ДŰ.

アンドマシンジ

FINAL REPORT SUMMARY

ž

IAPAN RAILWAY TEORIOLL SEX MOT/DAWA INSTITUTE OF

CIPIC CONSULTAN

102

105 105

14

۱SF

IRAR

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA) TRANSPORT PLANNING AUTHORITY MINISTRY OF TRANSPORT AND COMMUNICATION THE ARAB REPUBLIC OF EGYPT

# THE MASTER PLAN STUDY FOR EGYPTIAN NATIONAL RAILWAYS

# FINAL REPORT SUMMARY

December, 1996



JAPAN RAILWAY TECHNICAL SERVICE DAIWA INSTITUTE OF RESEARCH LTD. PACIFIC CONSULTANTS INTERNATIONAL



Na 52

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

TRANSPORT PLANNING AUTHORITY MINISTRY OF TRANSPORT AND COMMUNICATION THE ARAB REPUBLIC OF EGYPT

# THE MASTER PLAN STUDY

# FOR

# EGYPTIAN NATIONAL RAILWAYS

# FINAL REPORT SUMMARY

December, 1996

JAPAN RAILWAY TECHNICAL SERVICE DAIWA INSTITUTE OF RESEARCH LTD. PACIFIC/CONSULTANTS INTERNATIONAL





## PREFACE

In response to a request of the Government of the Arab Republic of Egypt, the Government of Japan decided to conduct the Master Plan Study for Egyptian National Railways (ENR) and entrusted the study to Japan International Cooperation Agency (JICA).

JICA organized a study team headed by Dr. Hiroshi Okada, President of Japan Railway Technical Service (JARTS) and composed of the members of JARTS, Daiwa Institute of Research, Ltd. (DIR) and Pacific Consultants International (PCI). The study team visited Egypt three times between November 1995 and October 1996.

Through the study, the study team recognized that ENR has a railway network in the high population density area along the River Nile and Nile Delta, which is a very advantageous situation for rail transport, and that Egypt is moving towards a market economy, steadily implementing economic reform programs. Under these circumstances, the study team clarified problems regarding ENR's management and finance, and formulated a master plan to improve management and achieve the financial viability of ENR.

To implement the reformation of ENR, the firm resolution of ENR and related government agencies, understanding and cooperation of various related parties, and strong leadership from top government officials are essential.

I sincerely hope that this report will contribute to the improvement of the management of ENR, and that ENR will play an important role in the midst of growing motorization, and contribute to Egypt's society and economy.

Finally, I would like to thank the Transport Planning Authority, Ministry of Transport and Communication, ENR and other related ministries, government agencies, and academics for their heartfelt assistance and valuable suggestions extended to the study team.

December 1996

Kimio Fujita President Japan International Cooperation Agency

# Letter of Transmittal

December 1996

Mr. Kimio Fujita President Japan International Cooperation Agency

Dear Mr. Fujita,

It is my great pleasure to submit herewith the Final Report for the Master Plan Study for Egyptian National Railways in the Arab Republic of Egypt.

The report is the result of the Study carried out by Japan Railway Technical Service, Daiwa Institute of Research and Pacific Consultants International as per the contract with Japan International Cooperation Agency (JICA) from November 1995 to December 1996.

Based on the recent socio-economic situation in Egypt, the master plan has been drown up in the Study to improve the management of Egyptian National Railways (ENR), a major means of transport in the country, as part of our cooperation related to movement towards the market economy in Egypt.

On behalf of the study team, let me express my heartfelt thanks to the Government of Egypt, especially Transport Planning Authority of Ministry of Transport and Egyptian National Railways, for the generous cooperation, assistance and warm hospitality they extended to them throughout entire period of the study.

Our thanks are also due to Japan International Cooperation Agency, the Ministry of Foreign Affairs, the Japanese Embassy in Egypt and the JICA Egypt Office for their valuable advice and support during the Study and preparation of this report.

I sincerely hope this report will be found helpful to ENR in promoting its sound management operation, so that the railway can continuously play a key role in the transport in Egypt by adequately meeting the changes in demand entailed by the economic reform in the country.

Yours faithfully,

Hyosh Chada

Hiroshi Okada Leader of the Japanese Study Team (President, Japan Railway Technical Service)

· · · ·

# CONTENTS

CHAPTER 1 INTRODUCTION
1.1 OBJECTIVE OF THE STUDY
1.2 TARGET YEAR OF THE STUDY
CHAPTER 2 MACRO ECONOMY
2.1 ECONOMIC INDICES IN EGYPT
2.2 FORECAST
Figure 2.3.5 Egynt GDP Forecast 7
Figure 2.3.1 Past GDP Growth Rate Comparison
Figure 2 3 2 (Government Budget Deficit ÷ GDP) & (Subsidies ÷
Government Budget
Table 2 3 6 GDP by Sector Forecast
Table 2 3 8 Employment Forecast
Table 2.3.12 Future GRDP by Sector 10
CHADTED 2 CURDENT CONDITION OF END AND FTS
CHAFTERS CURRENT CONDITION OF ENRANDITS
PROBLEMS
3.1 RAILWAY NETWORK & LINES/SEGMENTS
Figure 3.2.1 ENR Railway Network
Table 3.2.1 Outline of Each Line/Segment    12
3.2 TRANSPORT VOLUME
Table 3.3.3 Passenger Transport Volume of ENR
Table 3.3.4 (1) Freight Transport Volume of ENR    15
3.3 PERSONNEL
Table 3.5.1 ENR Staff in Budget, 1995/96
Table 3.5.2 Staff Working at ENR
Figure 3.5.4 ENR Employee Age Structure
3.4 MARKET STRUCTURE 17
Figure 3.6.1 Comparison of Distribution of Trip Purpose
Figure 3.6.2 Comparison of Distribution of Type of Job
Figure 3.6.3 Comparison of Distribution of Dominant Reason to Use Each
Mode
3.5 TARIFF STRUCTURE AND TARIFF ANALYSIS
Appendix 3.7.44 ENR Tariff Raise History (%)
Figure 3.7.8 GNP Per Capita and Average Passenger Fare by Country 21
Figure 3.7.10 GNP Per Capita and Average Freight Fare by Country
3.6 FINANCIAL STATUS
Figure 3.8.1 ENR Cost Recovery Ratio (excluding Metro)
Figure 3.8.2 Metro Cost Recovery Ratio
Table 3.8.1 Income Statement of ENR (excluding Metro)
Table 3.8.13 Income Statement of Metro
3.7 FINANCIAL ANALYSIS
Figure 3.9.1 Break Even Point Analysis of ENR (Excluding Metro)
(94/95)
Table 3.9.4 Breakeven Point Avalusis of Metro

	Table 3.9.1 Price Effect & Volume Effect Analysis of ENR (excluding	
	Metro)	27
	Figure 3.9.11 (1) International Comparison of Asset Turnover Ratio	28
	Table 3.9.9 Asset Turnover of ENR (including Metro)	29
	Figure 3.9.10 (1) Asset Turnover of ENR 1994/95	29
	Figure 3.9.3 Estimation Flow of (Revenue + Expenses) (Cost Recovery	
	Ratio) of Each Line/Segment	31
	Table 3.9.15 Estimation of Cost Recovery Ratio	32
	Figure 3.9.4 Cost Recovery Ratio of Each Line (All Lines)	33
•	3.8 TRAIN OPERATION	34
	Figure 3.10.1 Transition of Number of Express and Ordinary Passenger	
	Trains	34
	Table 3.10. 1 Daily Train Km (regular operation) - each ENR Line by	
	Diagram (both directions)	
	Table 3.10. 2 Result of Freight Train Operation	
	Figure 3 10 4 Train Average Speed from Cairo to Major Cities on Cairo -	
	Tanta - Mansura - Domietta l ine	37
	Figure 3 10 5 Train Average Sneed from Cairo to Major Cities in Unner	
	Fount	37
	3 9 DOLLINC STOCK AND MAINTENANCE	- 20
	- 3.7 ROLDING STOCK AND MAINTENANOD animamanananananananananan - 2.10 DEDMANENTAVAVAND CEATION	20
	2 11 CIONALINO AND TELECOMMUNICATION	10
	- 3 I I MUADING AND TELECOMMUNICATION minimum m I z z z z z z z z z z z z z z z z z z z	- 40 - 71
		··· 41
~		
C	HAPTER 4 BUSINESS IMPROVEMENT PROPOSAL	. 42
•	4.1 MANAGEMENT STRATEGY	42
	4.1.1 ENR's Changing Environment	42
	4.1.2 Response to Changing Environment.	43
	4.2 BUSINESS IMPROVEMENT ITEMS	45
	4.2.1 Promote a Market Oriented Tariff Policy	45
	4.2.2 Strengthen Ticket Checking System	46
	4.2.3 Reduce the Travel Time for Passengers on Main line	47
· ·	4.2.4 Improve the Freight Transport System	49
	4.2.5 Improve Passenger Service	51
	A 2.6 Require Compensation from the Government	52
	Table 1.2.6 1 Estimated Amounts to be Componented for Passengars by	
	Tuble 4.2.0.1 Estimated Amounts to be Compensated for Fassengers by	50
•	4.2.7 Deduce the Number of Stoff	
	4.2.7 Reduce the Number of Statt.	
· .	Figure 4.2.7.1 Kaliway Labor Efficiency in Developed Countries	
	Table 4.2.7.3 Natural Wastage based on Recruitment at 0%	56
	Figure 4.2.7.2 Number of ENR Personnel (excluding Metro)	56
	4.2.8 Raise the Availability of Rolling Stock	57
	Figure 4.2.8.1 Breakdown Rate and Total Running km per Loco. by Age	
	Group	58
	Figure 4.2.8.2 Breakdown Data by Cause	59
	4.2.9 Make Reasonable Scale of Investment	59
	4.2.10 Close Lines Which Are Lightly Used	60

Figure 4.2.10.1 Cost of Passenger Volume (Railway vs. Bus)	62
4.2.11 Make the Organization More Business Oriented	63
4.2.12 Correct the Data Collection System	63
Figure 4.2.12.1 Computer System & Data Checking Flow	65
4.2.13 Enhance Safety Devices on Main Lines	66
4.2.14 Improve Track Maintenance System	66
4 2 15 Develop Diversified Businesses	66
4.2.16 Clarify the Relationship between the Government and ENR	67
A 2 17 Promote Local Production of Diesel Flectric Locomotives	69
Figure 4.2.17 I Renlacement of Existing Locomotives at Age 25 Years	70
Figure 4.2.17.2 Replacement of Existing Locomotives at Age 30 Years	70
Figure 4.2.17.3 Replacement of Existing Locomotives at Age 33 Years	
4 3 GUIDELINE OF PRIVATIZATION	
4.3.1 Significance of Privatization	.71
4.3.2 Types of Privatization	71
4.2.2 Toward Drivatization of ENP	
4.5.5 Toward Privanzanon of Eink	
CHAPTER 5 BUSINESS IMPROVEMENT ALTERNATIVES	74
5.1 BUSINESS IMPROVEMENT FACTORS	74
Figure 5.1.1 Lines planned Train Speed-up and Closure lines	78
5.2 POLICY OF CASE CLASSIFICATION	
Table 5.2.1 Business Improvement Alternative Cases	80
	~ 4
CHAPTER 6 TRANSPORTATION DEMAND FORECAST	81
CHAPTER 6 TRANSPORTATION DEMAND FORECAST 6.1 METHODOLOGY OF DEMAND FORECAST	81
CHAPTER 6 TRANSPORTATION DEMAND FORECAST 6.1 METHODOLOGY OF DEMAND FORECAST 6.2 ZONING SYSTEM	81 81 81
CHAPTER 6 TRANSPORTATION DEMAND FORECAST 6.1 METHODOLOGY OF DEMAND FORECAST 6.2 ZONING SYSTEM 6.3 PASSENGER TRANSPORT DEMAND MODEL	81 81 81 81
CHAPTER 6 TRANSPORTATION DEMAND FORECAST 6.1 METHODOLOGY OF DEMAND FORECAST 6.2 ZONING SYSTEM 6.3 PASSENGER TRANSPORT DEMAND MODEL 6.4 PASSENGER ASSIGNMENT	81 81 81 81 81
CHAPTER 6 TRANSPORTATION DEMAND FORECAST 6.1 METHODOLOGY OF DEMAND FORECAST 6.2 ZONING SYSTEM 6.3 PASSENGER TRANSPORT DEMAND MODEL 6.4 PASSENGER ASSIGNMENT 6.5 ESTIMATION OF FUTURE TRAVEL DEMAND FOR ALTERNATIV	81 81 81 81 81 E
CHAPTER 6 TRANSPORTATION DEMAND FORECAST 6.1 METHODOLOGY OF DEMAND FORECAST 6.2 ZONING SYSTEM 6.3 PASSENGER TRANSPORT DEMAND MODEL 6.4 PASSENGER ASSIGNMENT 6.5 ESTIMATION OF FUTURE TRAVEL DEMAND FOR ALTERNATIV CASES	81 81 81 81 81 E 81
CHAPTER 6 TRANSPORTATION DEMAND FORECAST 6.1 METHODOLOGY OF DEMAND FORECAST 6.2 ZONING SYSTEM 6.3 PASSENGER TRANSPORT DEMAND MODEL 6.4 PASSENGER ASSIGNMENT 6.5 ESTIMATION OF FUTURE TRAVEL DEMAND FOR ALTERNATIV CASES	81 81 81 81 E 81 E 81 E 81
CHAPTER 6 TRANSPORTATION DEMAND FORECAST 6.1 METHODOLOGY OF DEMAND FORECAST 6.2 ZONING SYSTEM 6.3 PASSENGER TRANSPORT DEMAND MODEL 6.4 PASSENGER ASSIGNMENT 6.5 ESTIMATION OF FUTURE TRAVEL DEMAND FOR ALTERNATIV CASES 6.6 FREIGHT TRANSPORT DEMAND FORECAST 6.7 ROUGH ESTIMATION OF PASSENGER VOLUME OF METRO LINE	81 81 81 81 E 81 E 81 82 82
CHAPTER 6 TRANSPORTATION DEMAND FORECAST 6.1 METHODOLOGY OF DEMAND FORECAST 6.2 ZONING SYSTEM 6.3 PASSENGER TRANSPORT DEMAND MODEL 6.4 PASSENGER ASSIGNMENT 6.5 ESTIMATION OF FUTURE TRAVEL DEMAND FOR ALTERNATIV CASES 6.6 FREIGHT TRANSPORT DEMAND FORECAST 6.7 ROUGH ESTIMATION OF PASSENGER VOLUME OF METRO LINE Figure 6.1 Outline of Transport Demand Forecast	81 81 81 81 E 81 E 81 82 82 83
CHAPTER 6 TRANSPORTATION DEMAND FORECAST 6.1 METHODOLOGY OF DEMAND FORECAST 6.2 ZONING SYSTEM 6.3 PASSENGER TRANSPORT DEMAND MODEL 6.4 PASSENGER ASSIGNMENT 6.5 ESTIMATION OF FUTURE TRAVEL DEMAND FOR ALTERNATIV CASES 6.6 FREIGHT TRANSPORT DEMAND FORECAST 6.7 ROUGH ESTIMATION OF PASSENGER VOLUME OF METRO LINE Figure 6.1 Outline of Transport Demand Forecast Figure 6.2 (a) Zoning System (Lower Egypt)	81 81 81 81 E 81 E 81 E 82 82 83 84
<ul> <li>CHAPTER 6 TRANSPORTATION DEMAND FORECAST</li></ul>	81 81 81 81 E 81 E 81 82 82 82 83 84 84
<ul> <li>CHAPTER 6 TRANSPORTATION DEMAND FORECAST</li></ul>	81 81 81 E 81 E 81 E 82 82 82 83 84 84
<ul> <li>CHAPTER 6 TRANSPORTATION DEMAND FORECAST</li></ul>	81 81 81 81 E 81 E 81 E 82 82 82 83 84 84 85
<ul> <li>CHAPTER 6 TRANSPORTATION DEMAND FORECAST</li></ul>	81 81 81 81 E 81 E 81 82 82 82 83 84 85
<ul> <li>CHAPTER 6 TRANSPORTATION DEMAND FORECAST</li></ul>	81 81 81 81 E 81 E 81 82 82 82 83 84 85 85
<ul> <li>CHAPTER 6 TRANSPORTATION DEMAND FORECAST</li></ul>	81 81 81 81 E 81 E 81 E 82 82 82 83 84 85 85
<ul> <li>CHAPTER 6 TRANSPORTATION DEMAND FORECAST</li></ul>	81 81 81 81 E 81 E 81 E 82 82 82 84 85 85
CHAPTER 6 TRANSPORTATION DEMAND FORECAST	81 81 81 81 E 81 E 81 82 82 82 83 84 85 86 87
<ul> <li>CHAPTER 6 TRANSPORTATION DEMAND FORECAST</li></ul>	81 81 81 81 E 81 E 81 E 82 82 82 83 84 85 85 86
<ul> <li>CHAPTER 6 TRANSPORTATION DEMAND FORECAST</li></ul>	81 81 81 81 E 81 E 81 E 82 82 82 82 84 85 85 86
<ul> <li>CHAPTER 6 TRANSPORTATION DEMAND FORECAST</li></ul>	81 81 81 81 E 81 E 81 E 82 82 82 83 84 85 86 87 88
<ul> <li>CHAPTER 6 TRANSPORTATION DEMAND FORECAST</li></ul>	81 81 81 81 E 81 E 81 E 82 82 82 82 83 84 85 86 87 88
CHAPTER 6 TRANSPORTATION DEMAND FORECAST	81 81 81 81 E 81 E 81 E 82 82 82 82 82 83 84 85 86 87 88

1	Table 6.14-1 Comparison among Railway Passenger-km for Different Alternatives of Fare Raise in the Base Year (1995) and
	Target Year
	Table 6.14-2 Summary of Transport Demand Forecast of Railway
	Passengers for Different Alternative Cases in Different
	Planning Years
	Table 6.14-3 Comparison of Without and With Case for Main lines and         Other Lines
	Table 6 18 Statistics of Freight Activity of ENR Classified by Each
	Commodity Type in 1995
	Table 6.19 Estimated Growth Factors for Different Commodities Based on
	the Data of Years 1992 and 2012
:	Table 6.26 Tonnage Density of Total Commodities and Ton-Km for Each
	Line of ENR Railway Network in Different Planning Years 95
	CHAPTER 7 TRAIN OPERATION PLAN
	7.1 PASSENGER TRANSPORT
	7.2 FREIGHT TRANSPORT96
	Figure 7.1.1 Test Result of Train Running Performance Turbo Train
	Figure 7.1.2 Test Result of Ordinary Express Train
	Figure 7.1.3 Speed and Acceleration Force
	Table 7.1.1 Passenger Train Transport Volume         98
	Table 7.1.2 Passenger Flow and Coach Km in Without Case         98
	Table 7.1.3 Passenger Flow and Coach Km in With Cases 1-1 & 1-2
	Table 7.1.4 Passenger Flow and Coach Km in With Cases 2-1 & 2-2
	Table 7.2.5 Freight Train Km Forecast on Each Line       99
	7.3 CAPACITY FOR FUTURE TRAIN OPERATION
	Table 7.3.1 Track Capacity of Cairo - Alexandria Line and Number of         Trains       100
÷ .	Table 7.3.2 Track Capacity of Cairo - El Sad El Ali Line and Number of
	Trains
	CHAPTER 8 INVESTMENT PLAN 101
	8.1 CONCEPT OF RAILWAY INVESTMENT 101
	8.2 INVESTMENT PLAN UNTIL 2002 101
	8.2 INVESTMENT PLAN AFTER 2003
	Table 8.2.1 Investment Plan - Without Case (excluding Metro)       103
	Table 8.2.2 Investment Plan - With Case 1-1, 1-2 (excluding Metro)
	Table 8.2.3 Investment Plan - With Case 2-1, 2-2 (excluding Metro)
	Table 8.2.3 Comparison of Invésiment Plan for each Case         105
	CHAPTER 9 EVALUATION OF THE ALTERNATIVES
	9.1 FINANCIAL EVALUATION

	Table 9.1.27-36 Comparison of Alternatives
vport)	Figure 9.1.1 ENR Profit Forecast (Without government supp
	(excluding Metro)
ENR	Figure 9.1.2 Forecast of Profit (With government support)
	(excluding Metro)

Figure 9.1.3 2001/2002 Profit Increase from Proposals.
Figure 9.1.4 Profit (Loss) of ENR in 2001/2002 (excluding Metro)
Figure 9.1.5 Investment and Free Cash Flow, ENR (excluding Metro) 111
Figure 9.1.6 Investment and Free Cash Flow, ENR (excluding Metro) 111
Figure 9.1.7 Forecast of Debt ENR (excluding Metro)
Figure 9.1.8 Forecast of Fixed Asset Turnover Ratio ENR (excluding
Metro) 112
9.2 SOCIAL AND ENVIRONMENTAL IMPACT EXAMINATION 113
9.2.1 Social Impact Examination 113
9.2.2 Environmental Examination and Consideration
9.3 GENERAL EVALUATION
9.3.1 Final Selection & Evaluation of Business Improvement Proposals114
9.3.2 Extend Government Financial Support Until 2001/02
9.3.3 ENR After 2002
9.3.4 Overall Evaluation
CHAPTER 10 IMPLEMENTATION PLAN
10.1 MASTER PLAN
10.2 ESTABLISHING AN IMPLEMENTATION ORGANIZATION
10.2.1 Establish ENR Reform Management Committee.
10.2.2 Establish Reform Team
10.3 IMPROVEMENT PROPOSAL IMPLEMENTATION PLAN
10.3.1 Actions to be Implemented after thorough Discussion with Related
Parties (Including Labor Union)
10.3.2 Issues to be Discussed with Government Institutions 119
10.4 ITEMS WHICH CAN BE IMPLEMENTED IMMEDIATELY 110
CHAPTER 11 OUTLINE OF FURTHER STUDY

## CHAPTER 1 INTRODUCTION

## 1.1 **OBJECTIVE OF THE STUDY**

This Study is to formulate the Master plan for ENR, which is one cause of the government deficit. The goal is to fundamentally revise the management strategy of ENR, and to make a profitable railway with sound operations. For this purpose, the objectives of the Study are:

- (1) Identify future objectives and policies of ENR to achieve financial viability.
- (2) Prepare phased development plans for restructuring the management and financial systems of ENR.
- (3) Prepare phased development plans for the infrastructure, rolling stock, tractive power, etc., together with economic and financial analysis of each individual project based on free market forces and competition with other modes of transport.

## 1.2 TARGET YEAR OF THE STUDY

The target year of the master plan is divided into three periods: the first period from 1997 to 2002; the second period from 2003 to 2007; and the third period from 2008 to 2012. The Study mostly focuses on the short term plan until 2002, after 2003 that is examined as the railway strategy plan.

# CHAPTER 2 MACRO ECONOMY

#### 2.1 ECONOMIC INDICES IN EGYPT

Economic indices from 1990/91 to 1994/95 are shown in Figures 2.3.1 and 2.3.2.

#### 2.2 FORECAST

Considering the steady stabilization of Egypt's economy, future GDP growth rates forecast in the 3rd FYP by the Ministry of Planning are evaluated as proper, so data of the 3rd FYP were adopted. In the 3rd FYP, GDP growth rates are forecast 5.4 % for 1994/95-1996/97, 6.5 % for 1997/98-2001/02 (4th FYP period).

Growth rates forecast after 2001/02 were set at 6.5 % in consideration of the future long-term effect of the Economic Reform and Structural Adjustment Program. The result of the forecasts are shown in Table 2.3.5. Employee and GRDP (Gross Regional Domestic Product) forecasts are in Tables 2.3.8 and 2.3.12.







(Government Budget Deficit + GDP) & (Subsidies + Government Figure 2.3.2 **Budget**)



	0,200+		1001	. Y	1007/0	×	2001/0	2	2006/0	E	2011/1	4
SOLIDI	(actual	•L~		્ય		2		1]		1		1
COMMODITY	69,444	49.9%	73,201	49.9%	86,780	50.0%	113,202	50.7%	160,298	52.4%	226,328	54.0%
Agriculture	22,975	16.5%	23,765	16.2%	26,208	15.1%	30,812	13.8%	37,627	12.3%	45,266	10.8%
Industry / Mining	23.275	16.7%	25,231	17.2%	33,670	19.4%	49,568	22.2%	80,455	26.3%	125,738	30.0%
Oil / Oil Products	13.694	9.8%	14,083	9.6%	14,405	8.3%	15,406	6.9%	16,519	5.4%	16,765	4.0%
Electricity	2.390	1.7%	2.494	1.7%	2,951	1.7%	4,019	1.8%	5,507	1.8%	7,963	1.9%
Construction	7,110	5.1%	7,628	5.2%	9,546	5.5%	13,397	6.0%	20,190	6.6%	30,596	7.3%
PROD. SERVICES	45,782	32.9%	48,850	33.3%	59,705	34.4%	75,915	34.0%	100,951	33.0%	134,539	32.1%
Transport / Communic.	9,400	6.8%	9,829	6.7%	11,109	6,4%	14,736	6.6%	20,190	6.6%	27,243	6.5%
Suez Canal	6,104	4.4%	6,455	4.4%	7,810	4.5%	9,155	4.1%	11.013	3.6%	12,993	3.1%
Commerce / Fin. / Insur.	28,223	20.3%	30,219	20.6%	36,968	21.3%	46,665	20.9%	61,182	20.0%	80,472	19.2%
Tour / Rest / Hotel	2,055	1.5%	2,347	1.6%	3,818	2.2%	5,359	2.4%	8,566	2.8%	13,831	3.3%
SOCIAL SERVICES	23.954	17.2%	24,645	16.8%	27,075	15.6%	34,162	15.3%	44,663	14.6%	58,259	13.9%
Housing / Pub. Utility	3,169	2.3%	3,081	2.1%	2,951	1.7%	3,796	1.7%	5,200	1.7%	6,706	1.6%
Other (Gov. Personal)	20,785	14.9%	21,564	14.7%	24,124	13.9%	30,366	13.6%	39,463	12.9%	51,553	12.3%
TOTAL	139,180	100.0%	146,696	100.0%	173.560	100.0%	223,279	100.0%	305,912	100.0%	419,126	100.0%

••

Table 2.3.6GDP by Sector Forecast(at Factor Cost, at 1991/92 prices, in MN LE)

# Table 2.3.8 Employment Forecast

<u>ITEM</u>	<u>UNIT</u>	3FYP <u>1994/95</u>	4FYP <u>1997/98</u>	4FYP <u>2001/02</u>	5FYP 2006/07	6FYP <u>2011/12</u>
Population	1,000	58,978	63,433	69,106	74,978	80,673
EMPLOYMENT	1,000	15,322	17,004	19,892	24,202	29,445
Emp / Pop	%	26.0	26.8	28.8	32.3	36.5
GDP Grow Rate	%	5.4	6.5	6.5	6.5	6.5
Emp Grow Rate	%	3.3	4.0	4.0	4.0	4.0
GDP (91/92 price)	Mil LE	146,696	173,560	223,279	305,912	419,126
GDP / Pop	1,000LE	2.5	2.7	3.2	4.1	5.2
GDP / Emp	1,000LE	9.6	10.2	11.2	12.6	14.2

Forecast of employment by sector is estimated by the same method as forecast of total employment basically.

The data of growth rates of employment by sector and GDP by sector during the 3rd FYP period, and growth rate of GDP by sector during the 4th FYP which is estimated in section 2.3.3 were used for calculating the growth rate of employment by sector during the 4th FYP and after. Some figure adjustments are practiced at the same time. The result is shown as Table 2.3.9.

# Table 2.3.12Future GRDP by Sector(1991/92 prices, LE million)

ZONE	<u>1994/95</u>	<u>1997/98</u>	<u>2001/02</u>	<u>2006/07</u>	<u>2011/12</u>
1. Cairo	40,334	48,503	63,333	88,396	123,294
2. Giza	5,627	6,702	8,687	12,059	16,728
3. Kalyoubia	5,183	6,123	7,895	10,858	14,922
4. South Sharkia	5,527	6,455	8,217	11,084	14,958
5. North Sharkia	2,344	2,707	3,384	4,462	5,879
6. East Dakahlia	6,637	7,774	9,912	13,412	18,147
7. West Dakahlia	2,061	2,398	3,032	4,055	5,427
8. Damietta	2,864	3,423	4,468	6,283	8,804
9. Port Said	2,014	2,409	3,092	4,189	5,681
10. Ismailia	1,741	2,067	2,660	3,614	4,931
11. Suez	1,464	1,762	2,298	3,199	4,454
12. Menoufia	5,265	6,146	7,820	10,549	14,231
13. South Gharbia	5,503	6,478	8,307	11,339	15,469
14. North Gharbia	3,123	3,716	4,845	6,811	9,537
15. Kafr-El-Sheikh	4,324	5,032	6,360	8,533	11,437
16. South Behera	2,197	2,532	3,167	4,177	5,504
17. North Behera	5,673	6,655	8,498	11,574	15,753
18. Alexandria	14,178	17,078	22,328	31,266	43,726
19. Matrouh	440	519	664	905	1,232
20. Sinai	556	653	834	1,120	1,512
21. Fayoum	3,526	4,090	5,147	6,853	9,124
22. Beni-suef	3,123	3,617	4,544	6,028	7,995
23. Menia	5,554	6,406	8,007	10,551	13,891
24. Asyout	4,785	5,541	6,963	9,237	12,255
25. El Wadi El-Gidid	241	277	351	469	627
26. Suhag	5,121	5,953	7,501	9,982	13,293
27. Qena	4,928	5,780	7,380	10,000	13,574
28. Aswan	1,977	2,324	2,984	4,047	5,513
29. Red Sea	<u>380</u>	457	<u>604</u>	<u>864</u>	1,229
TOTAL	146,694	173,577	223,282	305,915	419,128

# CHAPTER 3 CURRENT CONDITION OF ENR AND ITS PROBLEMS

# 3.1 RAILWAY NETWORK & LINES/SEGMENTS

The railway network of ENR consists of 43 lines/segments, including 1 new line which commenced the operation in October 1996. It's total line length is approximately 4,401 kilometers.

There are 3 types of ENR lines, classified by train speed and/or passing tonnage, as shown below :

Class	Km	Number of Lines / Segments
] <sup>st</sup>	1,403	6
2 <sup>nd</sup>	787	11
3 <sup>rd</sup>	2,211	26
Total	4,401	43

Figure 3.2.1 ENR Railway Network



[	Name of Line	Length	Single	Number	Pass.	No. of	trains	Signal	Telecom	Class	Max.	Remarks
I		of line	double	of	& or		<b></b>			of	train .	1
<u>No.</u>	(Station to Station)	(Km) 10	UACK ATread	Stations	Ireight Da D	rassen.	1991	system	system D.E.	ine	speed	
1	Caro - Arxanona	100	HIMACK	48	rær	112	45	Abio.	Radio	151	50105	
	L	190	Donois			170	03	Auto.	Ka010		140	
		701	<b>N</b> 11	. 100	DAD	103	(0)	Auto.				Track doubling
2	Cairo - El Sad El Ali	791	Dongie	177	P&F	182	68	i yns	Radio	l st	120/	ldtu - Aswan
1		ļ						Token.			110	commenced in
		107	Single			28	17	Staff	Radio		90:70/	O.t. 1996
3	Benha - Port Said	113	Double	34	P&F	67	32	Tyris	Radio	1 st	90	
	· · · · · · · · · · · · · · · · · · ·	78	Single			20	9	Staff	Radio		90.70	
4	Tanta - El Mansoura	54	Double	19	P&F	56	12	Tyris	Radio	l st	90	
5	Abis - (Ras El Ten)	10	Double	7	P&F		-	Tyris	Radio	İst	70	
6	Helwan - El Marg	41	Double	33	P	270	-	Auto.	Radio	lst	100	
7	Nefisha - Suez	88	Double	16	P&F	18	16	Staff	Radio	2nd	55	
8	Mansoura - Domietta	63	Single	17	P&F	35	9	Staff	Radio	2nd	90	
9	Zagazig • Tanta	57	Single	15	P&F	34	2	Staff	Radio	2nd	70 60	
10	Imbaba - Itay El Baroud	120	Single	35	P&F	37	38	Auto.	Radio	2nd	70	
11	Sidi Gaber - Abu Quir	18	Double	14	P&F	198	2	Auto.	Radio	Znđ	70	
12	Qalyub - Menuf - Tanta	93	Single	23	P	55		Staff	Radio	2nd	70:55	
13	Ein Shams - Suez	129	Single	20	P&F	22	2	Staff	Radio	2nd	90	
14	Wasta - Fayum - Abu Kesah	61	Single	13	P&F	29	2	Staff	Radio	2nd	70	
15	El Marg - Shebeen Kanater	21	Single	12	P&F	50	4	Staff	Radio	2nd	70.40	
16	El Mamoura - Rashid	66	Single		P&F	18	2	Staff	Radio	2nd	70	
17	Mansoura - El Mataria	71	Single	23	P	24		Staff	Radio	20d	60	
18	Oabuh - Zseazio	61	Single	18	P&F	36	14	Staff	Radio	364	70	
10	Zanjuo - Zegazig	69	Single	20	PEF		- 12	Staff	Radio	303	70	······································
20	Abu Kabir - El Salbaia	24	Single	10	D	21	12	Staff	Radio	2.4	70.60	
20	Rache Zafte	- 24	Single		De.C	24		Staff Staff	Padia	210	70.00	
	Desus El Composido	10	Clauda			11		Staff	Radio	2-4	70	
22	Faque L'ationania	- 40	Single		COT D	24	. 2	Stan	Radio	310		<u></u>
23	Menul - Kalf El Zalyal	49	Single	18	r	24	· ·	Stall	Radio	310	00	
24	Ci Sania - Manatel Koon	19	Single		P&F	24		Stati	Kadio	- 540	65	
25	Mahalet Koun - Damannur	74	Single	21	P	30		Stall	Radio	310		
26	Benha - Menui	25	Single	10	P&F	24	2	Siall	Radio	3rd	60	
27	Qabbary - Marsa Matruh	15	Double	31	P&F	16	18	Tyris	Radio	3rd	90	·
L.		279	Single		P&F	- 16	4	Staff	Radio	313	90	
28	Sherbeen - Qelein	81	Single	20	P	36	•	Staff	Radio	3rd	70	
29	Bouseli - El Qassabi	29	Single	10	P&F	12	2	Staff	Radio	319	55.40	
30	El Fayum - Sinnuris	12	Single	4	Р	20	•	Staff	Radio	3rđ	50	
31	Desuq - Motobus	27	Single	- 8	P&F	14	2	Staff	Radio	3rd	40	
32	Abbassaya - Tebeen	20	Single	14	P&F	2	18	Staff	Radio	3rd	40	
33	El Geish - El Magharat	24	Single	•	P&F	2	16	Staff	Radio	3rd	40	
34	El Samala - El Saloum	260	Single	16	P	2	-	Staff	Radio	3rd		
35	Tebbeen - Managim	346	Single	19	P&F	2	8	Staff	Radio	3rd	:	
36	El lihad - Qabbary	108	Single	11	F	-	24	Staff	Radio	3rd		
37	Beni Suef - El Lahun	25	Single	10	P&F	18	2	Staff	Radio	3rd	40	
38	Shaweish-Abu El Sammad	12	Single	4	P&F	8	2	Staff	Radio	3rd	15	
39	El Gabal El Asfar	7	Single	2	P&F	2	4	Staff	Radio	Jrd	40	
40	Kafr Saad - Kafr Silman	3	Single	2	P	4	•	Staff	Radio	313	25	
41	Kafr Batikh - Domiatta Port	15	Single	2	F		8.	Staff	Radio	313		
42	Qena - Safaga	233	Single	14	P&F	2	10	Staff	Redio	31		
											· · · · · · · ·	Concernantin Oct 106

Table 3.2.1 Outline of Each Line/Segment

Note: Numbers of trains are maximum number of trains in both directions per day on the section. Number of passenger trains excludes seasonal train, and number of freight trains includes non-daily trains. Auto (Automatic signaling system); Token (Tokenless signaling system)

#### 3.2 TRANSPORT VOLUME

## (1) Passengers

- 63% of all ENR passengers traveled on the 3 main lines in 1994/95, excluding conductor tickets. Main lines carry most passengers, even though the total route length of main lines is 1,403 km (29% of total ENR route length).
- An extremely large number of passengers use conductor tickets.
- Only about 50% of suburban line passengers use season tickets, even though suburban lines are located in urban and suburban areas.

- Passenger-km grew by 7.2% per year over the past 5 years. (Table 3.3.3)

## (2) Freight

- 5 commodities accounted for 80.5% of all freight transport volume in 1994/95. (petroleum products, phosphate, iron ore, coal & coke, and wheat)

- Iron ore alone accounted for 23.6% of total ton-km and 40.9% of total freight revenue.

- Ton-km grew by 6% per year over the past 5 years.

(Table 3.3.4.11)

A AUVIC V		イーングロンク													
	ENR (Except ]	Metro)			 	METRO					TOTAL				
Year	Number of	Growth	Passenger-	Growth	Average	Number o	of Growth	Passenger-km	Growth	Average []	Number of	Growth	Passenger-	Growth /	Average
	passengers	ratio	Kin	ratio	đ	passengers	ratio	(million)	ratio	trip.	passengers	ratio	E E	ratio h	÷Ê
	(million)	(%)	(million)	(%)	(km)	(million)	(%)		(%)	(km)	(million)	(%)	(million)	)(%)	(iii)
1985/86	624.000		26.232		42.0						624.000		26,232		
1986/87	648.402	3.9%	33,075	26.1%	51.0					ľ	648.402	3.9%	33.073	26.1%	T
1987/88	580.030	-10.5%	34,167	3.3%	58.9	48.868		733		15.0	628.898	-3.0%	34,900	5.5% 5	5.5
1988/89	569.127	-1.9%	34.816	1.9%	61.2	72.490	48.3%	1,015	38.5%	14.0	641.617	2.0%	35,831	2.7% \$	5.8
06/6861	578.210	1.6%	36,253	4.1%	62.7	127.997	76.6%	1.792	76.6%	14.0	706.207	10.1%	38,045	6.2% 5	3.9
1990/91	612.760	6.0%	40,951	13.0%	66.8	146.455	14.4%	2.041	13.9%	13.9	759.215	7.5%	42,992	13.0% 5	6.6
1991/92	637.270	4.0%	42.589	4.0%	66.8	280.528	- %S-16	3.928	92.5%	14.0	917.798	20.9%	46,517	8.2% 5	0.7
1992/93	662.761	4.0%	44.744	5.1%	67.5	305.749	9.0%	4.280	9.0%	14.0	968.510	5.5%	49,024	5.4% 5	0.6
1993/94	670.299	1.1%	46,731	4.4%	69.7	311.948	2.0%	4.367	2.0%	14.0	982.247	1.4%	51,098	4.2% 5	2.0
1994/95	718.282	7.2%	51.282	9.7%	71.4	328.306	5.2%	4,596	5.2%	14.0	1,046.588	6.6%	55.878	9.4% 5	4.6
Growth	1985/86-94/95	1.6%		7.7%								5.9%		8.8%	
rate	1990/91-94/95	4.1%		5.8%			22.4%		22.5%			8.4%		6.8%	
Source: E.	NR Commerci	al Departn	rent											1	]

Table 3.3.3 Passenger Transport Volume of ENR

(N)         (N) <th></th> <th></th> <th></th> <th>L L</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>ĺ</th> <th>ſ</th> <th></th> <th></th> <th></th> <th>Ķ</th> <th> ;</th> <th></th> <th></th> <th>Į</th> <th></th> <th></th> <th>ſ</th>				L L							ĺ	ſ				Ķ	;			Į			ſ
Trends         Trends         Towas         <			(A) A	otual FI	eignt 1	ranspor	t Volu	ne			) ค	MOK	q			<u>)</u>	) Mar	Ket .	hare				
Tromosti (1000)         Toronis			26/1661		\$6/2661		1993/94		1994/95		- 26/16	6 26/26	26 • 26/2	194 93/	94-94/9	5/16 \$		92/93		103/94	¢.	4.95	
Cutac Crit         (1000)         (min)         (min) </th <th></th> <th></th> <th>Tomage</th> <th>Ton-km</th> <th>Tonnage</th> <th>Ton-km</th> <th>Tonnage</th> <th>Ton-km</th> <th>Tonnage</th> <th>Ton-km</th> <th>Tons</th> <th>Ton- T</th> <th>ons T</th> <th>-Ho To</th> <th>ns Ton</th> <th>ao T</th> <th>Ton-</th> <th>К Н Н</th> <th>Ton-</th> <th>Tons</th> <th>ġ</th> <th>SE SE</th> <th>ģ</th>			Tomage	Ton-km	Tonnage	Ton-km	Tonnage	Ton-km	Tonnage	Ton-km	Tons	Ton- T	ons T	-Ho To	ns Ton	ao T	Ton-	К Н Н	Ton-	Tons	ġ	SE SE	ģ
Conde Constraint         11/75         36/5         1.33/1         31/3         1.13/5         36/5         1.33/1         31/3         31	1		1(1000)	(IIII)	(1000)	( <b>u</b> r])	(0001)	(III)	(0001)	(mil)		ş	2	F	Ş		km		kn		km	X	5
Mannelisement         11.754         Model         1.2361         [1.1201         [1.1201         [1.1201         [1.12111         [1.1111 <th[1.1211< th=""></th[1.1211<>		Crude Oil									(%)	·) (•)	<ul><li>(%)</li></ul>	%) (0)	(%)	(0/0)	(%)	(%)	(%)	(%)	) (%)	)) (%	(%)
Amenic Gase         24-45         91-5         13-5         24-5         24-5         24-5         20-5	1	Petroleum Products	1,175.6	365.6	1.231.7	384.1	1.220.1	411.1	1,157.0	443.2	4.8	5.1 1.6	.6 7.	0 -5.	2 7.8	11.3	9.11.	12.5	12.9	10.9	11.7 19	~	2
Construction Materials         2949         512         1013         2023         5203         5213	1	Natural Gas							·   ·			-	╞	┞╴	-	-		_			-		T
Oper Control (condition)         0.500         0.501         0.500         0.501         0.500         0.501         0.500         0.501         0.500         0.501         0.5	1	Cement	244.9	52.5	184.9	39.6	147.5	33.1	208.8	42.8	24.5	24.5 -2	0.2 -1	6.4 41	6 293	1 2.4	5	61	1.3	6	60	×	-
Phoephate         (645)         400         2732         3924         9378         5374         5375         535         637         535         6373         535         6373         535         6373         535         635         6353         6		Other Construction Materials	299.9	43.0	279.0	56.8	688.2	129.3	271.3	62.1	7.0	32.2 1.	<del>4</del> 6.6 1:	77 -60	1.6 -52	0 2 9	4	2 ×	0	5	-		
Timo Occ         2.333.0         N13.1         2.285.5         799.6         2.617         91.6         1.4         1.1         1.45         8.6         9.6 <th></th> <th>Phosphate</th> <th>645.3</th> <th>460.2</th> <th>473.2</th> <th>342.8</th> <th>657.8</th> <th>534.4</th> <th>934.0</th> <th>706.9</th> <th>26.7  </th> <th>-25.5 35</th> <th>0.0</th> <th>54</th> <th>0 32.3</th> <th>63</th> <th>149</th> <th>4 X</th> <th></th> <th>0</th> <th>- </th> <th>0</th> <th>P</th>		Phosphate	645.3	460.2	473.2	342.8	657.8	534.4	934.0	706.9	26.7	-25.5 35	0.0	54	0 32.3	63	149	4 X		0	- 	0	P
Colument (Nome)         16.2         2300         986.5         3400         1,82.2         44.5         25.7         57.5         57.5         57.5         57.5         57.7         11.7         11.7           What         1.459.5         18.57         1.50.7         300.5         1.13.43.3         259.1         1.73.43         259.1         1.73.43         25.7         1.13.7         11.7		Iron Ore	2,323.0	813.1	2.285.5	799.6	2.617.9	916.3	2.393.5	837.7	-1.6	17 1	l L	». 9	5 86	22.4	26.4	23.2	26.9	4			•
Other Mineral (Nome)         1.459.3         317         1.507.7         359.1         1.794.2         487.0         5.2.4         2.2.12         57.6         80.9         1.40         100         11.8         10.2         77         15.1         12.4           First and Vegetable         322.6         7.4.7         1.5.0.5         300.0         0.		Coal and Coke	916.2	230.0	908.5	249.2	1.162.6	324.0	1.622.2	445.7	×	83 2	0.3	033	5 37.5	××	Y-L	00	X 4	104	100		1
Wheat         [1,59,3]         3357         1,3057         3305         1,1384         2691         1,794         2841         232         57.6         80.9         14.0         10.2         77         15.1         17.3           Other Constr         322.6         7.7         10.0         0.0		Other Minerals (Stones)									1	-	-	<u> </u>		-						-	
Other Cereals.         322.6         74.7         0.0		Wheat	1.459.3	335.7	1.505.7	350.5	1.138.3	269.1	1.794.2	487.0	22	44	4	3.2 57	6 <u>80</u> .9	114.0	10.9	15.3	×	10.2	1 6 6	-	
Fint and Vogetable         Fint an		Other Cereals	322.6	747	0.0	0.0	0.0	0.0	6.0	0.4			-	<b> </b> .	  -	1	4	0	00				
Suger Case         224.3         10.9         300.3         13.3         283.9         15.7         33.9         21.8         5.5         19.1         50.0         2.2         0.4         3.0         0.4         2.5         0.4         2.5         0.4         2.5         0.4         2.5         0.4         2.5         0.4         2.0         0.6         2.5         0.4         2.5         0.4         2.5         0.4         2.5         0.4         2.5         0.4         2.5         0.4         2.5         0.4         2.5         0.4         2.5         0.4         2.5         0.4         2.5         0.4         2.5         0.4         2.5         0.4         2.5         0.4         2.7         0.4         2.7         0.4         2.7         0.4         2.7         0.4         2.7         0.4         2.7         0.4         2.7         0.4         2.7         0.4         2.7         0.4         2.7         0.4         2.7         0.4         2.7         0.4         2.7         0.4         2.7         0.4         2.7         0.4         2.7         0.4         2.7         0.4         0.5         1.1         1.1         4.1         4.1         4.2		Fruit and Vegetable									1	.	┢	╞	-								
Fiber Crops		Sugar Cane	224.3	10.9	300.3	13.3	283.9	15.8	258.3	15.7	33.9 1	21.8 -5	د 1	<u>6</u>	0.0- 0	2.2	40	10	04	2 v	r v	5	Ţ
Live Stocic.         Live Stocic.<	. 1	Fiber Crops									ľ						:				-		Į
Ammal products         113.6         102.7         193.5         110.0         111.3         11.0         3.1         110.0         2.7         0.9         2.1           Aprealized fronces         113.6         102.7         99.5         91.0         111.1         94.7         106.6         84.0         -12.4         -11.4         11.8         4.1         4.2         -11.3         1.1         3.3         1.0         3.1         1.0         2.7         0.9         2.1           State:         Edobio Oi and Fats         457.2         157.1         406.8         184.4         58.0         270.0         470.3         186.5         -11.0         17.4         43.3         19.3         -10.7         4.4         5.7         6.3         4.0         5.0         5.0         5.0         5.2         6.3         4.0         5.0         5.0         5.2         6.3         4.0         5.0         5.0         5.7         5.0         5.7         5.3         5.0         5.2         6.3         4.0         5.0         5.0         5.2         6.3         4.0         5.0         5.0         5.2         5.3         1.0         5.1         0.0         5.0         5.0         5.0         <		Live Stocks										-	┢	╂╴	╞	-	.			Ī	1-	ĺ	Ţ
Agricultural Freducts         113.6         102.7         99.5         91.0         111.2         94.7         106.6         84.0         -12.4         -11.4         11.8         4.1         4.2         -11.3         1.1         3.3         1.0         2.7         0.9         2.1           Black Flowery)         457.2         157.1         406.4         18.4         58.10         270.5         196.5         -11.0         174.4         53.1         10.7         74.5         51.1         10.7         74.5         51.1         0.7         14.6         51.1         0.6         11.1         0.4         0.6           Aurnal Food         201 and Fast         45.7         30.3         196.5         11.0         77.4         43.3         19.3         -13.3         18.4         18.5         -18.3         -16.7         10.6         11.1         0.4         0.6         0.6         10.6         0.6         11.0         0.4         0.6<		Animal products									T	┢	╞	-	-			-					T
(Black Honey)         (Black Hone)		Agricultural Products	113.6	102.7	99.5	91.0	111.2	94.7	106.6	84.0	-12.4	11.4	8	4	117		5 5	0	1 2	Ċ	2 2 0	0	-
Sugar         457.2         1157.1         406.8         184.4         587.0         270.0         470.3         196.5         -11.0         17.4         43.3         19.3         -10.7         7.4         5.1         4.1         6.2         5.2         6.3         4.0         5.0           Ediblo OUI and Fats         Ediblo OUI and Fats         Ediblo OUI and Fats         20.5         1.5         1.6.7         1.4         5.1         4.1         6.2         5.2         6.3         4.0         5.0           Rownang Food         Products         73.4         30.7         5.2.2         3.7         44.4         2.3.3         1.8.4         1.8.5         -1.8.3         1.90         3.7.7         4.0         0.6         1.1         0.4         0.6         0.4         0.6         0.6         1.1         0.4         0.6         0.6         1.1         0.4         0.6		(Black Honey)								: .		r		:  1		<u>.</u>	<u>;</u>	2	;	2	2	<u>, 1</u>	-
Edible Oil and Fact         Edible Vature         Fact         Edible Vature         Edit         23.2         3.2		Sugar	457.2	1.57.1	406.8	184.4	583.0	220.0	470.3	196.5	-11.0	17.4 4	11	21- 51	3 -10	7 44	5	4 1	63	< >	4	¢	
Annual Food		Edible Oil and Fats											-						,		}		,
Beverages (Potable Water)         73.4         39.3         86.5         71.0         37.7         44.4         23.3         18.4         18.5         -18.3         -19.0         -37.5         -38.3         0.7         1.3         0.9         1.6         0.6         1.1         0.4         0.6         0.1         0.4         0.9         0.6         1.1         0.4         0.6         0.1         0.4         0.9         0.6         1.1         0.4         0.9         0.6         1.1         0.4         0.9         0.6         1.1         0.4         0.6         0.1         0.6         0.1         0.6         0.1         0.4         0.9         0.6         1.1         0.4         0.6         0.6         0.1         0.6         0.6         0.1         0.6		Animal Food									ŀ		╞	+.	╞							1	T
Other Feed Products         39.7         27.5         41.0         28.5         46.1         30.7         52.2         37.0         3.2         3.6         12.6         7.5         13.2         20.6         0.4         0.9         0		Beverages (Potable Water)	73.4	39.3	86.9	46.6	71.0	37.7	444	23.3	84	18.5 -1	83 1	9.0 -37	5 38	3 0.7		00	¥	40			T
Chemical Products         Commodal Products         Com Products         Com Products         Com Products         Com Products         Com Products <thcom products<="" th=""></thcom>		Other Food Products (Salt)	39.7	27.5	41.0	28.5	46.1	30.7	52.2	37.0	3.2	201	5 7		2 20 4	40	¢	40	0	20	0		].
Metal and Metal Products         Metal and Metal Products         Textile         End Metal         Froducts         13.5.7         157.0         86.6         56.7         43.2         126.0         13.2.6         36.8         36.2         2.4         3.3         1.1         2.0         2.3         1.3         2.2           Amutactured Fertilizer         253.7         102.7         109.9         58.3         248.5         155.7         157.0         86.6         56.7         43.2         126.6         36.7         3.3         1.1         2.0         2.2         3.9         1.3         2.2           Pulp and Paper         Pulp and Timber         2         2         3.4         2.6         56.7         43.2         126.6         3.6         3.6         2.4         3.3         1.1         2.0         2.2         3.9         1.3         2.2           Pulp and Paper         Lumber         2         4.4         8.2.8         59.8         60.5         61.6         3.41.2         8.2.8         36.7         1.4         2.6         1.8         2.9         1.3         2.2         3.9         1.3         2.6         1.8         2.9         1.3         2.2         3.9         1.2         2.6<		Chemical Products																; 			2-		
Textile       Textile       Textile       Textile       102.7       109.9       58.3       248.5       157.0       86.6       -56.7       -43.2       126.0       132.6       -56.8       -36.2       2.4       3.3       1.1       2.0       2.2       3.9       1.3       2.2         Pulp and Paper       Lumber       253.7       102.7       109.9       58.3       248.5       135.7       157.0       86.6       -56.7       -43.2       126.6       132.6       -56.8       -36.2       2.4       3.3       1.1       2.0       2.2       3.9       1.3       2.2         Pulp and Paper       Lumber       1       1       1.5       1.5       1.3       2.2       3.9       1.3       2.2         Other Manufactured Goods       9.3       2.5.9       170.6       41.4       289.4       82.8       84.8       18.0       370       0.9       0.8       1.7       1.4       2.6       1.8       2.3       3.1       1.4       2.6       1.8       2.3       3.1       1.4       1.7       84.4       17.2       89.8       8.6       5.4       3.1       5.3       3.1       1.6       1.7       1.4       2.6       1.8	1	Metal and Metal Products									T	╞		+-		┞	-				┢		T
Manufactured Ferilizer         253.7         102.7         109.9         58.3         248.5         157.0         86.6         -56.7         43.2         126.0         132.6         -56.8         36.2         2.4         3.3         1.1         2.0         2.2         3.9         1.3         2.2           Pulp and Paper         Lumber                2.2         3.9         1.3         2.2           Pulp and Paper                 2.6         7.3.5         2.5         3.9         1.3         2.2           Other Manufactured Goods                    2.6         1.3         2.2         3.9         1.3         2.2           Other Manufactured Goods                      2.6         1.3         2.2         3.9         1.3         2.2         3.9         1.3         2.2         3.9         1.3         2		Textile			-							┞	╞	-		L					ł	t	T
Pulp and Paper           Lumber and Timber         Lumber         170.6         41.4         289.2         61.6         341.2         84.4         82.8         59.8         69.5         48.8         18.0         37.0         0.9         0.8         1.7         1.4         2.6         1.8         2.9         2.1         2.2         2.1         2.2         2.1         2.2         2.1         2.6         1.8         2.9         2.1         1.6         7.8         1.7         1.4         2.6         1.8         2.9         2.1         2.2         2.1         2.6         1.8         2.9         2.1         2.6         1.8         2.9         2.1         2.2         2.1         2.6         1.8         2.9         2.1         2.2         2.1         2.6         1.8         2.9         2.1         2.3         2.1         2.6         1.8         2.9         2.1         2.2         2.1         2.2         2.1         2.2         2.1         2.2         2.1         2.2         2.2         2.1         2.2         2.2         2.2         2.2         2.2         2.2         3.2         3.2 <td></td> <td>Manufactured Fertilizer</td> <td>253.7</td> <td>102.7</td> <td>0.001</td> <td>583</td> <td>248.5</td> <td>135.7</td> <td>157.0</td> <td>86.6</td> <td>56.7</td> <td>1 2 14</td> <td>1 0 2</td> <td>2 K _ 3K</td> <td>75 3</td> <td>400</td> <td>23</td> <td> -</td> <td>&lt;</td> <td>;</td> <td>0</td> <td>- <mark></mark></td> <td>Τ,</td>		Manufactured Fertilizer	253.7	102.7	0.001	583	248.5	135.7	157.0	86.6	56.7	1 2 14	1 0 2	2 K _ 3K	75 3	400	23	-	<	;	0	- <mark></mark>	Τ,
Lumber and Timber         Lumber and Timber           Other Manufactured Goods         25.9         170.66         41.4         289.2         61.6         341.2         84.4         82.8         59.8         69.5         48.8         18.0         37.0         0.9         0.8         1.7         1.4         2.6         1.8         2.9         2.1         1.68         7.3         1.8         2.6         1.8         2.0         1.1         2.6         1.8         2.9         2.1         1.68         7.3         1.4         2.6         1.8         2.9         2.1         1.6.8         7.3         1.4         2.6         1.8         2.9         2.1         1.6.8         7.3         1.4         2.6         1.8         2.9         2.1         1.6.8         7.3         1.4         2.6         1.8         2.9         2.1         1.6.8         7.3         1.8         0.9         1.7         1.4         1.7         1.7         1.9         1.7         1.4         1.7         3.4         1.73         8.4         1.73         8.4         1.73         8.4         1.73         8.9         1.3         3.3         1.1         1.6         1.73         8.4         1.73         8.9		Pulp and Paper			:			T				-					-		, ,			<u>,</u>	1
Other Manufactured Goods         0.35.9         170.6         41.4         289.2         61.6         341.2         84.4         82.8         59.8         69.5         48.8         18.0         77.0         0.9         0.8         1.7         1.4         2.6         1.8         2.9         2.1         1.68.7         2.8         1.9         3.1         5.3         3.2.1         1.68.7         3.4         1.7         2.9         2.9         2.1         1.68.7         3.4         1.7.3         8.4         1.7.3         8.4         3.2.3         3.3         3.3.1         1.68.7         3.4         1.7.3         8.4         17.2         9.9         3.1         5.3         3.3.1         1.68.7         3.4         17.3         8.4         17.3         8.9         1.7         1.4         1.7         8.9         1.7         1.8         1.7         8.9         1.7         1.8         1.7         1.9         1.7         1.4         1.7         1.7         8.4         17.3         8.4         17.3         8.4         17.3         8.9         1.3         3.3         3.3.1         1.6.8         7.3         1.8         1.7         8.9           Total         10.0.300.5         3.080.		Lumber and Timber					Ì				t		╀	-	╞	-	-	-		Ī	-	t	T
Mixed Commodines         93.3         25.9         170.6         41.4         289.2         61.6         341.2         84.4         82.8         59.8         69.5         48.8         18.0         77.0         0.9         0.8         1.7         1.4         2.6         1.8         2.9         2.1           ENR commodities         1.74.5         239.4         1.768.6         238.5         1.935.6         294.3         3.038.4         388.7         1.1         192.2         9.4         3.1         1.6.8         7.8         18.0         9.6         17.3         8.4         17.2         9.9           Total         10.300.5         3.080.3         9.852.2         2.971.4         11.201.0         3.507.2         13.942.0         -5.2         3.5         13.7         18.1         5.8         17.4         10.0         10.06	· · .	Other Manufactured Goods									T	+-	╀	+	╞		-	+			+		T
ENR Commodities 11,748.5 239.4 11,768.6 285.5 1,935.6 294.3 2,038.4 388.7 11,192 9.4 3.1 5.3 32.1 16.8 7.8 18.0 9.6 17.3 8.4 17.2 9.9 Total 10.390.5 3,080.3 9,852.2 2,971.4 11,201.0 3,507.8 11,850.2 3,942.0 -5.2 3.5 13.7 18.1 5.8 17.4 100.0	1	Mixed Commodities	93.3	25.9	170.6	414	289.2	61.6	341.2	84.4	× 2%	59.8 65	14	×  ×	0 37.0	00	×0		4	l v	2 2	-15	Ţ
Total 10.390.5 3,080.3 9,8522 2,2971.4 11.201.0 3,507.8 11,850.2 3,942.0 -5.2 -3.5 13.7 13.8 15.8 17.4 100.0 100	- 1	ENR Commodities	1.748.5	239.4	1.768.6	285.5	1.935.6	294.3	2.038.4	388.7		19.2 19.	4	5	32	16.%	2 2	1×0	20	2	4 <del>-</del>		-]-
		Total	10,390.5	3,080.3	9,852.2	2.971.4	11.201.0	3.507.8	11,850.2	3.942.0	Š	2	Ē		17 4	lo I	001	0001	0 001				

Table 3.3.4 (1) Freight Transport Volume of ENR

#### PERSONNEL 3.3

This information has been obtained for the whole organization. This data was used to make retirement forecasts.

Table 3.5.1 ENR Sta	aff in Budget, 1995/9
Chairman	1
Vice Chairmen	6
Under Secretaries	21
General Managers	55
Grade 1	1,192
Grade 2	17,997
Grade 3	20,150
Grade 4	22,004
Grade S	11,872
Grade 6	15,282
Total	88,580

Source: ENR

Table 3.5.	2 Staff W	orking at ENR
19	92/1993	71,653
19	93/1994	72,890
- 19	94/1995	74,123
19	95/1996	74,015
0 51	10	

Source: ENR



# 3.4 MARKET STRUCTURE

Results of the Traffic Survey show the characteristics of railway passengers are :

- Most railway trips are related to "work" and "school".

- Most railway passengers are "government officials" and "students".

- The most important reasons passengers gave for using the railway were "travel cost", followed by "always available" and "safety".

(Figures 3.6.1, 3.6.2 & 3.6.3)



Note: Bus & Taxi = Aggregation of Cairo - Alexandria, Cairo - Aswan and Cairo - Damietta.



Each Mode

### 3.5 TARIFF STRUCTURE AND TARIFF ANALYSIS

#### (1) Pricing principles

The present pricing principle of ENR seems to be based on 3 principles : (a) Full cost pricing ; (b) What the traffic will bear ; (c) Reducing by haul.

Passenger tariff is classified by line (main, branch, suburban, urban line and Metro Cairo) and by class (1st A/C, 2nd A/C, 2nd and 3rd). Kinds of ticket are categorized into "normal", "seasonal", "kilometer" and "conductor". ENR has the discount system for marketing and social policy. Particularly, seasonal ticket is heavily discounted from view point of social policy. Freight tariff is actually set up based on type of shipment (bagged, bulky and flat rate cargo) and car load density by commodity.

#### (2) Low fares compared to other countries

From comparison of tariff level in the world, it can be briefly summarized as follows :

- The average passenger fare of Egypt is extremely low compared to other countries, (compared to both actual fares, fares adjusted for Purchasing Power Parity (PPP), and fares compared to GDP in each country).
- The average freight fare of Egypt is extremely low only with regard to actual level but is slightly higher level than middle level in the world with regard to fares evaluated by PPP and relative level to GDP including the one evaluated by PPP in the world.
  - (Figures 3.7.8 & 3.7.10)

#### (3) Tariff Raise

#### Appendix 3.7.44 ENR Tariff Raise History (%)

		Passenger			Freight
Year	1st Class A/C	2nd Class A/C	2nd Class	3rd Class	-
1988/89	60.0	80,0	50.0	50.0	50.0
1989/90	15.0	15.0	15.0	15.0	15.0
1990/91	15.0	15.0	40.0	40.0	15.0
1991/92	15.0	15.0	15.0	15.0	15.0
1992/93	15.0	15.0	15.0	15.0	15.0
1993/94	15.0	15.0	15.0	15.0	15.0
1994/95	10.0	, 10.0	10.0	10.0	14.0

#### (4) Traffic elasticity analysis

1) Analysis of traffic survey

The traffic survey shows that 21% of railway passengers are willing to pay up to 10% more than the current ticket price, showing that these passengers have very low incomes. 30% of railway passengers are willing to pay up to 100% more than the current ticket price, showing that current ticket prices are very low.

#### 2) Actual relation of traffic volume to tariff raise

The price elasticity of passenger demand to ENR and Metro tariffs is lower than the elasticity of passenger demand to average fare. The price elasticity of freight demand to basic ENR fares is slightly lower than the elasticity of freight demand to average fare.

#### 3) Statistical Analysis

The elasticity value of passenger traffic demand to railway relative average to bus average fare and to GDP per capita are -0.865 and 3.936 respectively. Passenger traffic demand is extremely sensitive to GDP, much more than to average fare. The elasticity value of railway freight traffic demand to railway average fare, to truck average fare, to inland waterway average fare and to produced volume are -0.018, -0.102, 0.400, and 1.232 respectively. Freight traffic demand is much more sensitive to produced volume than to tariffs. The elasticity of inland waterway average tariff is much higher than the elasticity of railway average fare.









### 3.6 FINANCIAL STATUS

#### (1) Financial conditions (Excluding Metro)

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%.





(2) Financial conditions (Metro)

(Table 3.8.13)

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 <u>excluding</u> depreciation improved from 92% in 91/92 to 117% in 94/95. However cost recovery ratio <u>including</u> depreciation decreased from 40% in 91/92 to 36% in 94/95 due to the huge depreciation burden.

Figure 3.8.2 Metro Cost Recovery Ratio



						(LE mi	llions)
	Actual						
	88/89	89/90	90/91	91/92	92/93	93/94	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	+	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	Ī	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	39,3	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
					1		
Interest (not paid)	1			290.9	307.8	465.4	N/A
Profit		-359.4	-433.8	-251.4	-216.8	-245	-195.9
revenue-expense (excluding depreciation)		-242.4	-279.8	-76.7	7.2	-1	40.7
Profit (including interest)				-542.3	-524.6	-710.4	
Cost recovery ratios (excluding 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

 Table 3.8.1
 Income Statement of ENR (excluding Metro)

Source: Financial Department, ENR

.

ana na amin'ny kaodim-paositra dia mampina mampina mandritra dia mampina mandritra dia mampina dia mampina dia	Actual	Actual	Actual	Actual	Actual	Actual	Actual
₩ <u>₩</u> ₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩	88/89	89/90	90/91	91/92	92/93	93/94	94/95
Total Revenues	21.3	35.4	41.8	50.4	61.6	68	73.8
Total income from	21.3	35.4	40.5	48.9	59	66	70.9
operations							
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	0	0	0	0	0	0	0
sleeping						-	, t
Profit from share in Co.'s	0	0	0	0	0	0	0
Internal operations	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-expense		-107.6	-115	-4.1	11.9	8	10.8
(excluding depreciation)							
Profit (Incl. interest)			<u> </u>	-206.6	-287.7	-259.2	
Cost recovery ratio							
(excluding interest)							
Ratios excluding		24.76	26.66	92.48	123.94	113.33	117.14
Depreciation							
Ratios including		21.20	19.14	40.35	31.43	34,34	35.72
Depreciation							

 Table 3.8.13
 Income Statement of Metro
# 3.7 FINANCIAL ANALYSIS

# (1) Volume effect & Price effect analysis

In terms of profit, price effect is much more important than volume effect because price effect directly increases profit.

# (2) Breakeven analysis

ENR (excluding Metro)

- Breakeven point sales are estimated at LE 874 million in 1994/95.
- LE 874 million is 41% higher than real revenue in 1994/95.

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



# Metro

- Breakeven point sales are estimated at LE 283 million in 1994/95.

- LE 283 million revenue is 3.83 times higher than actual revenue in 1994/95.

						(Units:	millions)
an a		89/90	90/91	91/92	92/93	93/94	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	(E)	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	C
Depreciation		24	61.6	70,4	146.3	138	143.6
Other expenses		0	0	0	0	0	5
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)=(1)	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

Table 3.9.4 Breakeven Point Analysis of Metro

Source : JICA Study Team

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

		90/91	91/92	92/93	93/94	94/95
Passenger						
price effect	(A)	1.01	44.29	25.50	17.76	10.77
volume effect	(B)	19.99	7.01	11.46	11.70	28.53
	(A) + (B) = (C)	21.00	51,30	36.97	29,46	<u>39.30</u>
price effect	(A)÷(C)	5%	86%	69%	60%	27%
volume effect	(B)÷(C)	95%	14%	31%	40%	73%
	· · · · · · · · ·					
Freight						
price effect	(A)	13.91	8,90	17.44	6.05	- 24.15
volume effect	(B)	2.07	1.13	-1.76	14.56	14.46
	(A) + (B) = (C)	15.98	10.03	15.67	20.60	38.61
price effect	(A)÷(C)	87%	89%	111%	29%	63%
volume effect	(B)÷(C)	13%	11%	-11%	71%	37%
Passenger +Freight				······		
price effect	(A)	14.92	53,19	42.94	23.80	34.92
volume effect	(B)	22.06	8.14	9.70	26.26	42.99
Total	(A) + (B)=(C)	36.98	61.33	52.64	50.07	77.91
price effect(pass+freight)	(A)÷(C)	40%	87%	82%	48%	45%
volume effect(pass+freight)	(B)÷(C)	60%	13%	18%	52%	55%

# (3) Productivity analysis

Value added is one important measure for management. Value added is value produced in the process of making goods and services. Value added is distributed to each management resource such as labor, capital, and assets. 88% of ENR's value added is distributed to labor. The share of wages to revenue was 47% in 1994/95. The share of wages to total cost was 36% in 1994/95. Although both ratios are relatively low by international standards, the ratio of wages to value added is high.

## (4) Asset turnover analysis

#### (Table 3.9.9, 3.9.10)

The assets turnover ratio of ENR in 1994/95 was very low, both from an historical comparison and by international comparison, and has not improved in the past several years.

ENR's low asset turnover ratio comes 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.

The asset turnover ratio of Japan Railways 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 ration of Japan Railways East was 0.32. Average fixed asset turnover ratio of 20 Japanese railway companies was 0.5.



Fig. 3.9.11 (1) International Comparison of Asset Turnover Ratio

Note: ENR is excluding Metro.

				(Units: mi	llions)
n dan serak manyai ya lamana da kata kata kata kata kata kata kata	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
	- NATION AND A DESCRIPTION OF THE OWNER OWNER OF THE OWNER OWNER OF THE OWNER OWNE	CONTRACTOR OF CONT	the second s	and the second state of th	the second s

## Table 3.9.9 Asset Turnover of ENR (including Metro)

# Fig, 3.9.10 (1) Asset Turnover of ENR 1994/95



## (5) Cash flow analysis

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.

# (6) Cost recovery ratio for each line/segment

To know the profitability of each line/segment is one of fundamental factors to develop the railway management. Namely, by the cost recovery ratio, the efficiency of upgrading and rationalization on the line can be quantitatively grasped. However, current data concerning this matter, revenues and cost by each line, are not satisfied. Therefore, the cost recovery ratio is estimated with some assumptions. The estimation flow is shown in Fig. 3.9.3, and the estimation results are shown in Table 3.9.15 and Fig. 3.9.4.



		Route		Reventie	(10001 E)	anan milaladak terdapatakentak	Cost	Cost
No	Continguing	(km)	Passan	Freichl	Other	Total	Total	Recovery
NQ.	Sectionvine	(NO)	rassen.	Freight	Caner	10/04	(10001 E)	Ratio
	Caina Alexandria		110 /18	12 5 28	35.010	158 857	142 959	111
<u></u>	Cairo - Alexarkina	203	131 073	53.645	58.052	242 770	337 703	0.72
2	Caro - El Sau CI All	690	24 640	0.201	0.040	42,170	51,006	0.96
3	Benna - Ismaila - Port Saki	191	24,040	3,031	5,540	13.57	34 604	0.90
4	Tanta - Mansoura	54	14,000	3,000	5,411	20,900	24,004	0.37
	Main Line	1,352	260,790	19,433	109,314	409,000	000,001	0.09
7	Nelsha - Suez	88	2,348	5,572	2,313	10,233	17,540	0.58
8	El Mansoura - Domietta	63	4,039	3,098	2,085	9,222	13,804	0.67
9	Zagazig - Tanta	5/	3,178	155	9/4	4,307	8,068	0.53
10	Imbaba - Itay El Baroud	120	928	1,661	/56	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 Salhela	34	446	-	130	576	2,599	0.22
21	Benha - Zefta	34	707	-	207	914	2,650	0.34
22	Fagus - El Sammana	10	28	-	8	36	704	0.05
23	Menuf - Kafr El Zaivat	49	469	-	137	606	3,782	0.16
24	FI 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 - Oabbary - Marsa	304	4,719	3.528	2,409	10,656	19,617	0.54
1 - '	Matruh							
28	Sherbeen - Qelein	82	4.835	47	1,426	6,308	7,317	0.86
29	Bouseli - El Oassabi	29	321	6	95	422	1,691	0.25
30	FLEavum - Sinnuris	12	- 31		9	40	753	0.05
31	Desug - Motobus	27	105	6	32	144	1,401	0.10
32	FI Abhassava - Tebeen	20		371	108	480	1,003	0.48
33	FI Geish - El Magharat	24					441	-
20	Samala - El Saloum	260		664	200	886	6,789	0.13
25	Teheen - Manaoim	345		50.671		50.671	50 671	1.00
126	Filthad . Oahhary	109	;	6 675	1 950	8 625	16 800	0,61
57	Real Suef . Fit shun		63		19	85	870	0,10
20	Shawich - M Abu Sammad	12	14		5		333	0.06
30	Ci Cabal Si Actar			<u> </u>		20	120	
39	Li Ududi Li Asidi						71	0.63
40	Mair Sadu - Nall Sillian		Z		196	* 203	1 1 2 2	0.53
41	Cons Safera			COP 14.0	346	1 097	503 B	0.00
42		233	64 260	75 041	240	1.00/	257 020	0.10
ļ	Branch/Suburban	2,103	21,309	15,200	22,100	140,020	201,808	0.00
i i	HOTAL	4,055	352,159	154,701	131,502	016,302	014,300	V./0

 Table 3.9.15
 Estimation of Cost Recovery Ratio

Note: Data for Lines 33 and 39 was not available.

.



## 3.8 TRAIN OPERATION

## (1) Transport condition of ENR

By looking actual operation and passenger transport and by the data acquired, the improvement of the situation of financial condition is confronting with the following various problems;

- a. Delayed modernization of railway safety facilities
- b. Long train travel time, even though track alignment is comparatively well condition on main lines and railway is exposed in severe competition with road traffic which are always in parallel with railways. (Fig. 3.10.2 to 3.10.5)
- c. Lack of punctual train operation

Figure 3.10.1 Transition of Number of Express and Ordinary Passenger Trains



The travel hours between railway and road are giving gradually fatal effect in various regions of Delta area by completing the highway networks. This phenomenon is spreading to the south region by completing the desert road. The transportation services of ENR are checked from fundamental factors of speed and tariff.

## (2) Passenger transport

Daily train kilometer of passenger shows in Table 3.10.1

Table 3.10. 1 Daily Train Km (regular operation) - each ENR Line by Diagram (both directions)

Lower Egypt	73,264 Km
Upper Egypt	48,599 Km
TOTAL ENR	121,863 Km

NOTE: Train km data are summed up from ENR Train Time Table 1994/95.

34

## (3) Freight transport

The efficiency increase of freight transport ENR is remarkable in recent years, as shown in the following Table.

	KINGHA ITAMA	primu
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 d	ay	••••••
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
Mean value of Freight Train running K	Km -	••••••••••••••••••••••••••••••••••••••
Loaded	298.7	312.7
Empty	264.3	258.6
Total	563.0	571.3

 Table 3.10. 2
 Result of Freight Train Operation

By concentrating effort to gather freight goods from big customers and by changing freight transport system to block train system from ordinary shunting operation system, the traffic volume of freight goods begins to increase. However, there are several problems on freight transport and the surrounding situation for rail freight transport is very sever.

- a. No pre-scheduled freight train operation
- b. Long travel time of freight train and slow train speed due to existing no-brake wagon
- c. Low rotation of wagons utilization



# Fig. 3.10 2 Train average speed from Cairo to major citics on Cairo - Alexandria line







Fig. 3.10 4 Train average speed from Cairo to major cities on Cairo - Tanta - Mansura - Damietta line

Fig. 3.10 5 Train average speed from Cairo to major cities in Upper Egypt



# (3) Safety train operation system

The safety system for nowadays high speed and high density train operation in many places, like ATC, is under going, but they are not yet sufficient for the requirement, although the number of accidents are decreasing these years remarkably.

# Fig. 3.10.6 Number of accidents in ENR (Some example)

Year	Rolling stock	P-W (Track)	Operation	Signaling	Commodity Set up	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	72	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

Derailments Classified According to their Responsibility





38

## 3.9 ROLLING STOCK AND MAINTENANCE

Problems and recommendations:

- Low availability of locomotives (see Table below)
- Low utilization of locomotives: average train-km per locomotive is only 160 km per day approximately.
- After 2000, an increasing number of locomotives must be replaced
- Few parts are produced in Egypt, and imports are expensive
- Improvement of working environment for maintenance depots
- Establishment of computerized inventory control system
- Installation of brake system for freight cars

## Number of Rolling Stock on Book (1-1-1995)

Type of Rolling Stock	No. on Book	Availability (%)
Locomotive		· · · · ·
For Main Line operation	576	74.0
For Shunting	259	51.6
Total	835	· · · · · · · · · · · · · · · · · · ·
Gas Turbine Train Unit	11	100
Passenger Cars		
AC Cars	786	87.8
Others	2,551	81.3
Total	3,337	
Freight Cars		
Open	4,391	· · · ·
Flat	1,902	
Covered	3,741	
Brake Van	400	
Tank Car	2,002	
Crane Cars	47	
Total	12,483	

## 3.10 PERMANENT WAY AND STATION

Some thoughts for track maintenance and station

Considering increase of track maintenance work volume by increase number of trains and speed-up of trains in future, the following items would be considered as subjects to improve for the time being.

#### (1) Lack of mechanical track maintenance

The tamping work by M.T.T mostly carry out for main lines and other important lines. Other lines are carried out by manual tamping work, that is to say the suitable track maintenance work does not carried out for other lines. For this purpose, handy mechanical equipment should be installed in addition to the increase number of M.T.T machine.

#### (2) Lack of mobility for gang

There are 2 types of gang for track maintenance;

- Normal gang for short distance section
- Flying gang for long section covering several normal gangs

Their travel and carrying of tools and material use the railway. There are no any automobile. In order to promote efficient track maintenance, flexible and frequent transport equipment like pick-up track should be prepared especially Flying gang.

# (3) Weakness of turnout on main lines

In station yards, there are still many timeworn or unsatisfied turnouts for the increase number of train and train speed up in future. These should be replaced in accordance with the grade of time.

# 3.11 SIGNALING AND TELECOMMUNICATION

## (1) Safety System for Train Operation

ENR has several systems for safe train operation, which have the following problems.

#### 1) Train block and signaling system

#### a. Staff blocking

The block system has no track circuit and is not interlocked with signal and point machines so that human attentiveness is required for train operation.

The cabin-to-cabin linkage for blocking is presently carried out through overhead wire and partially underground cable, while the communication to traffic control center is mainly available with radio. The current problem with staff blocking is of the overhead wire linkage, because of the fact that the wire is subject to unexpected cutoff.

#### b. Tyris blocking

Since the token handling is not needed and signal linkage is secured, the frequency of train traffic can be increased to some extent. However no track circuit being installed, human attentiveness should be required for train operation. The cabin-to-cabin linkage for blocking is the same as for staff blocking above.

#### c. Tokenless blocking

This system is considered as a system added the short length track circuit to the Tyris blocking. Since the short length track circuits are installed both at the vicinity of starting and home signal while at the same time interlocked with signals and blocking instruments, the safety of train operation can be secured more. However an handling of block instrument is needed in the signal cabin. The cabin-to-cabin linkage is currently made through overhead wire or underground cable.

#### 2) Train speed control

ENR has not yet installed the absolute train stop except for the ATC sections. Absolute train stop herein referred to means a system like ATS (Automatic Train Stop) which stops forcibly the train if the driver should overlook the stop signal.

## (2) Traffic control system

The traffic control system has the following problems with centralized control:

- 1 The availability of the contact between the center of CCTT and the train driver is limited to the simultaneous-single call in the assigned range due to the system mechanism.
- <sup>(2)</sup> Wire circuit is of low reliability due to unstable overhead lines.
- ③ Direct call is not available among way stations or signal cabins, so the call is subject to interchange of CCTT.

#### (3) Information transmission and control system

ENR's information transmission and control system consists of :

1) Radio transmission network

2) Cable and wire transmission

Cables and wires used by ENR are owned by ARENTO (Arab Republic National Telecommunication Organization).

The status of aerial wires is currently unstable due to unexpected cutoff or superannuated.

#### 3.12 INFORMATION SYSTEM

There are some points that should be considered in order to make a future plan of information system for ENR. These points are described bellow.

## (1) Organization

ENR doesn't have an Information systems department who takes charge of the whole ENR system demand. It means that it is difficult for ENR to have the total view for computerizing.

#### (2) Main frame oriented idea

Currently main applications are treated by main frame. Usually it takes very long time to satisfy end-user's demand.

#### (3) Network infrastructure

The weakness of the network infrastructure is an important factor. To make an ideal system, it is required to connect the each offices, workshops, etc.

#### (4) Data collection

Currently all data is input in Cairo office except in Zagazig. It is difficult to check the result of inputs where the data is occurred.

# CHAPTER 4 BUSINESS IMPROVEMENT PROPOSAL

## 4.1 MANAGEMENT STRATEGY

## 4.1.1 ENR's Changing Environment

# (1) Progress of privatization & move towards a market economy

Since 1990, Egypt's government has introduced reforms which are steadily moving Egypt towards a market economy. The privatization of state owned enterprises is an especially important step, as they play an important role in the economy. The privatization process has been slower than planned, but the government expresses a strong desire to push forward, and the tempo is likely to increase.

ENR must realize that the move to a market economy will have important impacts on ENR in the medium and long term.

# (2) Trend toward less Government support

The Egyptian government is trying to encourage economic growth through economic reform and deregulation. The government is privatizing state owned enterprises and encouraging private enterprises to become the center of economic growth. Government subsidies are being reduced, and this trend is expected to continue.

## (3) Increasing competition and changing market structure

How will market economy development impact the transportation system and transport market? Providers and users of transport service will be forced to become increasingly competitive in the market economy.

Private companies already play an important role in road vehicle transport. With tough competition, the role and profitability of state owned bus and truck companies is decreasing. To make them more competitive, the government plans to privatize its bus and truck companies in the next few years.

#### (4) Diversification of consumer needs

Consumer needs are expected to become more diverse with increasing incomes. Consumers are expected to increasingly value quality, in addition to price. Consumers will value more rapid, accurate, and pleasant transport.

## (5) Multiple large investment projects

Egypt's economic development plans through 2012 will require several large investment projects like the Sinai Peninsula railway development. Railway service will be considered for new cities and communities now relying on road transport, like 10<sup>th</sup> of Ramadan, Sadat City, and 6 October.

#### 4.1.2 Response to Changing Environment

## (1) Emphasize profitability

ENR has maintained its public service aspect up until now, but must increasingly emphasize profitability. ENR must build a more efficient organization to compete in the market economy.

This is shown in the diagram below :



#### (2) Clarification of roles

It is important to clarify the roles of the government and ENR, especially regarding new line investment and discounts to meet government policy. ENR cannot bear these burdens if it is to become a more independent organization responsible for its finances.

#### (3) Market needs

The market reforms will force ENR to adapt to consumer needs. ENR will need to consider service improvement if it wants to raise its fares, and set tariffs taking tariffs of the competing transport modes into consideration. ENR will need to build an organization which emphasizes marketing, in addition to operations.

## (4) Take advantage of railway strengths

ENR must build a strategy based on the railway's essential qualities to compete with other transport modes.

ENR must compete based on its strengths of safety, high speed, punctuality, and large volume transport. This requires ENR to allocate its main resources to its Main Lines. Operating trains on the lines of very low traffic volume is nothing but a waste of valuable resources.

#### (5) Strengthening cost competitive position

ENR must recognize that prices are set by the market in a market economy. This means that ENR must be cost competitive to increase profitability. This requires a slim organization with only necessary staff, and withdrawal from unprofitable operations.

#### (6) Emphasize information

Accurate information for management decisions is essential in the market. ENR requires rapid, accurate analysis based on reliable data. Decisions based on such analysis are necessary. ENR needs to rebuild its data collection system.

#### (7) Strengthen management system

ENR does not just need more passengers. ENR's business will be improved when it increases revenues. Therefore, ENR needs to resolve its management problems resulting in free riders.

#### (8) Change ENR employee attitudes

ENR competition will be private companies, and its users will also be mostly private. To compete, it is natural that employee attitudes must change.

#### 4.2 **BUSINESS IMPROVEMENT ITEMS**

## 4.2.1 Promote a Market Oriented Tariff Policy

#### (1) Reform of pricing principle and tariff structure

To cope with the market economy, ENR must revise present pricing principles like "Full Cost Pricing" and "What the Traffic Will Bear". Simplifying commodity classifications should be the first priority.

#### 1) Passenger

First, five types of services with three classes should be gradually combined into fewer classes (i.e. only Standard Class, and Special Class with A/C). Second, the tariff structure must be reformed based on a costing system by line and by service level. Third, review and reclassification of distances of the tariff table should be conducted as fast as possible to cope with the competitive market. Fourth, a flexible tariff system should be introduced by regulating only the maximum level of tariffs, by referring to experiences of foreign regulators. More flexible tariff policy could be realized by organized and dynamic combination of these improvements and reforms.

#### 2) Freight

First, reduction of the list of commodities, by cutting commodities which are not now handled by ENR, and simplification of the commodity classification system, are urgent tasks to promote daily work efficiency. Second, the degree of car load density should be reviewed by scientific technology. Third, review and reclassification of tariff table distances should be also conducted as fast as possible to cope with the competitive market. Fourth, the tariff structure must also be reformed, based on an individual costing system, by line, and by commodity. ENR's iron ore tariff is a model case of tariffs based on individual costing principles.

#### (2) Establishment of criteria for rational tariff level

To set up a rational tariff level, the following criteria should be considered and compared :

#### [Criteria for rational tariff level]

Criteria for a rational tariff level is composed of 7 items as follows :

i. Effective Distribution of Resources

- ii. Profitability
- iii. Publicity and Social Welfare
- iv. Paying Ability of Users (Willingness to Pay)
- v. Management Incentives
- vi. Influence to Consumer Price Level
- vii. Degree of Cross Subsidization

## (3) Tariff increase policy

## 1) Restructure of decision making process

Fundamental restructuring of the tariff decision making process, including tariff increases, is an urgent task for ENR.

The decision making process to receive permission for tariff revision at ENR is conducted only by the Ministry of Transport and the Policy Committee headed by the Prime Minister. The process of counsel and discussion has not been publicly announced to the people. Also, customers are not informed as to why ENR raised its tariffs in the past, even when they increased 15% or 20%. To avoid this situation, the decisions regarding tariffs should be decentralized or split into other agencies.

#### 2) Practical tariff increase policy

The tariff increase policy is closely related to the criteria of rational tariff level, because there are many factors and reasons to increase tariffs in response to criteria of rational tariff level. In this context, actions to establish practical, rational tariffs must start as soon as possible. In the short term, scenario 1 is the most suitable :

## [Scenario 1]

- i. Tariff structure is not reformed
- ii. Tariffs are increased for passenger and freight.

In scenario 1, ENR raises tariffs to cover costs including depreciation cost as soon as possible.

Actual tariff raise for passengers can be done by type of service, by type of train, and by line. Tariff raise can be done by commodity for freight. But to accurately estimate the impact of a tariff increase on ENR finances, a sophisticated traffic demand forecast model must be developed.

Factors to be considered when raising tariffs :

- i. Rational tariff level, which needs more detailed study
- ii. Improvement of service
- iii. Impact on consumer price level
- iv. Increase of operating expenditures from higher consumer prices
- v. Investment cost of strengthening transport capacity
- vi. Tariffs of other transport modes
- vii. Past results from tariff increases

# 4.2.2 Strengthen Ticket Checking System

ENR has been suffering huge losses from passengers without tickets. This is a problem for ENR finances, and is unfair to paying passengers. Passengers without tickets are estimated at about 4 million passengers per month. To avoid this loss, the following actions should be executed as soon as possible. Passengers without tickets are estimated at about 4 million

passengers per month. Intensification of checking system for passengers without tickets is one of the most simple and effective ways to increase revenue for ENR.

- a. Build fences around stations
- b. Extend opening hours of ticket office
- c. Promotion for introduction of portable issuing ticket machine
- d. Incentives for conductors
- e. Simultaneous investigation

# 4.2.3 Reduce the Travel Time for Passengers on Main line

The railway service should be concentrated on the improvement of Railway Passenger Transport on main line inter-city and urban spheres in Cairo and Alexandria.

## (1) Measures for reducing travel time

- (1) Increase hauling force of locomotives
- ② Increase passing speed on curves
- ③ Increase passing speed on switches
- (4) Increase the speed limit
- (5) Improve passing speed for operation by adopting tablet block system
- 6 Simplify track alignment at terminal stations

#### (2) Measures for reducing travel time by line

## 1) Trunk line between Cairo and Alexandria

The line facilities of Cairo - Alexandria are very suitable for higher speed operation, but the current traction effort of trains is not enough to take advantage of these very valuable track facilities. ENR should try to improve the slow speed near Cairo and Alexandria stations, and set 160km/hour as a target speed on the Cairo-Alexandria line.

#### 2) Trunk line between Cairo, Benha, Zagazig, Ismailia and Port Said

Zagazig should have stronger connections to Greater Cairo by increasing train speed. Road traffic between Ismailia and Cairo runs in 2 hours by desert road. Railway traffic can be formed to target inter-city traffic with Cairo, and regional traffic among cities between Benha and Ismailia, by utilizing the double track line.

Although the trains arrive at Benha station at approximately 75 km/h average speed from Cairo station, the total average speed decreases to 50 - 60 Km/h in Benha - Zagazig - Ismailia, although the section is constructed as a double track line.

#### 3) Trunk line between Cairo, Tanta, Mansura and Damietta

Shorter travel time between Cairo and Mansura can be achieved significantly by raising maximum speed, by short-cutting the stopping time at Tanta station, etc. 140 km/h operation can be achieved by strengthening the safety system between Tanta and Mansura, and by introducing more powerful locomotives.

Train average speed between Tanta and Mansura is 65 - 78 km/h, and current train sets still have the possibility to achieve 120 km/h operation, although current speed limit of rapid trains is 90 km/h.

#### 4) Trunk line between Cairo and Aswan

Trains can run in less than 11 hours between Cairo and Aswan in the near future, after completion of the double tracking project between Idfu and Aswan. 9 hours and 30 minutes can be achieved after completing the signal modernization project.

Train sets of night sleeper luxury cars can be utilized near the destination for daytime medium distance transport between Aswan and Luxor, or between Cairo and El Minya. The passengers who use the night trains can enjoy a full day in the destination, because the trains depart at 19:00 - 21:00 and arrive at 6:00 - 8:00 at the destination.

By utilizing the day time of Locomotive use, the train operation service between Aswan and Luxor and between Cairo and El Minya, etc. can be improved.

## 5) Facilities for quick return use at terminal stations

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

## 4.2.4 Improve the Freight Transport System

## (1) Current problems of freight transport

## 1) Many small freight stations

In ENR, more than 300 freight stations handling freight cargoes as shown in Table 4.2.4.1. Many of these freight stations are too small to be efficient.

## Table 4.2.4.1 Number of Station and Tonnage by Category

Tons	Number of	`station	Total loading/ tonnage (ye	/unloading ar) 1000
More than 100,000 tons	39	12.3%	22,859	86.9%
20,000 - 100,000	56	17.7%	2,515	9.6%
10,000 - 20,000	29	9.2%	433	1.6%
Less than 10,000	192	60.8%	509	1.9%
Total	316	100%	26,313	100%

#### 2) Short distance between adjacent freight stations

The average distance between freight stations is about 13 km.

#### 3) Short transport distance

Because of Egypt's geography, the average hauling distance of ENR cargo is about 330 km, rather short compared with international figures. 80% of cargoes are transport less than 400 km.

## 4) Commodity share

8 ENR's 30 commodities account for 91% of total loading/unloading tons and ton-kilometers, as mentioned in Chapter 3.3.

#### 5) Freight train operation

- There is not a pre-scheduled freight train diagram. Freight trains are operated in accordance with cargo bookings.
- Therefore, freight trains are frequently forced to wait at crossing stations for a long time.
- As the result, transport hours are lengthened, and receiving customers cannot get any information about the arrival times of their cargoes.
- Moreover, as some wagons do not have brakes, freight train speed is generally very low.
- This means that the track capacity on certain lines is restricted by slow freight trains, and the freight trains can run only during night.

# (2) Customer requirements

Railway freight customers have the following requests regarding ENR's freight services :

- Provide more freight wagons in proper condition for customers
- Improve the general conditions of freight wagons (i.e. cleaner wagons)
- Provide more frequent freight train operations
- Distribute freight wagons in accordance with customers' required timing ("Just in Time")

# (3) Direction to improve the freight transport system

#### 1) Rearrangement of freight stations

ENR's small freight stations are a problem. Long freight trains must stop at small stations to couple or uncouple only a few wagons. This reduces efficiency very much.

The team strongly recommended that ENR close small freight stations, which only have a few loading/unloading cargoes, paying due consideration to various factors such as seasonal tonnage variation, possibility of the future development, and user opinions.

The remaining major freight stations should be modernized with adequate loading/unloading equipment and facilities such as forklifts, gantry cranes, and storage, to attract customers.

## 2) Improvement of freight train operation

Freight trains should be operated according to a pre-scheduled train diagram, and brakes attached to wagons. Furthermore, a freight information system as mentioned below should be established.

## 3) Establishment of freight information system

An adequate information system which can trace the position of freight trains and the type and number of wagons should be established. The system should dispatch the adequate type and the necessary number of empty wagons to originating customers as soon as possible.

## 4) Promote of the containerization

The world trend is towards container transport. The containerization has the merit of transporting general cargo without troublesome loading/unloading work at the freight station, greatly saving labor and avoiding damage of valuable cargo.

In Egypt nowadays, container's are mostly transport by truck, with container transport by rail is very limited, such as transshipment from port to port.

Taking account of the above mentioned merits of containerization in rail freight transport, it is worthy to study a full-scale railway container system.

## 5) Marketing development by effective utilization of freight agent

Freight agents can function as a intermediaries between ENR and freight customers. In order to maintain close contact with customers and make promotions to attract more freight, the effective utilization and arrangement of freight agents is essential, together with providing proper incentives to customers.

- 6) Marketing development by introducing joint operation/joint venture with other transport modes
  - Transport freight by railway, with access by trucks owned by the joint venture company.
  - Function as an agent for freight customers (same as the above "Freight Agent".)
  - Function as a coordinator of future intermodal transportation system in accordance with containerization.
  - Function as a storage operator with storage facilities.

ENR should hold more than 50% of the joint venture shares to maintain control.

# 7) Scrap unused wagons

About 200 wagons designed for vegetables and livestock are now unused. They should be scrapped.

## 4.2.5 Improve Passenger Service

The following are comments on ENR's passenger transport policy :

## (1) Marketing purpose and realization

The purpose of marketing is to attract more railway passengers. To achieve this purpose, the following should be considered.

- Improvement of Services in accordance with Service Class.
- Enhancement of ENR's attitudes to emphasize marketing-oriented customer satisfaction.

## (2) Improvement of services according to service class.

## 1) Improvement of service level for First A/C and Second A/C Classes

- More telephones.
- Isolate smokers

For non-smoking passengers, it is recommendable to introduce a non-smoking coach in the same train.

- Cleaner coaches.
- Improve quality of food sold in coaches.

#### 2) Improvement for Second and Third Classes

- Basic improvement / maintenance of coaches such as windows, doors, seats, toilets, lights, and more cleaning.
- Punctuality.
- More trains.
- More coaches.
- Adjust the train schedule to meet passengers' needs.

#### 3) Improvement of ticket window system

# (3) Enhancement of ENR attitudes to emphasize marketing-oriented customer satisfaction

To enhance the "marketing-oriented (passenger-oriented) attitude" in ENR is very important. It is recommended to introduce a monitoring system, some monitors who are railway users outside ENR, and who will report regularly their comments about ENR service as users. The related section/department in ENR (Commercial Department) will collect their comments and use these comments in order to upgrade service.

## 4.2.6 Require Compensation from the Government

#### (1) Compensation for amounts discounted by social and political policy

There are two types of discount policy for passenger tickets. One is for marketing policy, and the other is for social/political policy. ENR discount rates for social policy are very high. The main reasons for these high discount rates are: (i) promotion of industries and education; (ii) protection of low income people from paying fares. These reasons primarily come from Government policy.

These socially discounted amounts are a kind of "public burden" which is paid by ENR as a substitute for the Government. In this context, losses of these discounted amounts should not be subsidized, but compensated by the Government. Payment for these discounted amounts should be rationally shared between ENR and the Government.

The result is shown in the Table 4.2.6.1. All normal ticket discounts are 50% or less. ENR should take care of discounts up to 50%, as this generates more volume. So the government should provide no compensation for these tickets. Kilometer tickets are a part of ENR's marketing policy, so they are not counted for compensation. Total amount of compensation is 35.4 million LE. in 1994/95.

The government compensates for discounts over 50%. The largest amount to be compensated is for students (18.7 million LE), followed by public sector workers and governmental officials (15.1 million LE), and private sector workers (1.6 million LE).

## (2) Compensation for construction cost of new lines

The new line between Ismailia and Rafah in Palestine is planned to be constructed for the development of Sinai peninsula. But this project is planned for national goals, and is out of scope of our study. The construction cost of this new line should be financed by the Government.

			) 			••••••	Period : 1994/95]
		Type of	Revenue	Average	Normal	Discounted	Amounts to be
Ticket	Type of Job/Discount	Class	(1,000 LE)	Discount	Revenue	Amounts	Compensated
Type				Rate (%)	(1,000 LE)	(1,000 LE)	(1,000 LE)
			(A)	(B)	$(A) \{ 1-(B) \} = (C)$	(C)-(A)=(D)	(D)x{(B)-50/(B)}
	Return Ticket	1~3	1,439.6	17.5	1,745.0	305.4	0.0
Normal	Special Group Discount	1~3	406.8	50.0	813.6	406.8	0.0
স্থ	Soldiers	1~3	2,551.2	50.0	5,102.5	2551.2	0.0
Discount	Blind People	1~3	18.3	50.0	36.7	18.3	0.0
	Total		4,416.0	42.6	7,697.8	3,281.8	0.0
:	Workers of Public Sector	1	151.7	86.0	1.083.4	931.7	384.6
	and Government Officials	5	1,994.4	85.8	14,067.8	12073.4	4,994.1
		3	3,825.5	86.0	27,252.9	23427.4	9,674.8
	Sub-total		5.971.5	85.9	42,404.1	36,432.6	15,053.5
	Workers of Private Sector	1	72.6	73.0	268.8	196.2	63.2
Season	· · · · · · · · · · · · · · · · · · ·	61	582.0	73.5	2,196.2	1.614.2	516.1
		(f) 2 2	1,149.3	73.5	4,336.9	3,187.6	1,019.2
	Sub-total		1,803.8	73.5	6,801.9	4,998.0	1,598.4
	Students	2	430.6	98.9	39,863.8	39,433	18,736.0
	Kilometer	-	239.9	73.0	888.3	648.5	0.0
		5	614.5	73.0	2,275.9	1.661.4	0.0
	Sub-total		854.3	73.0	3,164.2	2,309.9	0.0
	Total		9,060.2	90.2	92,234.0	83,173.8	35,387.9
	Grand Total		13,476.2	86.5	99,931.8	86,455.5	35,387.9
Source : R	tevenue and basic discount rates were p	provided by	the ENR Con	umercial De	partment.		

Table 4.2.6.1 Estimated Amounts to be Compensated for Passengers by Type of Ticket

Notes: 1) The discounted amounts to be compensated are limited to the amounts discounted for social policy.
 2) Discount rates for seasonal tickets are based on the ticket price of 6 months with 20 km travel distance.
 3) Discount rates by type of job for seasonal tickets are weighted averages of revenues of main/branch lines and suburban lines.
 4) Amounts to be compensated are assumed to be the amounts over a 50% discount.

## 4.2.7 Reduce the Number of Staff

# (1) Productivity

The Study Team explored the possibility of making specific Productivity comparisons using world-wide comparison data obtained from the World Bank.

In order to attempt to get a fix on this issue the Study Team returned to the World Bank Productivity Indicators to compare ENR to other railway companies. The first point to be noted is that ENR has reasonable productivity, partly due to Egypt's dense population (living on only 4% of Egypt's territory). But comparison with railways in developed countries indicates that ENR has room for improvement. The following method was used :

Regression analysis of 26 developed countries in the World Bank railway database results in the following formula for calculating the number of employees needed to operate a railway (see figure 4.2.7-1).

FIGURE 4.2.7-1

Figure 4.2.7.1 Railway Labor Efficiency in Developed Countries



RAIL TRAFFIC UNITS

55

# (2) Estimation of number of personnel

It is considered that the two key ingredients in producing an acceptable, non-controversial approach to reducing staff numbers will be Staff Recruitment and Staff Wastage.

Providing recruitment can be regulated to provide a significantly lower annual figure than natural staff wastage, then it should be possible to effect acceptable staff and establishment reductions without causing insurmountable problems to either individuals or Trade Unions.

Table 4.2.7.3	Natural	Wastage	based o	n Recruitment	at 0%	6
Case 1-1 (Rail+N	Metro)					

Year	Employces	Retire	Deaths	Resign	Special retire	Total wastage
1996	74,965	1,294	450	142	510	2,396
1997	72,569	1,563	435	138	493	2,630
1998	69,939	1,738	420	133	476	2,766
1999	67,173	2,316	403	128	457	3,303
2000	63,870	2,740	383	121	434	3,679
2001	60,191	2,589	361	114	409	3,474
2002	56,717	2,147	340	108	386	2,980

Source: JICA Study Team



Figure 4.2.7.2 Number of ENR Personnel (excluding Metro)

#### 4.2.8 Raise the Availability of Rolling Stock

## (1) Analysis of breakdown

- 1) Fig. 4.2.8-1 shows the locomotive breakdown rate in relation to locomotive age, total running km since first service, and annual average running km.
  - Breakdown rate =

     (number of breakdowns of each age group)
     (number on book of each age group on book).
  - b. Locomotive fleet of age 7 have the highest breakdown rate. Younger and older locomotives have a decreasing tendency to breakdown, except 3271-3299 of age 16 for Baharia line. It may be that this is because of high maintenance quality at Tebien Workshop.
  - c. Suddenly increasing breakdowns from age 5 to 7 seem to be caused by the first overhaul maintenance, along with long running km per year. It is said that dismounting or disassembling is a cause of breakdowns.
- 2) Fig. 4.2.8-2 shows the breakdown rate by cause for Group 1, and by group for Group 2 and Group 3.
  - a. Group 1 had more than 343 breakdowns. Group 2 had 163 breakdowns, and Group 3 had 126 breakdowns.
  - b. Fixation error, engine system failure, brake system failure, cooling water system failure including fan damage and battery damage of Group 1 are remarkable, amounting to 54.3 % of total breakdowns.

## (2) Reduction of breakdowns

The following recommendations are proposed with the goal of reducing breakdowns by 50% or more.

- 1) Dismounting and disassembling should be avoided as much as possible.
- 2) Differences in drivers' technical skills were found. Re-training and re-education are necessary for recovering the locomotive when they break down, and for decreasing unknown causes of brake system breakdown.
- 3) There are many wiring and bolting errors. This is from dismounting or disassembling. A double-checking system is needed, using painting marks to confirm completion of maintenance and inspection work by each worker himself. Torque wrenches are indispensable for bolting.
- 4) For engine maintenance, a clean working environment should be maintained in a separated shop. Disassembling of engines before their 4 year overhaul should be avoided. Techniques for examination without disassembly should be developed.
- 5) For the brake system, ENR should re-train and re-educate drivers, as mentioned in item 2) above, and periodically exchange gaskets and perform air leak tests.
- 6) For fan damage, NFB (No Fuse Breaker) should be used in place of ordinary fuses, to avoid single phase operation of three phase motor.
- 7) For cooling water circuits, periodical exchange of gaskets should be established.
- 8) For battery breakdown, a periodical exchange system, for example every 10 years, should be established.

- 9) For fuel circuits, cleanliness of filters should be strictly maintained by maintenance work in a separate clean room. NFB should be used for protection of the fuel pump motor.
- 10) For bearings, maintenance should be carried out in a separate clean room.
- 11) Maintenance manuals including work procedures, and visual boards in workplaces indicating important policies for maintenance, should be prepared to avoid common breakdowns mentioned above, and repeated breakdowns from the same cause.

Figure 4.2.8.1 Breakdown Rate and Total Running km per Loco. by Age Group





#### 4.2.9 Make Reasonable Scale of Investment

ENR has suffered from a huge capital cost burden. Decision-making for railway investment is very important for management improvement. This is especially true because fund raising at ENR will change after 1998/99. Investment decision making will become much more important in the future.

#### (1) Utilize existing assets more efficiently

Improvement of the utilization rate of existing assets would reduce required investments and increase the asset turnover ratio. As a result, ENR can improve profitability without significant investment.

#### (2) Investment decisions based on objective standards

Investment decisions impact ENR business results over many years. Investment decisions should be made carefully based on objective economic standards.

## 1) Standard for investment decisions

## (a) Financial Internal Rate of Return, and Net Present Value

Financial Internal Rate of Return (FIRR) and Net Present Value are two of the most appropriate financial valuation tools for each investment project.

#### (b) Asset Turnover Ratio

Asset Turnover Ratio is useful to measure the efficiency of investment.

## (3) Investment discipline, like investments less than cash flow

Investments which exceed cash flow result in depending on debt for fund raising. ENR should establish more discipline in investment decisions. For example, investments should be kept below cash flow until establishing a sound and sustainable financial structure.

#### (4) Clarify the responsibility between ENR and government

There are 2 possible goals of a railway investment: national interest or improving ENR's business. In accordance with these 2 goals, responsibility and authority between ENR and the government should be separated clearly.

#### 4.2.10 Close Lines Which Are Lightly Used

One of the most effective ways to reduce costs while minimizing social impacts is closing selected lines. Some lines in rural areas were constructed before road transport was available, but now most of the local population rides share taxis.

The basic principles for line closure are as follows:

- a. Extremely few passengers.
- b. Alternative transport is feasible and more economical.
- c. Transport volume is not forecast to increase much.
- d. The line is not an important freight or passenger by-pass route.
- e. There is no extension or improvement plan for the line.

Table 4.2.10.3 and Figure 4.2.10.1 show results from the survey and analysis for closure of lines.

The recommendations resulting from (1) Survey of 12 lines, and (2) Financial analysis are :

.

Table 4.2.10-3 Line Closure Recommendations

Ž	o. Railway Segment	Revenues	Loss Estimate	Close or	Savings from closing line	Savings from Closing Line and
	)	÷ Costs	(1994/95)	Don't close	, ,	Providing Bus Service
		(ENR avg: 76%)	(1000 LE)		(1000 LE)	(1000 LE)
<b>_</b>	1 E. Erman - Am Karah	Yocy	- 447 I	Dan't clace		
1	TOCALE MALE INTRA Y YOU	0/70	1 1 4 Y			
2	0 Abu Kebir - Fagus - El Salhia	22%	2,023	Don't close		
14	1 Benha - Zefta	34%	1,737	Don't close		
2	2 Faque - El Semaina	%5	668	Close	668	302,471
2	4 El Santa - Mahalet Rouh	31%	987	Don't close	0	
2	9 Bouselli - El Qassabi	25%	1,268	Don't close	0	
٣ ٣	7  El Fayum - Sinnuris	2%	7.14	Close	714	366,426
٣	<ol> <li>Desouk - Mottoes</li> </ol>	10%	1,258	Don't close	0	
ίΩ.	7 Beni Suef - Shaweish - El Lahun	10%	785	Close	785	772,380
ń	3 Shaweish - Menshat Abu El Sammad	6%	- 313	Close	313	358,531
4	) Kafr Saad - Kafr Suleiman	3%	69	Close	69	73,879
	Mowaslet El Roda - El Roda	1%	46	Close	46	42,191
		TOTAL	00011		7 505	1 015 870
					2	

Source: JICA Study Team

Note: Detailed data was unavailable for Mowaslet El Roda line.

61


# 4.2.11 Make the Organization More Business Oriented

The following proposals will be required to enable ENR to make a successful transition into a commercial organization.

- Create a new position of Chief Executive who would be charted to the Chairman of ENR and have direct organizational responsibility for the day to day running of ENR.
- The current organization does not reflect an enterprise that is gearing up for the demands of a commercial market-based world. ENR should separate the Commercial Department from its present position as an adjunct to the Operations Function and establish its organizational independence.
- Create a separate organization for Marketing and Sales under a position of Vice Chairman.
- There should be an independent review of the Safety arrangements and organization within ENR to establish whether there was a case for creating a dedicated Safety organization reporting directly to the Chairman or Chief Executive if it is decided to create such a position.
- There should be a complete re-evaluation of the ENR training programs, to anticipate and support the changes in organization and business culture that was to take place.
- It is proposed that a Change Management Group, which would include Productivity, should be established.

# 4.2.12 Correct the Data Collection System

In order to smoothly to carry out daily railway operations, understanding the transport situation and exchanging information are critical for the development of railway business.

# (1) Current condition and some proposals for the ENR data collection system

The Study Team tried to get accurate data for passenger volume and passenger kilometers, because the passenger revenue per passenger kilometer is too small compared to the minimum tariff of passengers per kilometer. However, this could not be clarified, even though the statistical data for passenger volume is estimated by Computer Center of Head Office in Cairo, based on data sheets collected from all passenger stations every month.

The existing ticket recording system needs a huge amount of input work because all data input is performed in the Head Office. Therefore, it is now impossible to avoid input errors, and it is also impossible to check whether the data recorded by the station on the sheets is accurate.

# (2) Direction to reform the Data collection and information system

A step to check the passenger sales recording system should be added. One way to do this is to collect this data and sum it up in regional offices, then send them to the Head Office. In the long run, the final goal will be to computerize all aspects of the data collection and

The first step in reform of the data collection system is :

- a. Marketing and sales management system for each region
- b. Accounting and financial management system
- c. Improvement of commercial system

# (3) Development of data collection system

An accurate data collection system should be established according to the following process.

- a. Education of 3 types of engineers as initial experts.
- b. Making a model system for regional accounting and financial management and sales management and marketing system for Cairo area (Figure 4.2.12.1).
- c. Organization after making a model system
- d. Policy for current system
  - 1) Ticket reservation system

This system should be independent because this system should not be influenced by other systems. So this system will remain after starting to make the new system.

# 2) Commercial system

The commercial system is an old system. So this system will be eliminated when the new system takes place of the current system. During the initial period when both the old system and the new concept system are used together, data for the two systems will be transferred by diskettes or magnetic tapes.

# (4) Recommendation of flow chart for checking the data

The following procedure is strongly recommended in order to make the data accurate. The policy of this procedure is that the data is checked manually, by the system itself, and finally the computer output is checked. Data is also checked by input operators and the people who make the original data.

The flow chart of the data checking system is shown in Fig. 4.2.12.1.



Figure 4.2.12.1 Computer System & Data Checking Flow

#### 4.2.13 Enhance Safety Devices on Main Lines

#### (1) Absolute train stop

Absolute train stop herein referred to is a system which stops a train forcibly if the driver should overlook the stop signal. ENR has installed ATC with absolute stop function on the main trunk lines. However, the other lines have no absolute stop installed, so ATC should be gradually extended to other lines, in order of priority.

#### (2) Transmission of information for train block and dispatching

Since the aerial wires for train block and dispatching are mostly owned and operated by ARENTO, it is suggested that ENR strongly request ARENTO to take such measures as the conversion of the aerial wires into underground cables to prevent unexpected cutoff or loss of wires.

#### (3) Electronic interlocking devices

ENR has been progressing with electrified signals for the main trunk lines, to improve safety and efficiency of train operation. For signals to be electrified in the future, it is suggested that electronic interlocking be introduced in place of conventional relay interlocking. Electronic interlocking features better expandability and reliability.

# 4.2.14 Improve Track Maintenance System

In view of the current situation and considering increased track maintenance work expected from increased number of trains and speed-up of trains, the following items should be considered as subjects to improve.

#### (1) Expanding mechanical works and organization

- Expanding M.T.T. work to all lines except lightly used lines - Performing M.T.T. work by ENR gangs

# (2) Installing Hand Tie Tamper (H.T.T.)

# (3) Mobility

For transport of tools, equipment and gang, road transport such as pickup trucks should be adopted.

# 4.2.15 Develop Diversified Businesses

The purposes of diversified businesses are : (1) Increase the revenues of ENR as a whole; (2) Utilize effectively assets and facilities of ENR such as its business/information network ; (3) Utilize the human resources of ENR.

From a legal viewpoint, ENR can actively develop a diversified business. Diversified Business is to be one of the major sectors for obtaining revenues.

# (1) Possibility of "Diversified Business"

#### 1) Re-development of station facilities

- a. The objectives of re-development of stations are major stations such as Cairo, Alexandria, Sidi Gaber, Luxor, and Aswan, which are located in highly populated cities, with large potential for commerce and tourism.
- b. Strengthening of commercial/restaurant facilities, to increase related revenues.
- c. In the case of Cairo Station, re-development of the station building itself will be considered, with proper conservation of the existing aesthetic atmosphere, especially the outside wall.

Other items to be developed are as follows.

- 2) Re-development of ENR real estate
- 3) Extension of by-product sales for outside market
- 4) Promotion of tourist business such as travel agents/hotels, by utilizing effectively the nationwide business/information network and human resources of ENR.

# (2) Pre-condition for land re-development (Constraint for Land Re-development)

Currently, ENR has no freedom to develop the real estate it uses. Accordingly, the diversified business related to real estate re-development will be possible to carry out after this constraint is resolved. When such a constraint is cleared, land re-development will be a major sector getting more benefits as a diversified business of ENR.

#### (3) Management scheme

The management scheme for the above diversified business will be made on the basis of joint operation and/or joint company with private companies (domestic / foreign).

In the case of a joint company, ENR should hold over 50% of the stock, as with its existing joint companies, for corporate control.

#### (4) Implementation

First it is necessary to establish a proper organization in ENR, i.e. a study group on "Diversified Business", composed of staff from related departments/sections within ENR.

# 4.2.16 Clarify the Relationship between the Government and ENR

#### (1) The most crucial issue

ENR must play a public role as a government agency, and also compete with other modes of transport. This is very difficult with the market economy steadily gaining power. A typical example of ENR's public role is the heavy discount for students and government employees. An example of competition is that ENR faces fierce competition from deluxe buses with TV, A/C, and clean toilets on the Cairo-Alexandria corridor, the most profitable segment for ENR.

This double role hurts financial performance, and also damages ENR's spirit to reform and compete. For example, ENR cannot try to close lines which lose money and have few riders, because of political pressure. Worse, ENR executives and employees know that ENR will never go bankrupt because ENR is a state-owned organization. This attitude cannot make ENR competitive. This will worsen the finance of ENR, eventually leading to an increase in the national financial burden.

To avoid this problem, Egypt must clearly establish a division between ENR's competitive and public service role.

First, the clear distinction of the financial record is required and the government should compensate losses from ENR's actions for public service.

Second, the government should strictly refrain from executing its power over ENR. More concretely, the government should gradually reduce restrictions on ENR and let ENR freely conduct such activities as personnel and organizational changes and tariff revisions. Furthermore, it is recommendable that a systematic revision should be made, so that the decision of ENR's annual budget, which now requires the approval of the People of Assembly, can be made only by the approval of or notification to the Minister of Transport.

On the other hand, ENR should prepare for the loss of various privileges ENR enjoys now because ENR is a state-owned organization.

# (2) Separation of powers to be considered

If ENR is to operate more like a competitive private company, control of ENR should be divided, for example :

- a) Owners/shareholders, including the government, approve appointment of board of directors, important financial transactions, and reorganizations.
- b) The board of directors takes major decisions on managing the business, such as appointing top executives, holding shareholder meetings, opening branches.
- c) Auditors audit financial documents.
- d) Government officials regulate the industry according to laws and regulations.

# (3) Deregulation

Deregulation has 2 aspects :

- a) Giving ENR freedom over issues such as board control over daily operation, and owner control over appointment of board of directors.
- b) ENR will have freedom to operate, within clear regulations established by a government regulatory agency. Regulations will cover issues such as safety and the environment.

# (4) Budget approval

The ENR budget is approved by the People of Assembly. This is very slow, and encourages interference in business issues by politicians.

#### (5) New business approval and land use

It is understood that now a special task force is studying methods of purchasing the land ENR uses from the government.

- (6) Separation of account for Government policy and financial measures for certain exemption
- 1) Finances should be separated for regular operation, construction of new lines, discounts to meet government goals, etc.
- 2) ENR should receive exemption from certain items which are not produced in Egypt, such as locomotives.

# 4.2.17 Promote Local Production of Dieset Electric Locomotives

To make the ENR's business profitable is a difficult task. One of the major reasons for this is the fact that ENR has to import Diesel Electric Locomotives (DEL) at expensive international prices. But ENR's average passenger fare, the main source of revenue, is extremely low by international standards. 70% of passenger revenues are from 3rd Class, but these revenues do not even cover capital costs. The tariff is too low, or the capital cost of rolling stock, especially locomotives, is to high compared with the tariff. However, this does not allow an increase in tariffs, due to social issues.

One solution of this problem is to produce the locomotives in a domestic factory as much as possible. This is especially important, considering the coming replacement of many old locomotives. In a similar railway's factory, the price of locally produced locomotives are 60% of the price of imported complete locomotives. The estimation in this Report shows a similar result for ENR, and in a rough calculation, the factory construction cost could be recovered by local production of 124 DELs, or in 5 years in case of 25 DELs produced per year.

However, the construction of such a factory requires huge investment. Therefore, it is essential to execute a thorough feasibility study separately.









ŝ

# 4.3 GUIDELINE OF PRIVATIZATION

# 4.3.1 Significance of Privatization

Recently, around the world, privatization of the national railways has been gaining momentum. There are two main purposes of privatization: one is to make the management of railway business more competition-oriented and thus more efficient; the other is to lessen the financial burden of the government for sustaining the national railway.

In most countries, the railway had been playing an active role in developing the national economy as a almost the sole means of ground transport for many years, until recently. Partly because of the huge amount of investment required to develop the railway, partly because of its monopolistic status, the railway, especially the inter-city and freight railway network, used to be run by the government in almost all countries in the world.

However, with road and air transport developing rapidly and with the transport market becoming increasingly competitive, national railways have become unable to cope with the situation due to their rigid management as governmental organizations, losing significant market shares and facing financial difficulties. To find a way out of this situation, the privatization of national railways is often proposed, considering the fact that the railway is no longer a monopolistic means of transport.

As for Egyptian National Railways, it has come to face severe competition with road, maritime, and air transport, because of the rapid development of highways, harbors, and airports. However ENR, as a government owned railway, is obliged to support national goals such as subsidizing transport for low-income people, and exploiting underdeveloped areas. Therefore, it is considered that immediate privatization of ENR is premature, although privatization in the medium term is inevitable, considering the secure trend toward a market economy in Egypt. Even at present, methods to privatize ENR should be examined in earnest.

This chapter provides basic conceptual information as guidelines for future consideration of privatization of ENR.

# 4.3.2 Types of Privatization

There are various types of privatization executed in the world. Among them, the discussion below introduces two types, the "Japanese style" and the "European style", as typical examples.

#### (1) The common items

Although two types of privatization mentioned above differ significantly, there are common aspects: the reasons why the national railways should be privatized; and the final goal of privatization.

a. The reasons why the national railways should be privatized

Both in Europe and Japan, the national railways have/had similar problems as mentioned below:

- Ambiguity of goals public service or self-financing operation
- · Lack of competitive, market based thinking from management and staff
- Lack of commercial independence
- Government control of staff pay and fares and tariffs
- A centralized organization that limited flexibility

- Strict legal restrictions on business activities
- Outdated regulations that applied rigidly
- Overstaffing and low productivity

# b. The final goal of privatization

The final goal of privatization is same in Europe and in Japan: The privatized railway organization should be profitable without government support, and free from government intervention as much as possible.

# (2) Brief comment on the two types of the privatization

As observed in this chapter there are the significant differences between the European and Japanese approaches.

• The European approach is to separate the railway operation from the infrastructure and to privatize the operation undertaking, while the investment and maintenance of the infrastructure remains for the responsibility of the government (except the British Railway approach).

There may arise the controversy of whether it is proper to separate the maintenance of infrastructure such as the track and signaling system from the railway operation, considering the safety of railway operation.

However, most European railways cannot be profitable without escaping from the financial burden of maintaining infrastructures, mainly due to their low traffic density. Resolution of this problem remains to be seen.

On the contrary, the Japanese approach privatized its national railways together with the infrastructure, dividing it into several passenger companies and one freight company, avoiding the controversial issue of safety problems, as mentioned above.

The main reason which enabled this approach is Japan's high traffic density, due to the high population density along the railway routes.

# 4.3.3 Toward Privatization of ENR

Thorough examination of the present status of ENR reveals that there exist almost the same problems experienced by national railways in European countries and Japan. To fundamentally solve these problems, privatization of ENR will be eventually required.

Then what type of privatization is most appropriate for ENR ?

It is not easy to properly answer this question at present.

The study team made a rough analysis of ENR's financial status in case infrastructure is separated from operations. This analysis found that the removal of the capital and maintenance cost of infrastructure does not significantly contribute to improve ENR's financial status. Instead, the capital cost of relatively expensive imported vehicles (especially locomotives) surpasses the cost of infrastructure, damaging the financial situation of ENR.

The regional division of the network such as seen in the Japanese approach is not adequate for ENR because its network is not large enough to justify regional division.

Considering ENR's high traffic density of passenger transport, which can be compared to that of the Japanese railways, if the all problems described in this study can be satisfactorily resolved, it may be possible to privatize ENR as a profitable railway company, together with its infrastructure.

However, it is too early to make a firm decision on the direction of privatization of ENR. The most important thing to do now is to take the step of 'separation of accounts', according to the EU Directive, to accumulate accurate and adequate data and examine them deliberately. Then the right direction toward the privatization of ENR will be found.

# CHAPTER 5 BUSINESS IMPROVEMENT ALTERNATIVES

# 5.1 **BUSINESS IMPROVEMENT FACTORS**

The business improvement alternatives aim to quantitatively test the effect of each improvement factor proposed. So only those factors with effects which can be quantitatively measured are considered. The following are such factors.

#### (1) Tariff increase

#### a. "Without Case"

#### (a) 1996/97 to 1997/98

During the period from 1996/97 to 1997/98, it is assumed that tariffs of all modes will increase 10% annually. This rate is based on the following assumptions and conditions:

- Increase of consumer prices influence ENR operating expenditures. By taking into account of performance of consumer prices in the past, prices are predicted to rise around 6.5% yearly.
- ii. ENR's low tariffs influenced other modes of transport so seriously that they were forced to drastically restructure their operations, because they cannot increase tariffs without improving service, and they are not subsidized by the Government. In this sense, ENR can act as a "Price Leader". It is expected that other modes will follow tariff increases by ENR.

iii. According to the traffic survey carried out by the study team, around 20% of ENR passengers seem prepared to pay at the maximum a tariff increase of 10%, and around 30% of railway passenger seem prepared to pay at maximum a tariff increase of 100%. Therefore, it seems that a 10% railway tariff increase will not be a large financial burden for many passengers.

iv. ENR tariff increases were in the range of 10% to 15% during the past several years.

#### (b) After 1998/99

After 1998/99, the rate of tariff increase is fixed in this case at 5% for all modes, which can be considered to be the minimum rate of tariff increase, taking account of future consumer price increases of around 6.5% per year.

b. Case 1-1 and Case 1-2

#### (a) 1996/97 to 1997/98

During the period from 1996/97 to 1997/98, it is assumed that the tariffs of ENR and other modes will increase 10% and 8% per year, respectively. The assumptions and conditions of setting up the tariff increase rate are almost the same as those of the "Without Case".

(b) 1998/99 to 2001/02

During the period from 1998/99 to 2001/2002, it is assumed that the tariff of ENR and other modes will increase by 7% and 5% per year, respectively. Basically the same assumptions and conditions as those of 1996/97 to 1997/98 are applied to this period. Setting a tariff increase rate of 7% for ENR is based on the assumption that travel time is shortened by increased frequency and faster speed. Setting up a tariff increase rate of 5% for other modes is based on the same assumption as the one of "Without Case".

# (c) 2002/03 to 2011/12

During the period from 2002/03 to 2011/12, the ENR tariff increase rate is set at 5% per year, based on the following assumptions:

- Tariff increases of 7% every year will become a financial burden for users.
- 5% per year will be acceptable for users, because it will be lower than the rate their income increases, and 5% per year is needed to cover increases in consumer prices of around 6.5% per year.

The same assumptions for tariff increases are applied to other modes.

#### c. Case-2-1 and Case 2-2

#### (a) 1996/97 to 1997/98

During the period from 1996/97 to 1997/98, it is assumed that tariffs of ENR and other modes will increase 10% per year. The assumptions and conditions for setting the tariff increase rate are almost the same as those of the "Without Case".

# (b) 1998/99 to 2001/02

During the period from 1998/99 to 2001/2002, it is assumed that tariffs of ENR and other modes will both increase yearly by 7%. Basically the same assumptions as those of 1996/97 to 1997/98 are applied to this period. Setting the tariff increase rate of 7% for ENR is based on the assumption that travel time is shortened by increased frequency, and by speeding up. Setting a tariff increase rate of 7% for other modes is based on the assumption that other modes will follow the same rate of tariff increases as ENR.

# (c) 2002/03 to 2011/12

During 2002/03 to 2011/12, the rate of tariff increase of ENR is set at 5% per annum based on the same assumptions as those of Case 1-1 and Case 1-2.

The tariff increase rates of all cases mentioned above are applied to both passengers and freight, and are considered to be average rates of tariff increase. Actually, different rates of tariff increase can be applied by line and by class for passengers, and by line and by commodity for freight on the basis of elasticity and cross-elasticity from detailed traffic demand analysis, sensitivity analysis, and simulation of financial improvement of ENR.

# (2) Intensifying the ticket checking system

Nonpaying passengers are estimated to be 15% to 25%, mainly passengers in normal 2<sup>nd</sup> and 3<sup>rd</sup> class.

In every With case, it is assumed that the collection of fares from nonpaying passengers of

these classes will be improved by 5% in 1997/1998, and 15% in 2001/2002, from current levels, by strengthening ticket inspection.

# (3) Speed-up

The team discovered that at present most passengers are not time-sensitive, and speed-up will not increase demand very much, but it is effective for raising the efficiency of crews and rolling stock.

In every With case, 10% reduction of the travel time between major stations on the main line are proposed (refer to Fig. 5.1.1).

# (4) Introducing government compensation

In principle, receiving the subsidies from the government is not preferable in a market oriented economy, even for the railways.

However, if the central government forces ENR for political reasons to follow its instructions which will certainly cause huge and unreasonable financial losses, ENR will be entitled to receive compensation within the limit of losses caused by the government.

The team considered the following two cases appropriate :

- 1) Excessive discount rate for government employees, students, etc. This kind of discount is implemented for national goals and not for competition in the transport market. The amount of this compensation is assumed to be 10.6% of the total 1997/98 passenger revenue.
- 2) New line construction such as to Sinai Peninsula. The line will be constructed to develop the area for national goals. However, with the very small amount of transport volume anticipated on the line, the financial results of this new line including capital cost will be greatly unprofitable at least for the medium term. Therefore, government compensation is justifiable. The team's proposals do not include calculations for capital or operation costs of such lines.

#### (5) Reduction of staff

ENR labor productivity is less than 60% of that in developed countries around 1992, so the reduction of staff is inevitable to improve ENR's finances. However, rapid and large scale reductions including compulsory dismissal may cause social unrest and cannot be implemented. Therefore, the team considered it effective to strictly curb the number of new recruitment to reduce employees.

In Without case, it is estimated that the rate of the new recruitment remains same as the current level, namely 1.63% of total employees.

In Case 1-1 and Case 2-1, new recruitment is not done until Jan. 2002 to gain financial health as early as possible. After that, new recruitment is to be carried out slowly, to gradually improve labor productivity in 2010 to the point that it will almost reach the level of developed countries around 1992.

In Case 1-2 and Case 2-2, new recruitment is to be limited to 1% of total staff each year until Jan. 2002, to gain financial health quickly. After that, new recruitment is to follow in almost same manner as that of Case 1-1 and Case 2-1.

# (6) Closure of lightly used lines

Closure of exceedingly lightly used lines has been proposed, considering benefits for both the national economy and business improvement of ENR. For every With case, closure of five branch lines, namely Faqus - El Sammana, El Fayum - Sinnuris, Beni Suef - El Lahun, Shaweish - M. Abu Sammad and Karf Saad - Karf Silman lines by 98/99 has been proposed, as described in 4.2.10. It is assumed that those lines will be closed by 98/99 (refer to Fig. 5.1.1).

# (7) Other improvement items

For every With case, among the improvement items listed in Chapter 4, the following items which can easily be quantitatively calculated are taken into consideration to make the financial analysis.

- Raising availability of rolling stocks
  - The availability of rolling stock, especially diesel locomotives, are increased from 74% at present to 85%.
- Correction of data collecting system It is assumed that ENR will install an adequate OA system to let the management access reliable up-to-date information.
- Enhancing safety devices on the main line The automatic signaling-system on the major lines is to be installed to increase operation safety.
- Development of diversified business
   Although it is not easy for ENR to develop the diversified businesses because ENR does not own the land it uses, ENR needs to earn extra revenues from commercial activities such as restaurants and travel agencies around the large passenger stations. 1% increase in the total revenues is anticipated from 98/99.



Fig. 5.1.1 Lines planned Train Speed-up and Closure Lines

#### POLICY OF CASE CLASSIFICATION 5.2

The alternative cases are classified into two cases: the case of the status quo ("Without" cases), and cases with variable improvement factors ( "With" cases).

For every case, railway expenses including wage cost have been estimated to increase in parallel with the inflation rate, estimated in the range of from 7% to 9% for the consumer price index, and from 5.5% to 6% as for the wholesale price index.

#### "Without"

In this case, no improvement factor is assumed except the fare increase, the annual growth rate of which is 5%, just same as that of other modes of transport.

# "With" Cases

To produce the alternative cases, fare increase and mode of staff reduction are selected as variable factors because they are the dominant factors to control the financial status of ENR. However, the other factors described in Chapter 4 are also very important for ENR's improvement, and have been taken into consideration in every "with" case.

Case 1-1

In this case, the tariff increase rate of ENR is assumed at 7% yearly, and that of the other modes is assumed at 5%. New recruitment is assumed to be stopped until 2001/2002.

Case 1-2

In this case, the tariff increase rate is assumed to be the same as in Case 1-1, while new recruitment is assumed to be carried out at 1% of the total number of staff. Therefore, the difference between Case 1-1 and Case 1-2 is the difference of the new recruitment.

# Case 2-1

In this case, the annual tariff increase rate of ENR is assumed at 7%, just the same as

that of other modes, while new recruitment is assumed to be stopped until 2001/2002. Case 2-2

In this case, the tariff increase rate is assumed to be the same as in Case 2-1, while new recruitment is assumed to be carried out at 1% of the total number of staff.

In short, in terms of tariff increase, Case 1-1/2 can be called the "7-5 case", and Case 2-1/1 the "7-7 case". In terms of recruitment, Case 1/2-1 can be called the "no-new-recruitment case" and Case 1/2-2 called the "minimum recruitment case".

Table 5.2.1 gives an outline of all five alternatives, including "Without" case.

Other Improvement		None		Done			Done		Done		Done		
Line Closure		None		5 lines			5 lines		5 lines		5 lines		:
Reduction of Staff		Recruit at	Current pace	No new	recruitment		1% new	recruitment	No new	recruitment	1% new	recruitment	
Introducing Government-	Compensation	Status quo		For Excessive discount &	new line for development		For Excessive discount &	new line for development	For Excessive discount &	new line for development	For Excessive discount &	new line for development	
Train Speed-up		Current Speed		10% on main line	2		10% on main line		10% on main line		10% on main line		
Strengthen Ticket	Checking	No		Yes			Yes	•	Yes		Yes		
Tariff Increase		Rail: 5%	Other modes: 5%	Rail:	7%	Other modes: 5%	Rail: 7%	Other modes: 5%	Rail: 7%	Other modes: 7%	Rail: 7%	Other modes: 7%	
		Without		Case 1-1			Case 1-2		Case 2-1	:	Case 2-2		

Table 5.2.1 Business Improvement Alternative Cases

Each case was tested under the condition where the government support is terminated in 97/98 and where it is postponed until 2001/2002.

80

# CHAPTER 6 TRANSPORTATION DEMAND FORECAST

# 6.1 METHODOLOGY OF DEMAND FORECAST

(Fig. 6.1)

6.2 ZONING SYSTEM

(Fig. 6.2 (a) and 6.2 (b))

Egypt is divided into 188 traffic zones, which are further aggregated to the 29 semigovernorates.

# 6.3 PASSENGER TRANSPORT DEMAND MODEL

1) Trip generation model

To calibrate the trip generation model, the following variables were input for statistical analysis, based on 188 traffic zones.

- Population size as independent variable

- Gross Regional Domestic Product (GRDP) as independent variable

- Employed population as independent variable

- Number of railway passengers per day for normal tickets as dependent variable

#### 2) Trip Distribution Model

A doubly-constrained gravity model was calibrated to distribute the average of generatedattracted numbers of railway passengers based on the 188 zoning system analysis in target years.

3) Mode choice model

- A logit model was applied with canalization of collected data of Traffic Survey conducted by the team.
- The main variables in the logit model were classified into three categories related to transport system, trip, and passenger category.

# 6.4 PASSENGER ASSIGNMENT

The estimated O-D matrices in target years were assigned to the railway network using an allor-nothing assignment method to estimate the sectional volume of railway passengers per day.

- 6.5 ESTIMATION OF FUTURE TRAVEL DEMAND FOR ALTERNATIVE CASES
  - Three options for each case will affect the travel demand forecast : reduced travel time, fare raise, and line closure.
  - Generally, a fare raise is the most important factor, dramatically influencing the mode choice decision. By raising railway fares 10% (assuming other mode fares rise 5%), ENR is forecast to loose 23.4% of its current passengers. Therefore, a lower fare rise of 7% was investigated to select the most appropriate policy which will not drastically reduce ENR's passenger transport share.
  - Travel time reduction or train speed-up seem to be unimportant factors in selecting the mode of travel in inter-city passenger movement, based on traffic survey results. (See Tables 6.9, 6.10, 6.11, 6.12, 6.13, 6.14)

# 6.6 FREIGHT TRANSPORT DEMAND FORECAST

- The methodology depends in principal on the growth factor method.
- Different commodities were categorized according to the 30-commodity code system adopted by previous National Transport Studies in Egypt.
- Based on the O-D matrices consist of the 26 commodities transported by ENR, tonnage, average distance as the base year 1995, the future demand forecast of railway freight are estimated by each line.
  - (See Tables 6. 18, 6.19, 6.26)

# 6.7 ROUGH ESTIMATION OF PASSENGER VOLUME OF METRO LINE

A rough estimation of annual passenger volumes in 2002 is as follows: 375 million on Metro Line No.1, and 175 million on Metro line No.2.

# Note: Railway transport share in all transport modes

Passenger : The railway share of all land transport modes (except private cars) is roughly estimated at 47%, which is derived from the modal split model.

Freight :

The railway share of freight in all transport modes (including land and inland waterways) is roughly estimated at 7.7% in 2012 based on the National Transport Study by JICA 1992.



Fig. 6.1 Outline of Transport Demand Forecast



	· · · · ·	Action Required in Planning Years							
Alternative Case	Year	Fare	Raise*	Speed-	Closing				
		Railway	Other	up"	Lines				
Do-Nothing	1995								
Without Case	1998	5%	5%	0%	No				
With Case		[7%], 10%	5%,7%, 10%	0%	No				
Without Case	2002	5%	5%	5%	No				
With Case		7%, 10%	5%, 7%, 10%	5%	Yes				
With Case 1 or 2		[7%], 10%	5%, 7%, 10%	[10%]	Yes				
Without Case	2007	5%	5%	0%	No				
With Case		5%	5%	5%	Yes				
With Case 1 or 2		5%	5%	10%	Yes				
Without Case	2012	5%	5%	0%	No				
With Case		5%	5%	5%	Yes				
With Case 1 or 2		5%	5%	10%	Yes				

# Table 6.9 Definition of Actions Required in Target Years for Different Alternative Cases

\* Fare raise of 10% for railways and other modes is investigated and referred to as Extra Case in this Chapter only.

\*\* The speed-up of 5% or 10% will be applied only once in 2002. It should be noted, therefore, that speed-up of 5% or 10% in years 2007 and 2012 is the same as of year 2002.

Shift of Ridership Share of Railway Passengers as a Result of Adopting Different Alternatives Fare Raise Table 6.10

lterna	tive Ca	50 V I V	Without	Case	•	With Ca	tse 1	. 1	With (	Case 2	8xt1	a Case
fare Ra. Applied	ise -> Logit -	Model->	St - All In	58 Come	78 - All I	58 acone	78 - 4918	58 Income	7% . All	- 78 [bcome	10% -	10%
speed Raise	Year	ang ang	Share	Ratio*	Share	Ratio*	Share	Ratio*	Share	Ratio*	Share	Ratio*
80	1995	I.	0.470	00 T	0.470	1.00	0.470	1.00	0.470	1.00	0.470	1.00
800	1998	R2 R2	0.475	1.01		 0.97	 0.456	0.97	0.477	1.02	 0.479	1 05 7 05
0% 5%	2002	82 82 82	0 4 0	1 - 05 - 1 - 05 - 1 - 05 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	0.438 0.439	0-93	 0.441 0.443	0.94	 0.486 0.489	1011 1011	 0.489 0.492	1.05
<b>6 6 6</b>	2007	26 27 28	0.485		0.443 0.444	1 4 5 - 0 1 4 2 - 0 2 2 3	 0-447 0-449	0.95	0.490 0.492 0.492	1.05 1.05	 0.492 0.494	1-05 1-05
6 6 6	2012	R9 R10 R11	0 - 4 8 8 8 8 8 8 8	1.04 1.1	0.447 0.448	0.95 0.95	0.451 0.452	0.96 0.96	0.493 0.495	1.05 1.05	0.494 0.496	1.05

86

Do-Nothing Case.

# Table 6.11Number of Passengers per Kilometer and Passenger-Km (x 1000) for Railway LinesIn Case of 5%-5% Fare Raise in Different Planning Years using All-Income Model:Without Case

INE	LINK	LNTH		Nunt	Number of Passenger-Km (1000)							
UDE	CODE	(KM)	1995	1998	2002	2007	2012	1995	1998	2002	2007	2012
1	24	208	194,990	216,733	247,703	290,337	335,891	40,538	45,059	51,497	60,361	69,832
2	52	892	65,674	71,051	80,715	93,696	107,524	58,590	63,386	72,008	83,589	95,926
3	8	192	57,295	65,064	74,323	85,773	98,809	11,009	12,502	14,281	16,481	18,986
° 4	5	53	108,411	119,136	136,060	156,577	181,253	5,700	6,264	7,154	8,233	9,530
- 5	3	15	5,842	6,374	7,394	8,752	10,122	86	94	109	129	150
6	3	41	0	0	0	0	0	0	0	0	0	0
7	3	- 91	10,032	11,876	13,683	19,099	21,884	913	1,080	1,245	1,737	1,991
8	4	63	50,217	55,169	63,052	72,665	84,405	3,141	3,450	3,943	4,545	5,279
9	6	56	21,994	24,087	27,384	31,159	35,853	1,236	1,354	1,539	1,751	2,015
10	10	119	2,791	3,067	3;457	3,977	4,535	333	366	413	475	542
11	2	38	0	0	. 0	0	0	0	0	0	0	0
12	13	94	34,323	37,686	43,122	49,159	56,678	3,213	3,528	4,037	4,602	5,306
13	3	135	17,411	20,081	23,293	34,382	39,529	2,348	2,708	3,141	4,636	5 330
14	3	61	35,529	38,918	44,217	50,637	58,251	2,177	2,384	2,709	3,102	3,568
15	8	21	9,015	10,408	11,869	13,503	15,660	193	223	255	290	336
16	2	52	4,039	4,454	5,067	5,882	6,783	209	231	262	305	351
17	3	- 71	20, 126	21,908	24,994	28,436	32,739	1,433	1,560	1,780	2,025	2,331
18	4	62	19,587	21,802	24,836	28,476	32,855	1,219	1,357	1,546	1.772	2.045
19	5	71	45,809	49,820	56,682	64,989	74,514	3,231	3,514	3.998	4,584	5.256
20	2	34	10,089	10,915	12,402	14,278	16,272	345	373	424	488	557
21	<sup>20</sup> 1	33	16,697	18,497	21,151	24.470	28.304	547	606	693	802	927
22	÷ 1	10	0	0	. 0		. 0	0	0	. 0	0	0
23	- 2	50	7,279	7,975	9,115	10,421	11,992	363	398	455	520	598
24	2	19	14, 165	15,443	17,558	19.887	22.967	265	289	329	372	430
25	. 5	73	37,722	41,058	46,607	53,436	61,535	2.761	3.005	3.411	3.911	4.504
26	: 5	- 26	18,994	21,100	24,115	27,309	31.444	491	545	623	706	813
27	10	295	5,928	6,451	7,485	8.803	10.170	1.749	1.903	2,208	2.597	3.000
28	4	81	23, 192	25,108	28.470	32.315	37,165	1.880	2.035	2 303	2,620	3.013
29	4	29	6,717	7,407	8,427	9.782	11.281	192	211	240	. 279	322
30	1.	12	17.471	19,045	21.591	24.723	28.385	205	224	254	200	334
31	2	27	27,378	29.884	33,943	39, 149	45,100	730	797	905	1.044	1,202
32	5	40	0	0	0	0	0	0	0	0	ů.	11200
33	1	24	0	0	0	0	0	0	0	0	Ň	ő
34	1	260	0	. 0	0	. 0	0	0	Ō	· 0	. 0	Ő
35	- 1	346	. 0	0	ŋ	0	0	- 0	0	0	0	ò
36	1	108	0	0	0	· 0	. 0	: 0	0	Ó	0	. 0
37	2	25	3,268	3,505	3,953	4,527	5.171	80	86	97	111	127
-38	2	12	3,851	4.132	4.659	5.335	6.094	45	68	54	62	- 71
39	1	7	0	0	0	0	0	0	ů.	0	0	: 0
40	1	3	0	0	0		ů.	Õ	ň	Ň	ñ	0
41	÷ 1	15	0	0	ů.	ň	ů N	Ň	ň	. ັ ດ	ň	Г
42	1	233	. 0	0	D	ň	ů O	ň	ň	ň		۰ ۱
43	1	338	0	0	Ô	Ő	· · O	ŏ	Ó	Ó	0	0
	•••••			•••••		•••••						