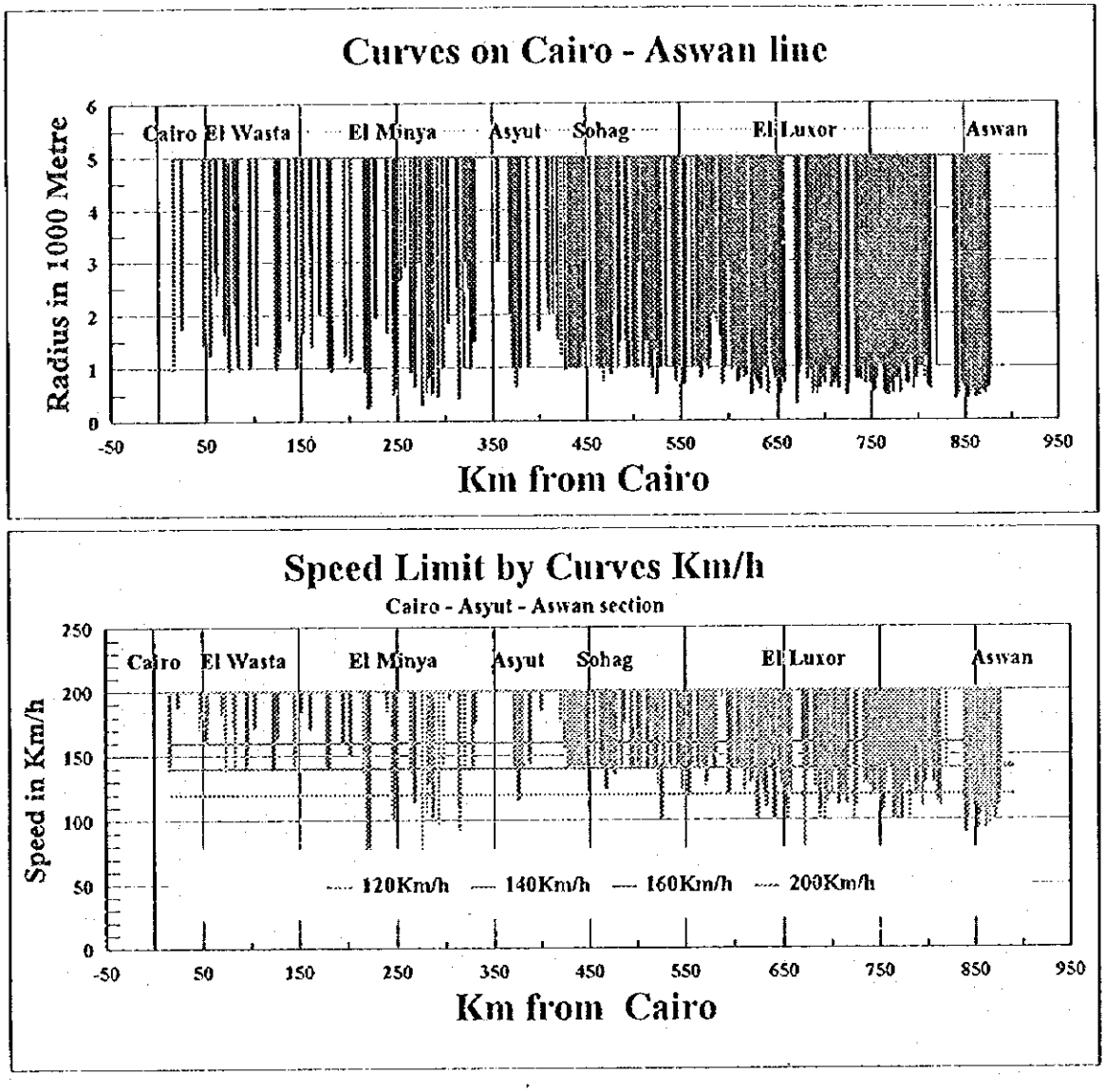


Fig. 3.10. 21 Limiting speed by curves for ordinary type trains on
Cairo - Asyut - Luxor - Aswan line



3.10.6 Safety Train Operation System

Safety systems like ATC are being installed for high speed and high density train operation in many places, but they are not yet sufficient, although the number of accidents has been decreasing remarkably in recent years.

Fig. 3.10.22 Number of accidents in ENR (examples)

Derailments Classified According to their Responsibiltiy

Year	Rolling stock	P-W(Track)	Operation	Signalling	Commodity Setup	Multiple	External	Total
90/91	104	70	19	13	2	46	64	318
91/92	72	49	21	15	1	40	53	251
92/93	71	49	15	4	2	49	26	217
93/94	42	16	8	3	0	28	14	111
94/95	33	18	10	3	0	22	13	99