



No. 35

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
MINISTRY OF INDUSTRY
THE ARAB REPUBLIC OF EGYPT

**Revised Feasibility Study
of
The Expansion Project
of
The El Dikhella Iron and Steel Works
in
The Arab Republic of Egypt
FINAL REPORT**

October 1988

**NKK Corporation
in association with
Kobe Steel, Ltd.**

Revised Feasibility Study of The Expansion Project of The El Dikhella Iron and Steel Works in The Arab Republic of Egypt
FINAL REPORT

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**Feasibility Study Update
of
The Expansion Project
of
The El Dikheila Iron and Steel Works
in
The Arab Republic of Egypt**

FINAL REPORT

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October 1993

**NKK Corporation
in association with
Kobe Steel, Ltd.**

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PREFACE

In response to a request from the Government of the Arab Republic of Egypt, the Government of Japan decided to conduct a revised feasibility study of the Expansion Project of the El-Dikheila Iron and Steel Works in the Arab Republic of Egypt and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Arab Republic of Egypt a study team headed by Mr. Kenzo Hikino, NKK Corporation, twice between March 1993 and August 1993.

The team held discussions with the officials concerned of the Government of the Arab Republic of Egypt, and conducted field surveys. After the team returned to Japan, further studies were made and the report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Arab Republic of Egypt for their close cooperation extended to the team.

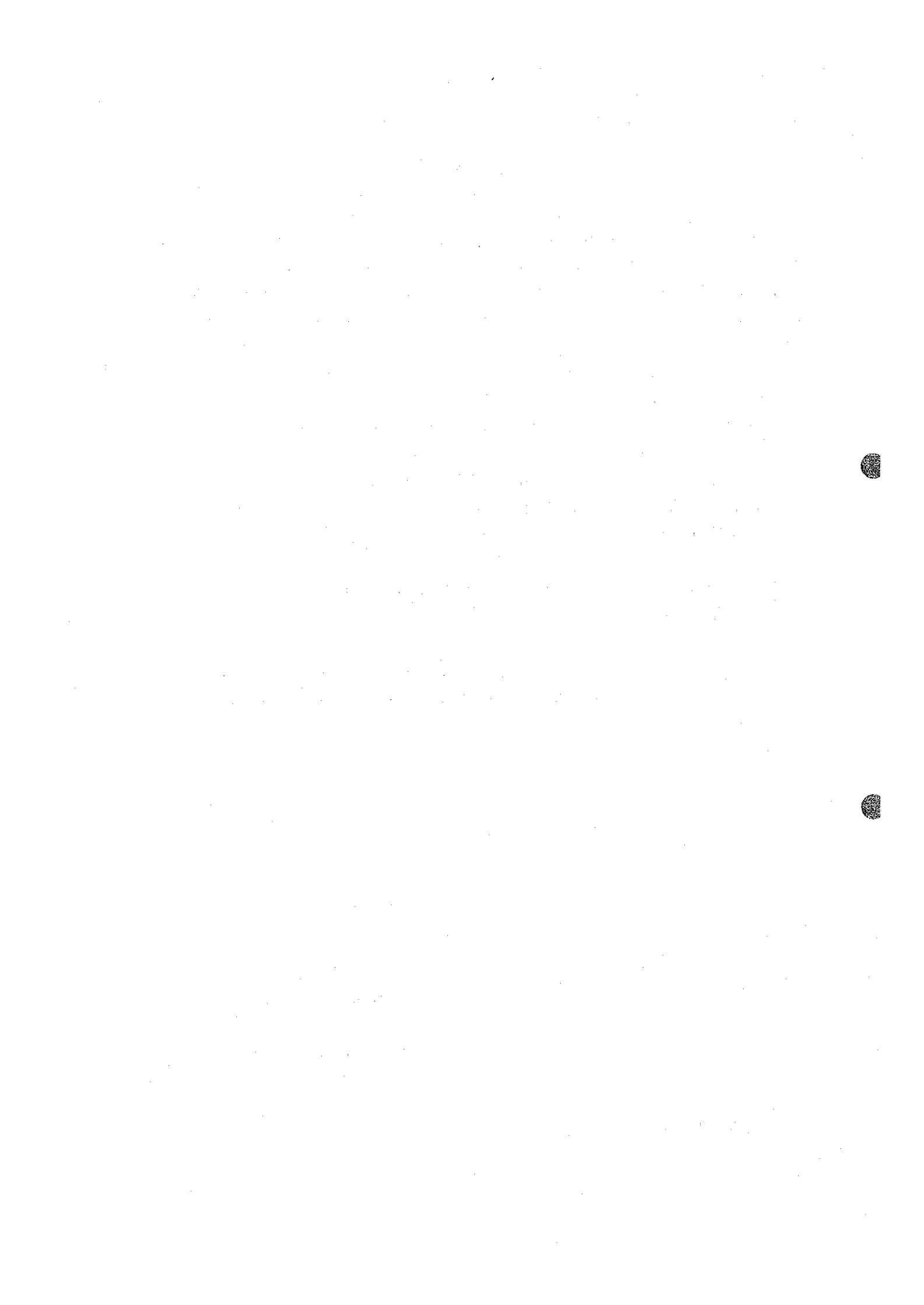
October, 1993



Kensuke Yanagiya

President

Japan International Cooperation Agency



October, 1993

Mr. Kensuke Yanagiya
President
Japan International Cooperation Agency
Tokyo, Japan

Dear Mr. Yanagiya

Letter of Transmittal

We are pleased to submit to you a revised feasibility study report on the Expansion Project of the El-Dikheila Iron and Steel Works in the Arab Republic of Egypt. The report contains the technical, economic and financial analysis, conclusion and recommendation. Also included are comments made by the Ministry of Industry of His Majesty's Government of the Arab Republic of Egypt during discussions on the draft final report which were held in Alexandria.

The calculated ROI for the facilities planned in the previous feasibility study made in 1988 under the present operational conditions in El-Dikheila became 7.48%. ROI of this revised feasibility study reached 13.15% through minimizing the investment in the upper stream of the expansion project.

In view of the rebar demand and supply balance in Egypt, we recommend to implement the expansion project of the El-Dikheila Iron and Steel Works which will contribute to the Egyptian economy.

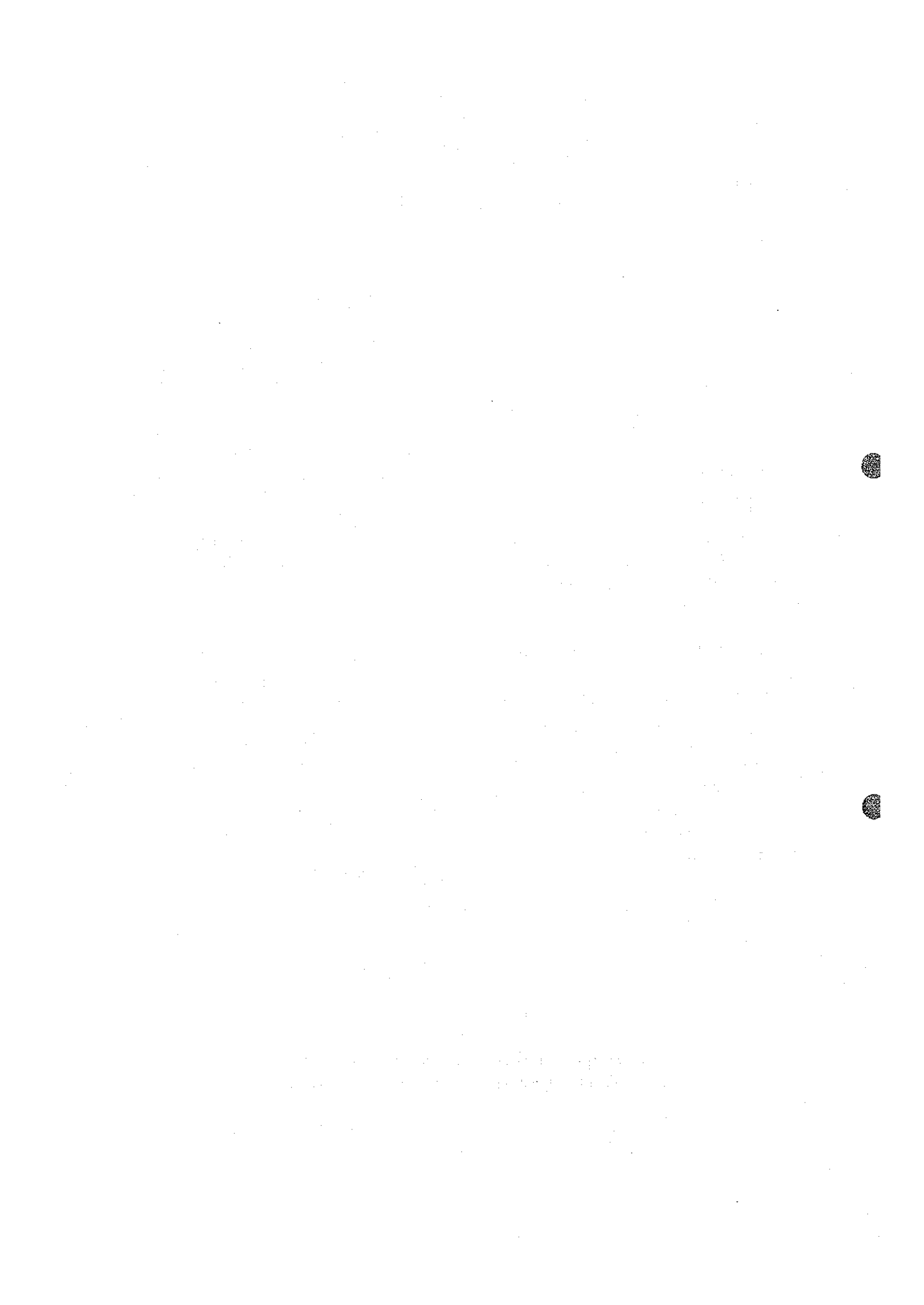
We wish to take this opportunity to express our sincere gratitude to your Agency, the Ministry of Foreign Affairs and the Ministry of International Trade and Industry. We also wish to express our deep gratitude to the Ministry of Industry and other authorities concerned of His Majesty's Government of the Arab Republic of Egypt for the close cooperation and assistance extended to us during our investigations and study.

Very truly yours,



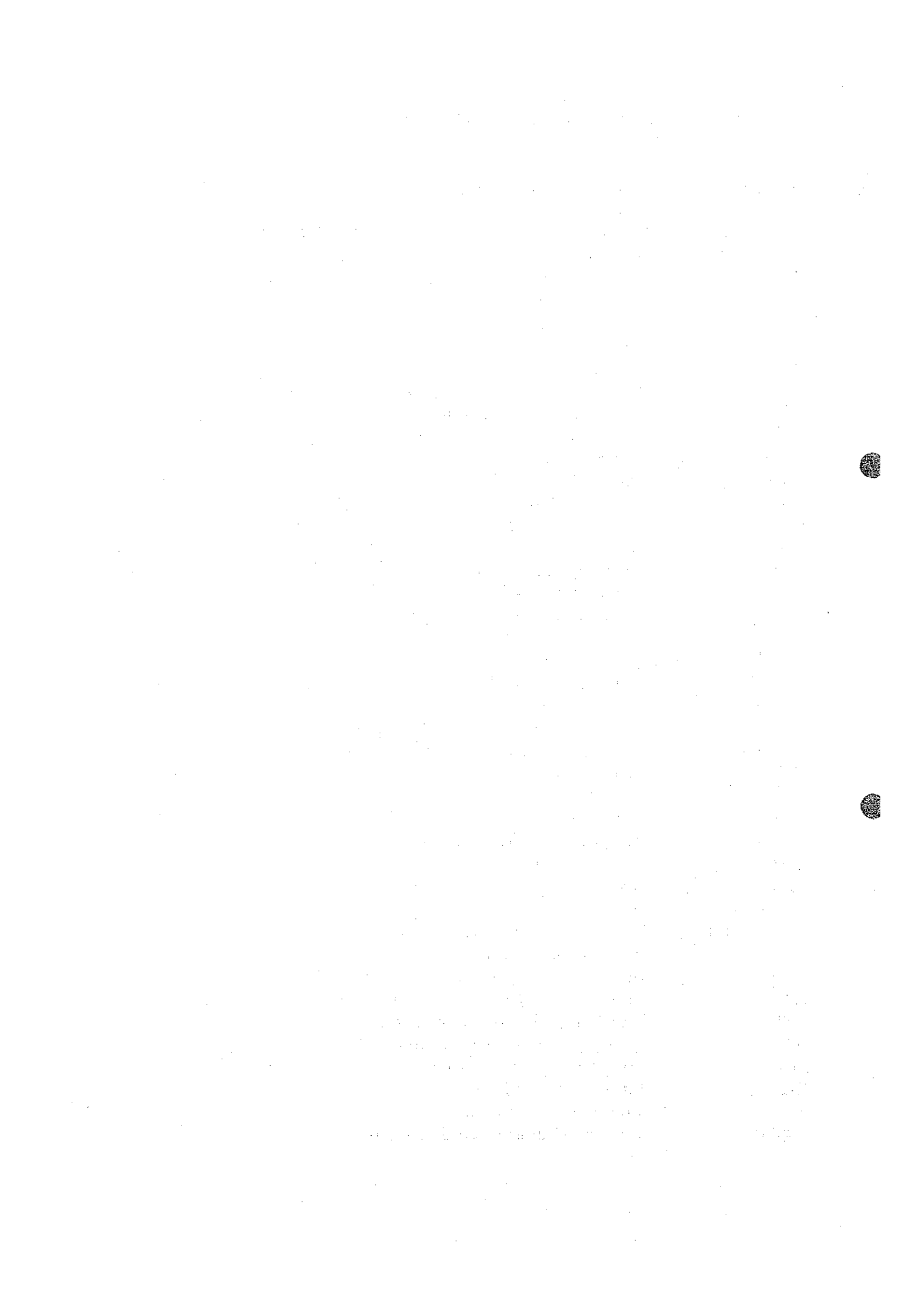
Kenzo Hikino
Team Leader

Revised Feasibility Study on the Expansion
Project of the El-dikheila Iron and Steel Works

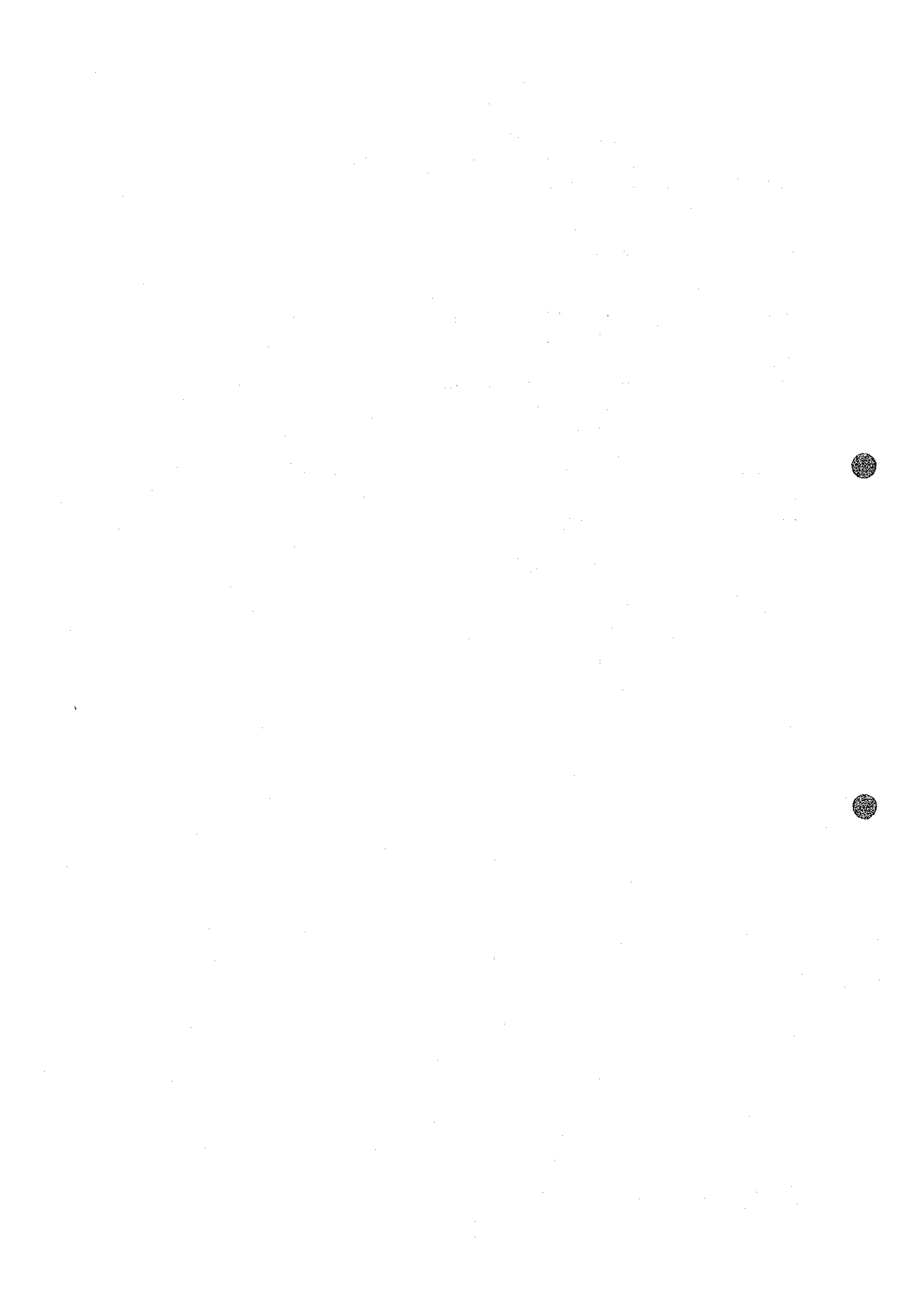


ABBREVIATIONS AND ACRONYMS USED

ANSDK	Alexandria National Iron and Steel Company SAE
A & I	Analysis and Inspection Facility
ADF	Administrative Facility, Administration building, Road and parking lot, Drainage system
AOTS	the Association for Overseas Technical Scholarship
BF	Blast Furnace
BMP	Bar Mill Plant
BSC	British Steel Corporation
BT	Billet
CAPMAS	Central Agency for Public Mobilization and Statistics
CCM	Continuous Casting Machine
CIF	Cost, Insurance and Freight
DCW	Direct Cooling Water
DMK	DEUTSCHE MARK, a German unit of money
DRI	Direct reduced Iron
DRP	Direct Reduction Plant
DSM	Delta Steel Mill
EAF	Electric Arc Furnace
ECW	Egyptian Copper Works Co.
EEA	Egyptian Electricity Authority
EEC	European Economic Community
EF	Electric Arc Furnace
EGITALEC	Egyptian Italian Engineering and Construction Joint-Stock Co.
EGPC	Egyptian General Petroleum Corporation
EXIM bank	the Export-Import Bank of Japan
F/S	Feasibility Study
f'ce	furnace
FOB	Free on Board
FY	Fiscal Year (July 1 to June 30)
GAFI	General Authorities for Investment
GDP	Gross Domestic Product
GOFI	General Organization for Industrialization
HADISOLB	The Egyptian Iron and Steel Co.
HBI	Hot Briquetted Iron
ICW	Indirect Cooling Water
IFC	International Financing Corporation
ISI	International Iron and Steel Institute
IMC	Executive Organization for Industrial Mining Complexes
IMF	International Monetary Fund
IRR	Internal Rate of Return
JC	Japanese Consortium
JETRO	the Japan External Trade Organization



JICA	Japan International Cooperation Agency
JISF	the Japan Iron and Steel Federation
LCP	Lime Calcining Plant
LD	LD Converter
LE	Egyptian Pounds
LF	Ladle Furnace
OJT	On the Job Training
p. a.	per annum
RPM	Rod Mill Plant, Rolling Mill Plant
ROD	Rod Mill Plant
ROE	IRR on Equity
ROI	IRR on the total Investment
S/W	Scope of Work
SMP	Steelmaking Plant
str.	Strand
t, T, ton	Metric Ton
t/d, T/D	Ton per day
t/h, T/H	Ton per hour
t/ht	Ton per heat
t/y, T/Y	Ton per Year
TR	Transportation Facilities
UNIDO	United Nations Industrial Development Organization
UT	Utilities



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CHAPTER 1. INTRODUCTION

1.1. Background of the Study

Egypt achieved high economic growth from the middle of 1970s to early 1980s and keeps 2-3% growth under the 5-year economic and social development plan. With the main object of decentralization of industries and population regionally, the plan promotes urban development while it aims at greening desert areas, and this caused increase of steel demand. However, the domestic capacity of steel supply is limited and the steel demand and supply gap shows a sign of steady increase and can be filled only by import of a large quantity of foreign steel.

In January 1979, the Government of the Arab Republic of Egypt, for the purpose of decreasing import of steel and saving foreign currencies, contemplated a plan to construct in El Dikheila area on the west of Alexandria an integrated steelworks based on direct reduction (DR) process and asked the Government of Japan to provide technical cooperation for its feasibility study. The Japan International Cooperation Agency (JICA), the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, carried out such feasibility study (F/S) concerning the construction of El Dikheila Iron and Steel Works in March 1979 and submitted a F/S report to the Government of Egypt in August the same year.

Based on the report, the Government of Egypt consulted with the World Bank Group and decided to implement the project as a joint venture business under the Law No. 43, 1974. A consortium (Nippon Kokan, Kobe Steel and Toyo Menka) was designated as technical partner and the

construction of El Dikheila Works with World Bank loan and Yen loan was decided. The construction was commenced in 1983 and the Works was completed as an integrated steelworks with startup of SMP (steelmaking plant) in May, BMP (bar mill plant) in July and DRP (direct reduction plant) in November 1986 and RMP (rod mill plant) in April 1987. Its product mix includes bar and rod with production capacity of 745,000 t/y in total.

The Government of Egypt planned to expand the Works to cover persisting shortage of steel products, especially rebars, and requested Japan's cooperation again in the F/S for the expansion project of El Dikheila Works.

In response to the request of the Government of Egypt, JICA conducted the F/S from 1987 to 1988 including field survey, planning of facilities' expansion, and economic analysis, and reported the expansion plan to the Government of Egypt and ANSDK.

In 1992, the Government of Egypt requested the Government of Japan to promote the expansion project in order to improve the imbalance between consumption and production of steel products, especially rebar.

In response to the request of the Government of Egypt, the Government of Japan decided to conduct the feasibility study update on the expansion project of El Dikheila Iron and Steel Works in Egypt.

The study has been undertaken by JICA. An agreement was made on November 19, 1992 between Egypt and JICA setting forth the scope of work with regard to the study.

In accordance with that agreement, the JICA's study mission visited Egypt from March 6 to March 23, 1993 to conduct field surveys for the study.

With the backdrop as above, this F/S is to conduct market research and update the technical, financial and economic analyses of the expansion project of the Works and the results of the study are compiled in this report.

1.2. Scope of the Study

The scope of this study is summarized in the following.

- 1) To study the background and related conditions of the project
 - a) General economic situation of Egypt
 - b) Present situation and policies on iron and steel industry in Egypt (including policies regarding steel prices and distribution)
 - c) Relevant law and regulations
 - d) Comparative advantage of ANSDK
 - e) Other relevant information
- 2) To conduct demand and supply analysis
 - a) Domestic demand of rebars and other products
 - b) Domestic supply of rebars and other products
- 3) To study the existing system of El Dikheila Iron and Steel Works
 - a) Existing works' facilities and the operating performance
 - b) Performance of the infrastructure such as port facilities, gas supply, electricity, water, and transportation facilities

- c) Status of the procurement of raw materials
 - d) Financial status and profitability of ANSDK
 - e) Existing engineering services, management and training arrangement in ANSDK
- 4) To study raw materials for the expansion project
- a) Availability of iron ore, pellets, steel scrap, and direct reduced iron
 - b) Availability of other materials such as limestone, refractories, and other additives
- 5) To study the expansion facilities and the availability of infrastructure
- a) Plant site and layout for the expansion
 - b) Various options of technologies for the expansion
 - c) Prospective products or product mix and production capacity
 - d) Availability of appropriate infrastructure facilities such as gas, power, water, port services and transportation
 - e) Conceptual design for the expansion facilities
- 6) To make an implementation plan for the project
- a) Implementation schedule of the project

- b) Procurement of construction materials necessary for the expansion of the works
 - c) Additionally required manpower and organizational function
 - d) Construction costs and production costs for the expansion of the works
- 7) To conduct the financial and economic analysis for the expansion project
- a) Total required funds
 - b) Fund plan
 - c) Financing
 - d) Production costs
 - e) Balance sheet
 - f) Profit and loss statement
 - g) Financial statements
 - h) Internal return rate
 - i) Sensitivity analysis

In making the implementation plan for the expansion and financial analysis, consideration has been given to the following.

- Study on the outlook of future steel demand & supply by

taking into consideration the third 5-year economic and social development plan beginning in 1993 F.Y.

- Detailed study on product mix and material flow at the stage of expansion
- Confirmation of land required for the expansion project and the most effective layout
- Consideration to the facilities and operating method for energy saving, and yield and quality improvement
- Consideration for maximum effect of capital investment
- Suggestions for drawing up a plan of the optimum construction method and ensuring safety when the expansion is carried out while the existing plants are kept in operation.
- Actual status of technical assistance to the operation and technology transfer

1.3. Process of Execution of the Study

1.3.1. Field survey

For the purpose of making the F/S for the expansion project of El Dikheila Works, the field survey was conducted mainly in Cairo and Alexandria for 18 days from March 6 to March 23, 1993 as shown in Table 1-1.

In order to investigate whether the expansion project is feasible technically, financially and economically, and to plan product mix, production and also the most suitable facilities, studies were made on general economic condition, steel policy including price and sales channel, steel demand and supply condition in Egypt, and the existing facilities and their operational condition of the Works. For the study, the mission visited not only El Dikheila Works but also relevant governmental offices such as Ministry of Industry, Ministry of Housing and Utilities, Ministry of Finance, Metallurgical Industries Corporation, General Authorities for Investment, General Organization for Industrialization, Electric Power Agency, and other steel mills, related industries, steel-consuming industries, financial institutions, etc.

As shown in Table 1-2, the team members consisted of 8 persons including the leader and experts in the fields of DR, steelmaking, rolling, utilities & infrastructure, policies for iron and steel industries, market research, economic and financial analyses, and in addition, experts joined the team for the analysis work in Japan.

A list of officials and other persons whom the members of the team had the pleasure of seeing and having discussion during the field survey is given in Table 1-3.

1.3.2. Analysis work in Japan

Based on the findings of the field survey, the mission engaged in analysis work in Japan, which included compilation of data on the economic condition and other relevant matters in Egypt forming the background of the project, study on the present condition and outlook of steel demand and supply in Egypt and the availability of raw materials forming the premises for the expansion projet, and also formation of the expansion plan and related facilities plan, construction schedule and operation plan. It included financial and economic analyses also. The result of such work is compiled in this report.

In addition, in preparing the report, the mission met two counterparts of Egypt, who visited Japan from March 28 to Arpil 9, 1993 and had consultation with them. At the same time, JICA provided them with opportunities to visit similar or related steel mills in Japan.

1.3.3. Explanation of the report

To give an explanation to the draft final report, JICA dispatched a mission to Egypt during the period of July 30 to August 11, 1993, and the mission discussed with Egypt. The mission visited ANSDK and Metallurgical Industries Corporation and gave detailed explanation to the report and it was agreed that the final report will be submitted by the end of October 1993. Schedule of the report explanation mission and a list of members are as shown in Table 1-4 and 1-5, also the matters agreed between the both parties in preparation of the final report were put down in the minutes of meeting. (See page 1-23/1-27.) The Minutes of Meeting is attached.

Table 1-1 Field Survey Schedule (1/2)

DATE	PLACE VISITED
03/07	JICA Cairo Office Japanese Embassy Ministry of Industry IFC
03/08	ANSDK
03/09	ANSDK
03/10	Egyptian Electricity Authority
03/11	Metallurgical Industries Corporation Ministry of Finance Taxation Authority EGITALEC
03/12	Day-off
03/13	Kajima Corporation Portland Tora Cement Co. Helwan Works of Egyptian Iron and Steel Co.,Ltd. El Nasr Steel Tubes and Fitting Co. Arab Contractors
03/14	CAPMAS Egyptian Copper Works Ministry of Housing and Utilities General Authorities for Investment OECF

Table 1-1 Field Survey Schedule (2/2)

DATE	PLACE VISITED
03/015	Suzuki National Bank of Egypt General Organization for Industrialization ANSDK
03/16	Ferrometalco ANSDK
03/17	JETRO EGPC Public Enterprise Office
03/18	Report writing
03/19	Report writing
03/20	Presentation of a Progress Report to ANSDK
03/21	Presentation of a Progress Report to Ministry of Industry
03/22	JICA Japanese Embassy
03/23	Left Cairo

Table 1-2 List of Members of the Mission

Field Survey

Mr.Kenzo HIKINO	Mission Leader
Mr. Hironobu SAKO	Raw materials and Direct Reduction
Mr.Ujimasa NAGAYAMA	Steelmaking
Mr.Hisayuki AOI	Rolling
Mr.Yoshikazu UCHIMOTO	Lime Calcining, Utility and Infrastructure
Mr.Yasushi KIMURA	Policies on Iron and Steel Industries
Mr.Shunji HOSOKAWA	Market Analysis
Mr.Mitsugu HIRATA	Financial Analysis
Mr.Junsuke NISHIHARA	Coordination

Study in Japan

Mr.Isamu KAWAKAMI	Sub-Leader, Technical Coordination
Mr.Akira ISHII	In-works Transportation, Maintenance and Others
Mr.Itsuo NOZAWA	Civil and Building Engineer
Mr.Ikou YOSHIDA	Civil and Building Engineer
Mr.Toshimich MAKI	Steelmaking
Mr.Yoshiyuki MIYAGAWA	Continuos Casting
Mr.Yasuyuki ABE	Rolling
Mr.Shigeyoshi KOMEJI	Electrical Equipment
Mr.Tetsuo SOTOMA	Utility
Mr.Kazuo FUJIMURA	Analysis and Inspection
Mr.Hiroo MATSUDA	Economic Analysis

Table 1-3 List of persons whom the mission met for the Feasibility Study

Date	Place of meeting	Name	Department (section)	Position
Mar. 7	JICA Cairo Office	Mr. K. Iwaguchi		Resident Representative
		Mr. N. Kobayashi		Asst. Resident Representative
	Embassy of Japan	Mr. Toshio Azuma	First Secretary	
		Mr. Naoki Kurumada	First Secretary	
	Ministry of Industry	Mr. Abed El Moneim Ismail		Chairman
	International Finance Corporation Cairo Office	Mr. J. H. Stewart		Special Representative Middle East
		Mr. Tarek Allouba		Investment Officer
Mar. 8	ANSDK	Eng. I. S. Mohammadain		C.M.D.
		Eng. Mohamad Abdel Aziz Khattab		J.M.D.
		Mr. E. Ogura		G.M.
		Mr. Saleh Mohamed Ibrahim	Production	D.G.M.
		Mr. Aly Atef Yehia	Technical	D.G.M.
		Mr. Ahmed Atef Awad	External Relation	D.M.

List of persons whom the mission met for the Feasibility Study

Date	Place of meeting	Name	Department (section)	Position
		Mr. Ahmed Mohamed Attia El-Saqa	P.T.C.D.	D.M.
Mar. 9	ANS DK	Eng. I. S. Mohamadain		C.M.D.
		Eng. Mohamad Abdel Aziz Khattab		J.M.D.
		Mr. E. Ogura		G.M.
		Mr. Hussein Hassan Saleh	Financial	D.G.M.
		Mr. Saleh Mohamed Ibrahim	Production	D.G.M.
		Mr. Aly Atef Yehia	Technical	D.G.W.
		Mr. Saad El-Din Abdel Raouf	A.D.	D.M.
		Mr. Mohamed Hazem Aly	F.D.	D.M.
		Mr. El-Soufy Elsayed Aly	P.T.D.	D.M.
		Mr. Mohamed Salama Taher	S.D.	S.M.
		Mr. Mohamed Fouad Iman	P.R.D.	D.M.
		Mr. Ahmed Mohamed Attia El-Saqa	P.T.C.D.	D.M.

List of persons whom the mission met for the Feasibility Study

Date	Place of meeting	Name	Department (section)	Position
		Mr. Mohamed Sidky Galal Barghash	C.D.	D.M.
		Mr. A. Yamagami	P.R.D.	C.D.M.
		Mr. Y. Suemura	M.U.D.	C.D.M.
	ANSDK - PRD	Mr. Yasser	PRD-RMP-ROD	Section Manager
		Mr. Micheal	PRD-RMP-BAR	Section Manager
		Mr. Nasrat Zaki	CD	
		Mr. Saito	JC Consultant	Section Coordinator
	ANSDK - Market	Mr. S. Ibrahim	PRD & PTCD	DGM
		Mr. A. El-Saqqa	PTCD	DM
		Mr. Hussein Saleh	SD	DGM & DM (SD)
		Mr. Moh Salama	SD	SM
		Mr. Aly Alsagier	SD	L. SM
		Mr. Mohamed Hagem Aly	FD	DM
		Mr. Moustafa Dorra	FD	SM

List of persons whom the mission met for the Feasibility Study

Date	Place of meeting	Name	Department (section)	Position
		Mr. Aly Ahmad E. Saghir	Sales Sec.	Manager
		Mr. Mohamed S. Taker	Sales Sec.	Manager
	ANSDK - MUD	Eng. Aly Atef	MUD	Dept. General Manager
		Mr. Elsoufi	PTD	Department Manager
		Eng. Salam Hamdy	UT	Section Manager
		Eng. El-Sayed Mahmoud A. Latif	MC	Section Manager
		Eng. Abdel Sabour Rashidy	MM	Section Manager
		Eng. Mahmoud Nasrat	EM	Section Manager
		Eng. Mohamed Aly	EM	Section Coordinator
	ANSDK - PRD	Mr. Farrag	PRD (SM)	SM
		Mr. Hassan	PRD (SM)	ASM (EAF)
		Mr. Ayuub	PRD (SM)	ASM (CCM)
		Mr. Ishizaka	PRD (SM)	CSM
		Mr. Desouki	PRD (SM)	ASM
		Mr. Khalil	PRD (SM)	Engineer

List of persons whom the mission met for the Feasibility Study

Date	Place of meeting	Name	Department (section)	Position
		Mr. Mohamed Darwish	PRD/DRP	SM
		Mr. Said Attia	PRD/DRP	ASM
		Mr. Gaber Hefny	PRD/DRP	Engineer
	ANSDK - FD	Mr. Mohamed Hazem Aly Hassan	FD	Department Manager
		Mr. Moustafa Ibrahim Dorra	FD-Budget & Cost Control Sec.	Section Manager
		Mr.	PRD/DRP	Engineer
Mar. 10	Egyptian Electricity Authority	Dr. Ibrahim Yassin Mahmoud	Studies, Research & Development Sector	General Director
		Dr. Fawzia	System Planning	Manager Director
Mar. 11	Metallurgical Industries Corporation	Mr. Adel A. Danaf		Chairman
		Mr. Mitri Baghdadi	Economic Sector	
		Mr. Abd El Latiffe Ali. Sahim	Technical Sector	
		Mr. Mahmoud Eissa	Technical Sector	
	Ministry of Finance Taxation Authority	Mr. Fathy Abdel Baky	M.O. Finance	President

List of persons whom the mission met for the Feasibility Study

Date	Place of meeting	Name	Department (section)	Position
	EGITALEC	Mr. Ahmed El Nozahi		General Manager
		Mr. Mohamed S. Hanafy	Studies & Consulting Service	Engineer
Mar. 13	Kajima Corporation	Mr. Nobuyoshi Furuichi	Egypt District Office	General Manager
	Helwan Works of Egyptian Iron & Steel Co.	Mr. Mohamed Hosny	Technical Affairs	Deputy of Director Sector
		Mr. Fekry Abu-Aref	PC & Planning	Consultant
		Mr. Shams Salevi	Computer Section	General Manager
		Mr. Ahamed Abu Elffavi	Public Relation	Information Manager
	El Nasr Steel Tubes and Fitting Co.	Mr. Abd El-Chany Ismaiel	Director	Technical Director
	Portland Tora Cement Co.	Mr. Hassan Ragab	Vice Chairman	Engineer
		Mr. Mahmoud Abbas	Production Manager	Chemist
		Mr. Mohamed Esimail	Production	Chemist
		Mr. C. Mohamed Magdy	Chemical Lab.	Chief
	Arab Contractors	Mr. Abd Elrehim M. Elhoushy	B. Sc. Civil Engineer	Vice Chairman
		Mr. Lothar M. Guirguis	B. Sc.-M. Sc. Consultant Civil Engineer	General Manager

List of persons whom the mission met for the Feasibility Study

Date	Place of meeting	Name	Department (section)	Position
		Mr. Hany Hammed	Quality Control Director	AC
		Mr. Nagg Riad	Quality Control Engineer	
Mar. 14	GAFI	Dr. Mohieddin A. Elghareeb		Executive President
	CAPMAS	Mr. Taha Abd Elghani	Industrial Dep.	General Director
		Mr. Mahmoud A. Abowleid	Industrial Dep.	Director of Industrial Dep.
		Mr. Mostafa Salem Goafar	Head of the Statistical Sec.	First Under Secretary
		Mr. Ehale Abdel Moucim ElTagy	Head of the Statistical Administration	Under Secretary
		Mr. Abd Elmoghny Eaad		Under Secretary
	Egyptian Cooper Works	Mr. A. Margani		Chairman
		Mr. Fawzi Seif		Technical Director
	Ministry of Housing & Public Utilities	Mr. Wasfi Moubasher		First Under Secretary
		Mr. Samir Naggar		Under Secretary
	OECE	Mr. Shigenori Ogawa	Representative	
	ANSDK - SMP	Mr. Mohamed M. A. Bary	PTD	R.M. Section Manager
		Mr. Mohamed Hussien Ghannam	PTD	R.M. Section Chief

List of persons whom the mission met for the Feasibility Study

Date	Place of meeting	Name	Department (section)	Position
Mar. 15	Suzuki Egypt S.A.E.	Mr. Harada	Plant Manager & Technical Director	
		Mr. Kashiwagi	Manager Planning & Follow up	
	National Bank of Egypt	Mr. M. Madbouly	Senior Executive General Manager	Member of the Board
		Mr. Ahmed Abu-Bakr	Credit Dept.	General Manager
	General Organization for Industrialization	Eng. Ahmed. S. Mostafa	Technical Affairs	Chief of the Admin.
		Eng. Sayed Abdel Kader El-Sayed	Training Dep.	Executive Chairman
	ANSDK - SMP	Mr. Farrag	PRD (SM)	SM
		Mr. Hassan	PRD (SM)	ASM (EAF)
		Mr. Ayuub	PRD (SM)	ASM (CCM)
		Mr. Ishizaka	PRD (SM)	CSM
		Mr. Desouki	PRD (SM)	ASM
Mar. 16	Ferrometalco	Mr. Michael Elkmeier		General Manager
		Mr. Khaled M. El-Naquib	Head of Project Dep.	Chief Eng.
		Mr. Hesham Anber	Head of Project Dep.	Senior Eng.
	Public Enterprise Office	Dr. Mahmoud Salem		Legal & Economical Advisor

List of persons whom the mission met for the Feasibility Study

Date	Place of meeting	Name	Department (section)	Position
		Mr. Alaa Amer		Privatization Specialist
	ANSDK	Mr. Saad El-Din Abdel Raouf	AD	Department Manager
		Mr. Fawzy Farag Guirguis	AD	Section Manager
		Mr. Ahmed Mohamed Attia El-Saqqa	PTCD	Department Manager
		Mr. Moustafa Ahmed Badr	PTCD	Section Manager
	ANSDK - PRD	Mr. Yasser	PRD-RMP-ROD	Section Manager
		Mr. Saito	JC Consultant	
	ANSDK - SMP	Mr. Farrag	PRD (SM)	SM
		Mr. Hassan	PRD (SM)	ASM (EAF)
		Mr. Ayuub	PRD (SM)	ASM (CCM)
		Mr. Ishizaka	PRD (SM)	CSM
		Mr. Desouki	PRD (SM)	ASM
	ANSDK - FD	Mr. Moustafa Ibrahim Dorra	FD Budget & Cost Control Sec.	Section Manager
Mar. 17	JETRO	Mr. Yoshikazu Matsui		Managing Director

List of persons whom the mission met for the Feasibility Study

Date	Place of meeting	Name	Department (section)	Position
	Egyptian General Petroleum Corporation	Dr. Mostafa A. Shaarawy		Chairman
		Mr. Abd Allah El-Bastawisi Add Allah		Gas Distribution G.M.
		Mr. Hany Soliman Aly	Gas Production Follow up	General Manager
	ANSDK - FD	Mr. Moustasfa Ibrahim Dorra	FD Budget & Cost Control Sec.	Section Manager
	ANSDK - PRD	Mr. Micheal	PRD-RMP-BAR	Section M.
		Mr. Saito	JC Consultant	
	ANSDK - SMP	Mr. Farrag	PRD (SM)	SM
		Mr. Hassan	PRD (SM)	ASM (EAF)
		Mr. Ayuub	PRD (SM)	ASM (CCM)
		Mr. Ishizaka	PRD (SM)	CSM

Table 1-4 Schedule of the Report Explanation Mission

Jul. 30 (Fri)	Tokyo-Frankfurt
31 (Sat)	Frankfurt-Cairo
Aug. 1 (Sun)	IMC : Hikino, Hosokawa, Hirata, Nagayama Aoi, Uchimoto Embassy of Japan : Hikino, Hirata, Uchimoto
2 (Mon)	JICA : Hikino, Hosokawa, Hirata, Nagayama, Aoi, Uchimoto
3 (Tue)	ANSDK
4 (Wed)	ANSDK
5 (Thr)	ANSDK
6 (Fri)	Day-off
7 (Sat)	Day-off
8 (Sun)	IMC : Hikino, Hosokawa, Hirata, Nagayama, Aoi, Uchimoto JICA : Hikino, Hosokawa, Hirata, Nagayama, Aoi, Uchimoto OECF : Hikino, Hirata, Uchimoto
9 (Mon)	Cairo-London
10 (Tue)	London-
11 (Wed)	Narita

Table 1-5 List of Members of the Report Explanation Mission

Mr. Kenzo HIKINO	Mission Leader
Mr. Syunji HOSOKAWA	Market analysis
Mr. Mitugu HIRATA	Financial analysis
Mr. Ujimasa NAGAYAMA	Steelmaking
Mr. Hisayuki AOI	Rolling
Mr. Yoshikazu UCHIMOTO	Utilities and infrastructure

MINUTES OF MEETING

August 5, 1993

DRAFT FINAL REPORT
FOR
FEASIBILITY STUDY UPDATE
OF
THE EXPANSION PROJECT
OF
THE EL-DIKHEILA IRON AND STEEL WORKS
IN
THE ARAB REPUBLIC OF EGYPT

Alexandria National Iron & Steel Co., S. A. E. (ANSDK) and mission of the Japan International Cooperation Agency (JICA) had a series of discussion and exchange of review on the Draft Final Report for the Feasibility Study prepared by the Study Team during August 3 through August 5, 1993.

The contents of the Draft Final Report submitted by the Study Team, were briefly presented in General Meeting on August 3, 1993, followed by respective sessions for specific area.

Each session continued on August 4, 1993.

The following are the major items discussed and/or agreed upon:

I. Market Research

ANSDK understood the Study Team's explanation on the subject of the demand, supply and price of the steel products in the past and in the future.

II. Expansion Plan

1. General

The final stage of the expansion was discussed according to the Appendix-2. ANSDK requested to deal with an alternative plan for further production, which can be incorporated in the Appendix.

Sagga *file*

2. SMP

- (1) Scrap charge into EAF will be done with 2 buckets per heat (under conditions of DRI 45%)
- (2) 2 LFs will be installed in ladle aisle. Namely, No. 1 LF will be located near south end and No. 2 LF will be located near north end of the aisle.
- (3) Capacity of F.E.S. of EAF will be increased considering adoption of oxygen-lancing technology.

3. RMP

- (1) New coil yard

The draft report submitted by the Study Team shows that the expansion yard will be 8 spans area from column 36-44.

ANSDK explained the necessity of expanding coil yard to be 16 spans area from column 36 - 52, using some calculation which was submitted to the Study Team.

Also ANSDK explained that two coil handling cranes will be needed in the new coil yard area.

The Study Team explained that the further study will be necessary in the engineering stage.

- (2) Roll grinding machine

ANSDK asked for adding new grinding machine for W/C rolls.

The Study Team also explained that the further study will be necessary in the engineering stage.

- (3) Roll changing rig

ANSDK asked to have two changing rigs, one for 10", the other for 6" and 8" same as start up in 1987.

4. Utility

- (1) ANSDK requested that the capacity of oxygen and nitrogen gas should be designed to secure uninterrupted operation of DRP and SMP.
- (2) ANSDK requested that cooling water supply pumps should incorporate 10% marginal capacity.
- (3) The location of the new oxygen plant, water treatment station VI was discussed taking into consideration environmental conditions.
- (4) ANSDK request to add spare chemical dosing pump and grab bucket to discharge sludge in the basin.

Minor modifications of specifications stated as above should be adjusted in the engineering stage.

Sanga *SLH*

5. Power station

ANSDK requested correction of report on page 6 - 111. e) "Data logging system", from "1. To relieve operators of trouble of gathering" to "1. To relieve operators of trouble for gathering".

6. Transportation

Handling of scrap was discussed between ANSDK and the Study Team.

Transportation of scrap from ports to site is executed by sub-contractors, and inside transportation is operated by ANSDK.

Countermeasures for increasing scrap discharge at ports and handling in the site will be studied by ANSDK.

III. Financial analysis

1. ANSDK informed that the actual dividends ratio was 10% of paid-up capital in 1992 instead of 9%.

(Reference)	1990	8%	(distributed in 1991)
	1991	9%	(distributed in 1992)
	1992	10%	(distributed in 1993)

2. ANSDK commented that paid-up capital amount for expansion facilities should be settled upon keeping balance of financial structure. D/E ratio 70:30 after expansion, because of financial covenants in existing international loan agreement.

Saqqo *tsu*

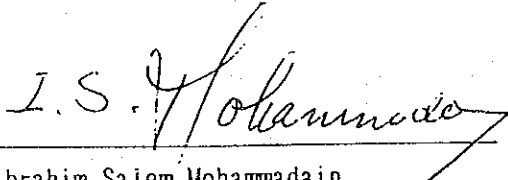
MEMBERS OF ANSDK:


Eng. Ibrahim Salem Mohammadain	Chairman and Managing Director
Eng. Mohamed Abdel Aziz Khattab	Joint Managing Director
Mr. Hiroshi Funanokawa	Consultant General Manager
Mr. Hussein Hassan Saleh	Deputy General Manager & SD Manager
Eng. Saleh Mohamed Ibrahim	Deputy General Manager
Eng. Aly Atef Yehia	Deputy General Manager & MUD Manager

Department Managers of PTCO, FD. *(SD), PTD, PRD. *(MUD) and CD
(Note: * concurrent with Deputy General Manager)

MEMBERS OF THE STUDY TEAM:

Mr. Kenzo Hikino	Leader of the Study Team
Mr. Ujimasa Nagayama	
Mr. Hisayuki Aoi	
Mr. Yoshikazu Uchimoto	
Mr. Shunji Hosokawa	
Mr. Mitsugu Hirata	


Ibrahim Salem Mohammadain
Chairman and Managing Director
Alexandria National Iron & Steel
Co., S. A. E.


Kenzo Hikino
Leader
The Study Team

CHAPTER 2. EGYPTIAN ECONOMY AND ITS IRON AND STEEL POLICY

2.1. Outline of Egyptian Economy

2.1.1. Main economic indicators

Egypt's main economic indicators for 1990/91 are as follows:

- Land area (1,000 km ²)		1002
- Population (10,000 persons)		5424
- Unemployment (%)		8.4
- Nominal GDP (LE1 billion)		98.7
- Real GDP (LE1 billion)		50.8
	(Price level at 1986/1987)	
- By sector (%)	Commodity producing sectors	47.7
	Production services sectors	34.0
	Social services sectors	18.3
- Rate of growth of GDP (%)		2.3 (IMF)
- National budget (LE1 billion)	Revenues	32.1
	Expenditures	42.1
- Rate of increase of consumer prices (%)		14.7
- Trade balance (US\$1 million)		-7538
	Exports	3887
	Imports	11425
- Invisible trade balance (US\$1 million)		3667
	Receipts	7679
	(Suez, tourism, etc.)	
	Payments	4012
	(Debt, interest, etc.)	
- Remittances from workers overseas (US\$1 million)		3775
- Foreign exchange reserves (US\$1 million)		6900
- External liabilities (US\$1 million)		29800
- Foreign exchange rate		

Free market rate has been uniformly used since November 1991 and the rate has since been stable.

2.1.2. Some specific features of the recent Egyptian economy

The Egyptian economy grew at a high level in the latter half of the 1970s and this continued until the middle of the 1980s. However, the growth rate of real GDP has since then sunk into a low level of 2 to 3%,

Ever since the open-door policy was adopted in 1973, the Egyptian economy has been managed with the aim of achieving balanced development between growth, employment and prices. However, due to the characteristic price structure by subsidies and the inefficient public sectors kept unchanged and coupled with an increase in population, the economy was plagued, in the latter half of 1980s, with such difficulties as stagnant production, unemployment, inflation and an increase in accumulated external liabilities. Under these circumstances, economic restructuring became a pressing need and was launched in the second 5-year Economic and Social Development Plan started in 1987, of which main aim was a shift to a market economy. Meanwhile, against the background of an international trend to support Egypt caused by the outbreak of the Gulf Crisis, a fuller-scale economic restructuring was put into practice in 1991. To be concrete, a cut of subsidies to reduce budgetary deficit, a tax increase including introduction of sales tax, and in finance, liberalization of interest rates and foreign exchanges were put into practice. Furthermore, lifting of price control, trade liberalization, and privatization of public sectors were also put into practice in earnest.

These economic reforms have actually made considerable progress. It is reported that the total balance of external liabilities which amounted to nearly 50 billion dollars in 1989 has now decreased to 30 billion dollars thanks to an

agreement reached in May 1991 with the IMF and World Bank with respect to far-reaching economic restructuring programs qualified for international support. Though the Egyptian economy has now begun to run with a favorable wind at its back, it still has various difficulties involved.

2.1.3. Production trends by sector and results of the second 5-year plan

Partly due to the outbreak of the Gulf Crisis, the Egyptian economy went through a very difficult period during the five years (87/88 - 91/92) covered by the second Economic and Social Development Plan. As noted above, the IMF statistics indicated that the economic growth rate during the period was 2 to 3% annually, while the statistics by the Central Bank of Egypt indicated that the same was at a little bit higher level of 4 to 5%. Anyhow, both the figures are below 5.8% p.a. aimed at in the second 5-year plan.

Table 2.1.3-1 Trends of Gross Domestic Product (GDP)

(in million LE)

	87/88	88/89	89/90	90/91	91/92
IMF(at 1984/85 prices) Growth rate(%)	44,910 (3.9)	46,245, (3.0)	47,427 (2.6)	48,498 (2.3)	
Central Bank of Egypt, etc. (at 1985/88 prices) Growth rate (%)	43.249 (5.9)	45,648 (5.5)	48,228 (5.5)	50,177 (4.0)	52,932 (5.5)

Main industries in Egypt are agriculture (accounting for 19% of GDP), industry and mining (the same 18%) and commerce, finance and insurance (the same 23%). Oil had a higher weight in the past but it has narrowed to below 4% recently.

As for production trends by sector, the rate of growth in the commodity producing sectors was 4.9% for 89/90, 4.4% for 90/91, and 4.8% for 91/92, about 1% less than 5.8% aimed at in the 5-year plan. Of the commodity sectors, the agriculture, for which the target figure in the 5-year plan was set at 4.1% which is lower than other sectors, moved at the level a little over 3% during these three years. The industry and mining sector was expected to grow at a high rate of 8.4%, but actually remained at 7.4% for 89/90, 5.7% for 90/91, and 6.2% for 91/92. The construction sector moved at 5.5% to 5.7%, a little less than the target of 5.9%. The only commodity sector which exceeded the target figure was oil, for which the target figure was set at a low level of 2.3%.

In the production services sectors, the Suez Canal dues and the tourism revenues, a main source of foreign currency reserve of Egypt, sharply declined in 90/91 due to the Gulf Crisis, but are estimated to recover in 91/92 to exceed the 5.6% target.

The social services sectors are fast-growing sectors of the Egyptian economy. In particular, the housing and public utilities sector has been growing at a high rate of increase exceeding 10%. Housing, in particular, is increasing at a rate exceeding 7% p.a. even when it is taken together with the construction in the above-mentioned commodity producing of growth compared with the other sectors.

By summarizing the economic trends in the past five years, we may presume that the following results have been obtained (The following prices are as at current basis).

- 1) The GNP (local production) increased from LE81.9 billion in 87/88 to LE208.3 billion in 91/92, showing an annual increase of 20.5%.
- 2) The GDP (local produce) increased by LE76.7 billion to LE125.5 billion, showing an annual increase of 20.8%. Of the amount increased, the private sectors accounted for 85%.
- 3) The total amount of investment was LE114.9 billion, of which LE65.7 billion by the private sector. Of the total amount invested, the commodity producing sectors accounted for 54%, the production services sectors for 22%, and the social services sectors for 24%.
- 4) The total amount of consumption during the 5-year plan ended at the end of 91/92 increased at the rate of 24.1% p.a.
- 5) New employment for the total of 1.9 million persons was created in the past five years, of which the commodity sectors accounted for 54%. A person's wages increased by 15.9% p.a. in the same period.
- 6) During these five years, imports by the agriculture, and industry and mining sectors increased 3.7 times, while exports increased 4 times.

Table 2.1.3-2 Trends of Gross Domestic Product(GDP)By Sector (at 1986/87 prices, in million LE)

Product	1989/90			1990/91			1991/92			Annual Growth Rate in 5 Year Plan (%)
	Value	Structure (%)	Growth Rate (%)	Value	Structure	Growth Rate (%)	Value	Structure	Growth Rate (%)	
	9,525	19.7	3.3	9,820	19.6	3.1	10,150	19.2	3.4		4.1
Industry & Mining	8,567	17.8	7.4	9,054	18.0	5.7	9,613	18.2	6.2	8.4
Oil & Oil products	1,795	3.7	2.7	1,869	3.7	4.1	1,949	3.7	4.3	2.3
Electricity	631	1.3	3.1	664	1.3	5.2	703	1.3	5.9	7.1
Construction	2,384	4.9	5.5	2,514	5.0	5.5	2,658	5.0	5.7	5.9
Total Commodity sectors	22,902	47.5	4.9	23,921	47.7	4.4	25,073	47.4	4.8	5.8
Suez Canal, Transport, Communication & Storage	4,797	9.9	9.8	4,992	9.9	4.1	5,351	10.1	7.2	5.1
Commerce, Finance & Insurance	11,116	23.0	4.7	11,549	23.0	3.9	12,080	22.8	4.6	5.5
Tourism	694	1.4	7.8	513	1.0	Δ26.0	715	1.4	39.4	10.9
Production Service Sectors	16,607	34.4	6.3	17,054	34.0	2.7	18,146	34.3	6.4	5.6
Housing & Public Utilities	1,136	2.4	12.8	1,258	2.5	10.7	1,393	2.6	10.7	11.4
Social & Personal Services	2,125	4.4	5.3	2,225	4.4	4.7	2,330	4.4	4.7	5.2
Government Services Insurance	5,458	11.3	5.6	5,719	11.4	4.8	5,991	11.3	4.8	5.5
Social Services Sectors	8,719	18.1	6.4	9,202	18.3	5.5	9,714	18.4	5.6	6.2
GDP	48,228	100.0	5.7	50,177	100.0	4.0	52,933	100.0	5.5	5.8

Source: Central Bank of Egypt
National Bank of Egypt

2.1.4 National budget and finance

The amount of Egyptian national budget increased sharply for two years in a row for 90/91 and 91/92. The total amount for 91/92 was LE54.4 billion, a large-scale budget showing an increase of about 30% over the previous year, because of an increase in the payment of interest on internal and external liabilities, an increase in pensions and wages for public employees as an anti-inflation measure, and others.

In Egypt, budgetary deficits caused by such factors as wide-ranging subsidies (especially for food and energy) and support to overstuffed public sectors had been a serious problem. Therefore, measures to reduce subsidies or to increase tax revenues were taken in the latter half of the 1980s. As the results, the deficits have been on the decrease and the ratio of deficit to GDP which had long been above 15% came down to about 7% in 91/92.

Table 2.1.4-1 Trends of Budgetary Deficits

(in billion LE)

Fiscal Year	88/90	89/90	90/91	91/92
Revenues ①	21.3	23.5	32.1	45.0
Expenditures ②	33.4	34.2	42.1	54.4
Balance ③=①-②	-12.1	-10.7	-10.0	-9.4
③/GDP (%)	16.9	12.2	9.1	6.8

Source: Central Bank of Egypt, IMF

Looking at the revenues and expenditures for 90/91, it is noted that the revenues of a public nature such as the profits from Suez Canal and petroleum accounted for 20%.

The next biggest items are taxes such as corporation and income taxes which accounted for 18%, followed by commodity tax and customs duties. When compared with the figures for the previous year, an increase in revenues from public sectors such as Suez Canal dues, which were stagnant due to the Gulf Crisis, and an increase in tax revenues are conspicuous. The raising of customs duties, etc. effected in May 1991 and the sales tax (which absorbed the consumption tax applied to some commodities) introduced at the same time brought about a sharp increase in tax revenues for 91/92 budget.

On the expenditures side, current expenditures increased 34% over the previous year with especially large increases in such items as subsidies, defense outlays, interest payment on internal and external liabilities, and pensions.

In the shift to a market mechanism for which Egypt is now striving, reduction or abolition of subsidies for daily necessities - the biggest problem to be solved - will inevitably raise prices. Therefore, the Egyptian economy will have to pursue a very difficult course to hold down an increase in prices as much as possible while abolishing subsidies.

Table 2.1.4-2 Trends of The State Budget(Actual)

(in million LE)

	Expenditures				Expenditures		
	88/89	89/90	90/91		88/89	89/90	90/91
Total Expenditures	33,400	34,230	42,168	Total Revenues	33,400	34,230	42,168
Current Utilizations	17,432	18,878	25,357	Current Revenues	15,625	17,417	24,551
Wages	5,225	6,064	7,089	Sovereign Revenues	10,195	12,112	15,947
Current Expenditures and Transfers	12,207	12,814	18,268	Taxes	4,058	5,305	7,795
Subsidy	2,573	1,937	3,288	Customs	2,848	2,917	3,266
Defence Outlays	2,984	3,057	3,928	Consumption Taxes	2,407	2,874	3,373
Interest on Public Debt	3,011	3,657	5,660	Miscellaneous	882	1,016	1,513
Pensions	1,366	1,565	2,138	Current Revenues and Transfers	5,430	5,305	8,604
Miscellaneous	2,273	2,598	3,254	Petroleum and Suez Canal	1,453	1,229	2,92
Investment Utilizations	11,480	9,803	10,178	Miscellaneous	3,977	4,076	5,681
Capital Transfers	4,488	5,549	6,633	Capital Revenues	5,642	6,071	7,579
Public Debt Obligations	1,861	2,181	3,182	Revenues for Investments	4,549	4,871	5,220
Financing the Deficit	1,820	2,421	2,403	Revenues for capital Transfers	1,093	1,200	2,359
Miscellaneous	507	947	1,048	Overall Deficit	12,133	10,742	10,038
				External Financing	3,372	3,090	2,856
				Domestic Saving Vessels	3,609	1,944	2,933
				Banking System	4,758	5,538	3,883
				Miscellaneous	394	170	366

Source: Central Bank of Egypt (1990/91)

2.1.5 International balance of payments

1) Foreign trade (90/91)

Egypt's exports consist of petroleum and petroleum products which account for 51% of the total, followed by textiles such as cotton yarn accounting for 14% and industrial products other than textiles accounting for 15%. The ratio of agricultural commodities which stood at 15% in 88/89 came down to 8%. The imports consist of machines and transport equipment which account for 20%, followed by foodstuffs accounting for 14%, and chemical and rubber products and wood and textile materials each accounting for 10%.

By trading partners, the largest 32% of exports went to EEC countries, 22% to Afro-Asian countries excluding Arab countries, 17% to COMECON countries, and 14% to the U.S. Imports are made from EEC countries for 32% of the total, the same figure for export, from the U.S. for 17%, from other European countries and Afro-Asian countries each for 12%.

It should be noted in this connection that, as part of measures for introduction of a market economy, the Egyptian Government has started trade liberalization and reformation of foreign exchange control. To be concrete, the government has started reduction of import prohibited articles, curtailment of a tariff, and establishment of a single exchange rate system based on market forces.

2) International balance of payments

A specific feature of Egypt's international payments position is that a constant and large deficit in trade account is covered by a surplus in invisible trade. Main sources of earnings in foreign currencies are the following four items: remittances from workers overseas (3.8 billion dollars in 90/91), income from oil (2.0 billion dollars), Suez Canal dues (1.7 billion dollars), and income from tourism (900 million dollars). In 90/91, the balance of current account turned into the black for the first time in several decades. This trend seems to have strengthened in 91/92 when a further increase in various receipts including those from tourism is expected. Foreign currency reserves have now exceeded 10 billion dollars from 6,9 billion dollars in 90/91. It should also be noted that, thanks to an agreement in the Paris Club, the accumulated external liabilities which stood at 50 billion dollars in 88/89 decreased to 35.5 billion dollars in 90/91, and further decreased to 30 billion dollars as of today.

Table 2.1.5-1 The Groups of Exports

(In Millions of US Dollars)

	1988/89	1989/90	1990/91
	Amount	Amount	Amount
<u>Agricultural commodities</u>			
Cotton	298.6	220.0	83.2
Rice	5.5	6.9	4.5
Potatoes	14.7	15.3	27.7
Citrus fruits	41.2	90.0	37.9
Other commodities	53.1	75.0	72.7
Total Agricultural Commodities	413.1	407.2	226.0
<u>Industrial Commodities</u>			
Petroleum products	1,066.3	1,228.6	1,970.7
Spinning and weaving industry	446.1	635.1	528.9
Cotton yarn	316.2	446.2	318.0
Cotton textiles	52.9	58.8	74.6
Other spinning and weaving manufactures	77.0	130.1	136.3
Other industries	531.5	666.7	634.2
Foodstuffs	52.2	59.6	85.8
Chemicals	144.8	248.0	180.6
Engineering and metallurgical industries	280.7	278.3	277.9
Other industrial products	53.8	80.8	89.9
Total Industrial Commodities	2,043.9	2,530.4	3,133.8
Unclassified Commodities	240.0	207.2	527.0
Grand Total	2,697.0	3,144.8	3,886.8

Source: Central Bank of Egypt

Table 2.1.5-2 The Groups of Imports

(In Millions of US Dollars)

	1988/89	1989/90	1990/91
	Amount	Amount	Amount
Livestock and products of the animal and vegetable kingdoms, foodstuffs and beverages industry	2,403.6	23,327.5	1,622.8
Fats, greases, and oils and products, metallic products and fuel	679.9	781.4	1,062.4
Chemical, rubber and leather products	1,004.5	1,158.8	1,161.5
Wood, cork, paper and textile materials and their manufactures	937.1	1,147.8	1,155.2
Machines and transport equipment	2,049.6	2,433.0	2,329.8
Base metals and their manufactures	902.7	951.4	812.4
Miscellaneous manufactures	331.8	420.0	378.2
Unclassified commodities	2,051.4	1,747.6	2,196.6
Imports (direct loans)	-	473.6	705.6
Grand Total	10,360.6	1,1441.1	11,424.5

Source: Central Bank of Egypt

Table 2.1.5-3 Regional Distribution :
Exports, Imports and the Trade Balance
(In Millions of US Dollars)

	Export Proceeds		Import Payments		Trade Balance	
	1989/90	1990/91	1989/90	1990/91	1989/90	1990/91
Arab League countries	234.2	300.8	147.0	142.3	Δ87.2	158.5
EEC countries	1,076.3	1,234.0	3,822.4	3,361.4	Δ2,746.1	Δ2,127.4
Comecon countries	695.2	673.2	790.6	884.4	95.4	Δ 211.2
Other European countries	104.4	87.3	1,206.9	1,301.0	Δ1,102.5	Δ1,213.7
Afro-Asian countries	506.0	836.7	1,201.6	1,255.8	Δ695.6	Δ419.1
United States of America	382.7	531.6	2,704.3	1,801.3	Δ2,321.6	Δ1,269.7
Australia	1.8	1.2	353.1	180.7	Δ351.3	Δ179.5
Other countries	144.2	222.0	741.6	1,642.8	Δ597.4	Δ1,420.8
Total	3,144.8	3,886.8	10,967.5	10,569.7	Δ7,822.7	Δ6,682.9

Source: Central Bank of Egypt

Table 2.1.5-4 Balance of Payments

(In Millions of US Dollars)

	1988/89	1989/90	1990/91
	Amount	Amount	Amount
Export proceeds	2,697.0	3,144.8	3,886.8
Shipping	533.7	541.3	811.9
Suez Canal dues	1,306.7	1,471.8	1,661.9
Tourism	900.6	1,071.8	924.1
Interest, dividends and other revenues	734.0	776.9	1,049.4
Other receipts	2,778.2	2,921.1	3,231.5
Total of Current Transactions Receipts	8,950.2	9,927.7	11,565.6
Import payments	10,360.6	1,144.1	11,424.5
Commercial payments	248.0	275.6	232.2
Shipping	109.4	80.8	101.0
Interest on loans and obligations	1,123.2	1,688.5	1,529.7
Travel, education and medical expenses	111.8	88.1	82.9
Government expenditures	311.8	340.5	444.7
Other payments	1,397.5	1,483.4	1,621.5
Total Payments	13,662.3	15,398.0	15,436.5
Balance	Δ4,712.1	Δ5,470.3	Δ3,870.9
Official transfers	711.2	1,093.7	1,486.9
Workers' remittances	3,532.2	3,742.6	3,775.3
Total of Transfers	4,243.4	4,836.3	5,262.2
Balance of Current Transactions and Transfers	Δ468.7	Δ634.0	1,391.3

Source: Central Bank of Egypt

2.1.6 Movements for privatization

Public sector reforms and privatization are one of the important pillars of Egypt's economic restructuring. The privatization plan was started a few years ago and a new law to govern approximately 400 public sector companies was enacted in 1991. It is reported that these companies almost fully owned by the government account for 70% of the Egypt's industrial sectors. According to the Law No.230, these public sector companies are scheduled to be put outside the management of the government ministries and agencies and to be reorganized as subordinate companies of independent holding companies. According to the PEO established in 1991, the currently existing 27 industrial holding companies will be reduced to 17. And during the process of such reduction, the PEO, it is reported, will effect industrial reorganization going over the framework of industrial grouping.

Table 2.1.6-1 shows output of major industrial products by public and private sectors. According to this table, almost all output was made in the public sector in 82/83, but the output in the private sector has recently been increased in such products as animal and poultry fodder, and reinforcing iron. Table 2.1.6-2 shows the privatization program of the PEO. The program is being carried out more carefully than expected. The current unemployment rate in Egypt is about 8%. A major problem in the years ahead is how the above reorganization in the public sector will affect employment.

Table 2.1.6-1 Output of Major Industrial Products

Product	Unit	1982/83			1989/90			1990/91		
		Public	Private	Total	Public	Private	Total	Public	Private	Total
Cane Sugar	Thousand tons	697	..	697	820	-	820	833	-	833
Beet sugar	Thousand tons	..	-	22	-	130	130	..	140	140
Animal & poultry fodder	Thousand tons	..	..	7,775	2,739	480	3,219	2,288	2,252	4,540
Cotton yarn	Thousand tons	..	..	234	257	40	297	263	42	305
Wool yarn	Thousand tons	..	..	13	13	2	15	8	2	10
Silk and artificial fibers	Thousand tons	24	-	24	38	-	38	41	-	41
Blankets	Thousand pieces	..	..	4,100	2,800	2,900	5,700	3	3	6
Ready-made garments	Million pieces	..	..	47.5	21	68.4	89.4	44	71	115
Cars	units	19,033	-	23,563	15,684	-	1,568	13,200	-	13,200
Buses	units	783	-	783	1,650	600	4	1,450	450	1,900
Lorries	units	2,759	-	2,759	1,510	-	2,250	585	-	585
Washing machines	Thousands	..	..	339	256	93	1,510	260	30	290
Refrigerators	Thousands	..	..	423	501	203	349	269	117	386
Butagaz heaters	Thousands	24	-	24	71	-	704	69	-	69
Aluminium	Thousand tons	..	..	..	181	-	71	165	-	165
Reinforcing iron	Thousand tons	..	..	338	300	1,000	181	310	1,250	1,560
Cement	Thousand tons	..	..	3,776	13,200	2,100	1,300	14,300	2,350	16,650
Phosphates	Thousand tons	746	-	746	947	-	1,530	945	-	945
Glass sheets	Thousand tons	25	-	25	24	-	0	24	-	24
Phosphatic fertilizers	Thousand tons	586	-	586	1,509	-	947	1,450	-	1,450
Nitrogenous fertilizers	Thousand tons	..	..	..	4,977	-	24	4,650	-	4,650
Caustic soda	Thousand tons	47	-	47	110	-	1,450	93	-	93
Tyres (for cars and trucks)	Thousands	727	-	727	1,240	-	4,977	1,291	-	1,291
Soap	Thousand tons	..	..	..	331	79	110	290	93	383

Table 2.1.6-2 Privatization Program by Sector
(Number of Companies)

	1991/92	1992/93	1993/94	Total
Trade	1	4	1	6
Foodstuffs	4	2	11	17
Mining	2	1	2	5
Engineering	1	4	4	9
Tourism	9	3	2	14
Cement	2	0	3	5
Chemicals	0	6	2	8
Transportation	0	2	5	7
Textile	0	1	5	6
Others	1	2	4	7
Total	20	25	39	84
Total Assets (million LE)	1,429	1,250	9,857	12,536

Source:PEO (calculated value)

2.2. Economic Policy for the Future

2.2.1. Fundamental industrial policy

Egypt is now carrying out various economic reforms including introduction of a market economy. Its fundamental industrial policies can be summarized as follows:

- 1) Government enterprises will be privatized step by step.
- 2) The same policies will be applied to both private and government enterprises.
- 3) Elements of competition will be infused into all enterprises to improve quality of products.
- 4) Stabilization of foreign exchange rates.
- 5) To advance economy, production and quality will be improved. For this purpose, exports will be encouraged, and imports and liabilities will be held down as small as possible.
- 6) To increase investment from foreign countries, incentives such as tax exemption will be given over a long period of 5 to 10 years.
- 7) Industrial relocation will be promoted through creation of industrial complexes.
- 8) Export and import liberalization will be advanced.

The third 5-year plan was started in 92/93 based on the above principles.

2.2.2. The third economic and social development plan and economic prospects

The third Economic and Social Development Plan was started on July 1, 1992. This third 5-year plan is made as part of a long-term plan ranging from 1982 to 2001 on the premise that the population will reach 70 million persons in 2001. The annual economic growth rate set out in the new 5-year plan (92/93 to 96/97) is 5.1%, which is lower than 5.8% set out in the second 5-year plan. In particular, the rate is set at a low rate of 4% for 92/93 when the transition to a market economy is scheduled.

By sector, the annual target rates are set at higher rates of 7.0% and 7.2% for industry and mining and for construction respectively, while a lower rate of 3.5% is set for agriculture. As to oil, the rate is set at -1% for 92/93 and at a very low average of 1% for the whole five-year period, showing Egypt's intention to completely get away from its dependence on oil. As a result, in the total of commodity sectors, the growth is estimated at a little bit lower rate of 4.7%. The growth in the production services sectors is set at 5.3% and that in the social services sector is set at 5.7%. As a result, by percentage distribution, the commodity sectors will fall from 50.5% in 1992 to 49.8% in 1997, and the production services and social services sectors will add a little gain.

Looking separately at the public and private sectors, the growth of the public sector as a whole is set at 2.4%, while that of the private sector as a whole is set at

6.7%, showing a greater expectation on the vigor of the private sector. Of the private sector, in particular, industry and mining, construction, services, and real estate are expected to grow at 10% or higher. On the other hand, the growth of each public sector of the commodity producing sectors is set at 1% or lower except for electricity (electricity is totally public), with agriculture set at -1.6%.

The investment plan is for the total of LE154.0 billion, an increase of 34% compared with LE114.9 billion, the total amount of investment in the second 5-year plan. The breakdown shows LE77.2 billion for commodity sectors (50.1%), LE30.1 billion for production services sectors (19.5%), and LE46.7 billion for social services sectors (30.3%). Separate figures for public and private sectors are not made available, but the amounts to be invested in the government and business sectors are estimated to be LE64.5 billion and LE89.5 billion, respectively.

Table 2.2.2-1 Targeted Gross Domestic Product

(at 1991/92 prices, in billion LE)

	91/92	92/93	92/93 Annual Growth Rate %	96/97	92/97 Annual Growth Rate %	01/02	97/02 Annual Growth Rate %
Agriculture	20,675	21,275	2.9	24,555	3.5	30,287	4.3
Industry & Mining	21,409	22,735	6.2	30,090	7.0	48,947	10.3
Oil & Oil Products	13,342	13,205	△1.0	14,022	1.0	15,038	1.4
Electricity	2,009	2,125	5.8	2,755	6.5	3,978	6.0
Construction	6,076	6,240	2.7	8,620	7.2	13,300	9.1
Total Commodity Sectors	63,511	65,580	3.3	80,042	4.7	111,550	6.9
Transport Communication & Storage	8,018	8,437	5.2	10,358	5.2	14,443	6.9
Suez Canal	6,154	6,381	3.7	7,467	3.9	9,085	4.0
Commerce, Finance & Insurance	26,658	27,799	4.3	34,245	5.1	45,977	6.1
Restaurants & Hotels	1,954	2,140	9.5	3,350	11.4	5,420	10.1
Total Production Services Sector	42,784	44,757	4.6	55,420	5.3	74,925	6.2
Housing & Public Utilities	1,763	1,827	3.6	2,755	9.3	3,750	6.4
Other Services	17,427	18,366	5.4	22,590	5.3	30,000	5.8
Total Social Services Sector	19,190	20,193	5.2	25,345	5.7	33,750	5.9
Grand Total	125,485	130,530	4.0	160,807	5.1	220,225	6.5

Table 2.2.2-2 Growth Rate of Domestic Product
in 5-Year Plan

(%)

	91/92 to 96/97		
	Public Sectors	Private Sectors	Total
Agriculture	△1.6	3.6	3.5
Industry & Mining	1.1	10.6	7.0
Oil & Oil Products	0.3	4.5	1.0
Electricity	6.5	-	6.5
Construction	1.1	9.8	7.2
Total Commodity Sectors	1.2	6.7	4.7
Transport Communication & Storage	3.6	6.8	5.3
Suez Canal	3.9	-	3.9
Commerce, Finance & Insurance	0.3	6.4	5.1
Restaurants & Hotels	△7.0	13.7	11.4
Total Production Services Sector	2.4	7.0	5.3
Housing & Public Utilities	6.0	10.5	9.3
Other Services	5.3	5.3	5.3
Total Social Services Sector	5.0	6.1	5.7
Grand Total	2.4	6.7	5.1

Source: The Ministry of Planning

Table 2.2.2-3 Targeted Investment Expenditures
(at 1991/92 prices, in billion LE)

	Third Plan (1992-1997)		Fourth Plan (1997-2002)	
	Public Sectors	Structure (%)	Public Sectors	Structure (%)
Agriculture	13.9	9.0	23.0	9.5
Industry & Mining	28.0	18.2	60.0	24.8
Oil & Oil Products	15.0	9.8	20.0	8.3
Electricity	17.7	11.5	28.0	11.6
Construction	2.6	1.7	4.0	1.6
Total Commodity Sectors	77.2	50.2	135.0	55.8
Transport Communication & Storage	20.0	13.0	30.0	12.4
Suez Canal	0.5	0.3	3.5	1.4
Commerce, Finance & Insurance	3.9	2.5	5.0	2.1
Restaurants & Hotels	5.7	3.7	7.5	3.1
Total Production Services Sector	30.1	19.5	46.0	19.0
Housing & Public Utilities	28.8	18.7	35.0	14.5
Other Services	17.9	11.6	26.0	10.7
Total Social Services Sector	46.7	30.3	61.0	25.2
Grand Total	154.0	100.0	242.0	100.0

Source: The Ministry of Planning

The balance of payments structures in which a large deficit in trade account is covered by a surplus in invisible account has been remaining unchanged. The balance between total revenues and total expenditures was LE2.0 billion in surplus at a recent date, and LE3.0 billion in surplus is estimated for 96/97. In the revenue side, an increase in the exports of mining and industrial products (at 16% p.a.) and an increase in income from tourism (at 11% p.a.) are expected, while oil and oil products are estimated to decrease. In the expenditure side, imports of intermediate products are estimated to increase at 4.1% p.a., and this is expected to promote industrial development. However, in view of a large import share of manufactured products such as consumer goods including these intermediate products, an increase in domestic content is a problem the Egyptian economy is now facing.

As to employment, total employment of 13.9 million in 91/92 will be increased to 16.35 million in 96/97 by creating 2.45 million new jobs during the five years. Reduction in the rate of unemployment through industrial development is one of the Egypt's most important problems. Therefore, creation of more employment than the employment for 1.9 million created during the period of the previous 5-year plan is expected in the new 5-year plan.

In addition, it should be noted that the outline of the fourth 5-year plan covering the period from 1998 to 2002 was announced at the same time with the third 5-year plan. According to the announcement, the annual economic growth rate set out in the fourth plan is 6.5%, which is higher than the target set out in the

third plan. By sector, industry and mining, construction, and services sectors are continuously given a high growth target. The investment plan in the fourth plan is for the total of LE242.0 billion, a sharp increase of 57% compared with the third plan.

As mentined above, various objectives for the Egyptian economy in the coming five to ten years were announced and have already been put into practice. However, achievement of these objectives requires a solution to many problems. In this connection, the promotion of the fundamental policies mentioned in the previous section is very important.

Table 2.2.2-4 Balance of Payments

(at 1991/92 prices, in million LE)

	91/92 Expected	92/93 Target	96/97 Plan	Rate of Change 91/93(%)	Annual Growth Rate(%)
Total Current Revenues	59,930	62,047	71,989	3.5	3.7
Agricultural Exports	1,575	1,720	2,480	9.2	9.5
Industrial Exports	5,762	6,510	12,125	13.0	16.0
Exports of Crude Oil & its Products	5,545	4,918	4,624	Δ11.4	Δ3.6
Miscellaneous	3,823	4,356	4,507	13.9	3.3
Total Visible Exports	16,705	17,504	23,736	4.8	7.3
Suez Canal Dues	6,030	6,253	7,250	3.7	3.8
Tourism	5,170	5,637	8,764	9.0	11.1
Other Services Revenues	12,217	12,534	14,026	2.6	2.8
Total Invisible Exports	23,417	24,424	30,040	4.3	5.1
Remittance of Egyptian Working Abroad	12,646	12,835	13,400	1.5	1.2
Other Revenues of Trans- -fers	7,167	7,284	4,813	1.6	Δ7.7
Total Returns & Current Transfers	19,808	20,119	8,213	1.6	Δ1.7
Total Current Transfer Payments	57,645	60,117	68,694	4.3	3.3
Consumption Imports	11,220	11,410	12,220	1.7	1.7
Intermediate Imports	19,060	19,900	23,805	4.4	4.1
Investment Imports	9,920	9,950	10,595	0.3	1.3
Total Visible Imports	40,200	41,260	46,620	2.6	3.0
Total Payments of Invisible Imports	10,505	11,162	12,160	6.3	3.0
Total Payment	6,940	7,695	9,914	10.9	7.4
Balance of Current Transactions	2,285	1,930	3,295		

Source: The Ministry of Planning

Table 2.2.2-5 Increase of Employment in 5-Year Plan

thousand people

	Employment in 1991/92	Employment in 1996/97	Number of Increase
Agriculture	4588	4922	334
Industry & Mining	1902	2399	497
Oil & Oil Products	38	48	10
Electricity	103	120	17
Construction	911	1175	264
Total Commodity Sectors	7543	8664	1122
Transport, Communication & Storage, Suez Canal	662	789	167
Commerce, Finance & Insurance	1491	1866	375
Restaurants & Hotels	151	184	33
Total Production Services Sectors	2264	2839	575
Housing & Public Utilities	2743	3112	369
Other Services	1351	1735	384
Total Social Services Sectors	4094	4847	753
Grand total	13900	16350	2450

Source : The Ministry of Planning

2.3. Steel Industry Policy in Egypt

2.3.1. Outline of Egyptian steel industry

1) Types of steel enterprises

Egyptian steel industry is made up of public and private sectors. Factories capable of steelmaking are found in four companies in the public sector and in only a small part of the private sector including ANSDK.

- Public sector	Steel production capacity(1000tons/year)
a) Egyptian Iron & Steel Co. - Helwan (Integrated steel maker)	920
b) National Metal Industries Co. - Abou Zaabal (Semi-integrated steel maker)	200
c) Delta Steel Co. - Mostord (Semi-integrated steel maker)	160
d) Egyptian Copper Works Co. - Alexandria	85
Total of Public Sector	1,365
- Joint ventures and private sector	
a) Alexandria National Iron & Steel Co. - El Dikheila(Integrated steel maker)	1,000
b) Mostafa Sarhan Company - Alexandria (Semi-integrated steel maker)	90
c) National Company - Al Baraka (rolling)	200

d) Abdel Whab Kouta Co. - Port Said (rolling)	150
e) Alexandria Company - Ezzat El Hawary (rolling)	120
f) El Shinawy Company - Tanta (rolling)	100
g) El Timsah Company - Cairo/Alexandria(rolling)	50
h) Arab Steel Factory - Alexandria(rolling)	60
i) Ayad Factory - Helwan (rolling)	40
j) Al Motahida Co. - Tayseer El Hawary(rolling)	40
k) Sayed El Ahl Co. (rolling)	25
l) Other small factories(Average 500 tons)	50
Total of joint ventures and private sector	1,925
Grand Total	3,290

(Source : MIC)

2) Production, supply and demand

The output of steel in Egypt was 1.4 million tons in 1987, 2.0 million tons in 1988, and it increased to 2.5 million tons in 1991. By type of furnaces, open hearth furnace steel has been around 6 to 7%, while the percentage of converter steel and electric arc furnace steel has been changing widely. In 1987, the percentage of converter steel was 52.3% and that of electric arc furnace steel was 38.0%, while, in 1988, the percentages reversed when converter steel took up 38.0% and electric arc furnace steel, 53.9%. The reverse seems to have been caused by ANSDK which started operation in 1986.

Table 2.3.1-1 Trends of Crude Steel Production
and By Type of Furnaces

Year	1987	1988	1989	1990	1991
Crude Steel (1,000 tons)	1,433	2,025	2,114	2,247	2,556
LD(%)	52.5	39.2	37.3	36.2	39.4
EF(%)	38.0	58.9	56.7	57.5	54.4
OH(%)	7.5	6.9	6.1	6.3	6.1

As for supply and demand of the long and flat steel products, these data are shown in Table 2.3.1-2, and apparent consumption of each products, which was 3.2 million tons in 1991, decreased to 2.9 million tons in 1992. Total apparent consumption including wire and pipe was 3.0 million tons in 1992.

Table 2.3.1-2 Trends of Apparent Steel Consumption
(1,000 tons)

Fisical Year	1987	1988	1989	1990	1991	1992
Production	1,180	1,625	2,059	2,262	2,491	2,527
Exports	53	109	133	150	132	215
Imports	1,522	1,018	1,009	801	843	574
Apparent steel consumption	2,649	2,534	2,935	2,913	3,202	2,886

Note : Only the long and flat products
Source: MIC EGITALEC

2.3.2. Steel industry policy in Egypt

Egypt is now moving toward a market economy. Egyptian steel industry is also involved in this move and its policies are the same as the fundamental industrial policies mentioned in Section 2.2.1. In particular, improvement of quality and buildup of international competitiveness are most important problems.

Steel industry policy had long been made under controlled economy in Egypt. To be concrete, the products of Hadisolb, a major state-owned company, pig iron, sections, sheets and coils continued to be subject to the mandatory pricing regulations through the sanction from the Minister of Industry. The situation remained as such until mid 1991; however the new economic policy started since that date, in which the market economy method causing subjection of prices to the forces of competition and the forces of supply and demand was introduced. Accordingly, marketing of Hadisolb's production at present is carried out within the frame of an open market without any import restrictions on the similar commodity imported from the

foreign markets. Consequently the local prices were influenced by the strong state of contraction in the world markets for steel products. Furthermore, the local market receives huge quantities of steel products from Libya, Russia and Eastern Europe at lower prices in recent years.

The production of the public sector mills of reinforcing bars was at approximately 300 thousand tons, representing 15% of the iron circulated in the local market, and was subject to mandatory price regulation by decrees from the Ministry of Housing. Also a part of El Dikheila Works' production was also subject to these decrees. The state of affairs remained unchanged for them until mid 1991, when mandatory pricing became invalid. The new pricing method has been implemented within the framework of the economic transformation to the free market policy since then. However the selling prices of reinforcing bars remain stagnant because of the sluggish demand and the flooding the local market with huge quantities of imported products at reduced prices. Incidentally, tariff rates for steel products range from 5% on raw pig iron, and from 5% to 10% on the intermediate processed products, and from 5% to 40% on manufactured steel.

The trend of privatization of public sector's mills is still vague in PEO's privatization program by sector until 1994.

It should be noted in this connection that Egypt is in shortage of raw materials including those in the category of semi-processed and finished products. Therefore, the role of industries that supply basic materials including steel industry will become more and more important. Main production facilities owned by public sector companies are shown in Table 2.3.2-1 and the following are expansion works planned by them:

- HADISOLB: In 1995,96, expansion of converter capacity from currently available 1.2 million tons a year to 1.45 million tons a year. In 1996, expansion of hot strip mill capacity from 500,000 tons a year to 650,000 tons a year and improvement of quality and unit costs. In 1996, installation of a new continuous casting machine having a capacity of 120,000 tons a year. In 1998, installation of a new domestically produced bar mill having a capacity of 150,000 tons a year.

- NMI: In 1997, installation of a new domestically produced bar mill having a capacity of 150,000 tons a year.

- ECW: Addition of secondary refining (LF) to open hearth furnace to increase capacity by 30%.

(Source : MIC)

Table 2.3.2-1 Major Equipments of Public Sector's Mills

Comapny	Major Equipments	Capacity (million tons/year)
The Egyptian Iron & Steel Co. (Hadisob) (Works:Heiwan)	• Sintering machine	300
	• Blast furnace 575m ³ x2	160
	• LD Basic oxygen converters 1,033m ³ x2	120
	• Electric arc furnaces (12t/chx2)	7.2
	• Continuous casting machines 2-strand slab CCx3	60
	• 6-strand billetCCx3	60
	• Blooming mill (blooming:900mm)	24
	• Heavy section mill (750mm)	18
	• Medium section mill	25
	• Bar mill (360/280mm)	7.5
	• Heavy plate mill (1,500mm)	9.3
	• Hot strip mills (1,200mm)x2	50
	• Cold strip mills (1,200mm)x2	26
• Pickling line	43	
The National Metal Industries Co. (Nametin, NMI) (Works:Kalyoub iah)	• Open hearth furnaces (35t/ch x 3)	10
	• Electric arc furnaces (35t/ch x 2)	18
	• Continuous casting machine 3-strand billet CCx1	16
	• Bar mill (x3)	19
Delta Steel Mill SAE (DSM) (Works: Mostorod)	• Electric arc furnaces (6t/chx1, 18t/chx1, 25t/chx2)	18
	• Continuous casing machine 3-strand billet CCx1	12
	• Light section mill	4
	• Bar & wire rod mill	9
The Egyptian Copper Works (ECW) (Works: Alexandria)	• Electric arc furnaces (50t/chx1, 25t/chx1)	14
	• Open hearth furnace (35t/ch x 1)	3
	• Continous casting machine 4-strand x 1	10
	• Bar mill	25

Source:MIC,Iron&Steel Works of the Wbrld,etc.

CHAPTER 3. STEEL DEMAND AND SUPPLY

This CHAPTER is with regard to present statistics and future forecast on the supply and demand of steel market in Egypt, which are sorted out on the basis of product category. Items mentioned here are primarily with long products and flat products in the light of the purposes of this report, while pipes and wires are referred to as supplement.

3.1. Present Demand and Supply

3.1.1. Steel production

The steel production in Egypt has been marked by a rapid growth since ANSDK started its operation in 1987. The production share of long products in 1992 is more than 80% of the total steel production in Egypt (excluding pipes and wire products), which illustrates the typical trend in the developing countries that the share of long products is much larger than that of flat products. For reference, the production of pipes and wires in 1992 was 126,000 tons and 13,000 tons, respectively.

The above trend that long products, especially bars are major production items is due to the pattern in the steel consumption where machinery industries are under development.

Table 3.1.1-1 Steel Production

(Unit : 1,000 t)

FY	1985	1986	1987	1988	1989	1990	1991	1992	1992
Long Products	477	588	847	1,216	1,648	1,850	2,016	2,053	81.2%
· Bars & Rods	385	486	787	1,112	1,517	1,731	1,863	1,875	74.2%
· Others	92	102	60	104	131	119	153	178	7.0%
Flat Products	317	306	333	409	411	412	475	474	18.8%
Total	794	894	1,180	1,625	2,059	2,262	2,491	2,527	100.0%

(Note) Excluding pipes and wires

Source : MIC, EGITALEC

3.1.2. Steel import

As the domestic steel production has been expanding dramatically, the steel import in Egypt has been decreasing since 1987. However, import of long products still covers a major part of import items and flat products share only around 40% of total steel import. Import of pipes was 68,000 tons in 1992 and has been kept in the range between 50,000 and 80,000 tons in these four to five years. The statistic data for wires is not available. The countries that export significant amounts of steel to Egypt are Rumania, ex-Czechoslovakia, and Yugoslavia. Germany and Turkey follow.

Table 3.1.2-1 Steel Import by Product Category

(Unit: 1,000 t)

FY	1985	1986	1987	1988	1989	1990	1991	1992	1992
Long Products	1,662	1,840	1,293	851	764	658	599	345	60.1%
Bars & Rods	1,562	1,673	1,126	769	736	620	529	261	45.5%
Others	100	167	167	82	28	38	70	84	14.6%
Flat Products	234	357	229	167	245	143	244	229	39.9%
Total	1,896	2,197	1,522	1,018	1,009	801	843	574	100.0%

(Note) Excluding pipes and wires

Source : MIC, EGITALEC, ECE

Table 3.1.2-2 Steel Import by Country of Origin
(Unit : 1,000 t)

FY	1988	1989	1990	1991	1992	1992
Roumania	142	261	334	154	64	11.0%
Czechoslovakia	218	111	91	135	111	19.3%
Yugoslavia	141	207	21	44	13	2.3%
Germany	102	78	61	85	51	8.9%
Terkey	5	18	73	91	6	1.0%
Others	410	334	221	334	329	57.3%
Total	1,018	1,009	801	843	574	100.0%

(Note) Excluding pipes and wires

Source : CAPMAS

3.1.3. Export of steel products

Egypt has exported few steel products, of which the amount was usually around 100,000 tons per year mostly for bars. The decrease of local demands made export of steel products increase considerably to 215,000 tons in 1992. Export of pipes was around 25,000 tons per year as welded pipes and wires of around 1,000 tons was exported annually.

Table 3.1.3-1 Steel Export

(Unit:1,000 t)

FY	1985	1986	1987	1988	1989	1990	1991	1992
Long Products	0	0	0	50	107	120	104	182
·Bars & Rods	0	0	0	49	94	98	62	138
·Others	0	0	0	1	13	22	42	44
Flat Products	1	17	53	59	26	30	28	33
Total	1	17	53	109	133	150	132	215

(Note) Excluding pipes and wires

Source : MIC, EGITALEC

3.1.4. Steel consumption

The apparent steel consumption (production + import - export) in Egypt is indicated in the following Table 3.1.4-1. The steel consumption has been dull in these four or five years because of low real GDP growth rate (IMF basis).

Especially, the apparent consumption of bars and rods, which occupies 70% of the total steel consumption, has fluctuated more sharply maybe due to large changes in the stock. The consumption of bars and flat products fell

sharply in 1992 when Egypt was at a transitional stage towards market economy and restructuring.

Table 3.1.4-1 Steel Consumption

(Unit : 1,000 t)

FY	1985	1986	1987	1988	1989	1990	1991	1992	1992	92/85
Long Products	2,139	2,428	2,140	2,017	2,305	2,388	2,511	2,216	76.8%	0.5%
·Bars & Rods	2,047	2,159	1,919	1,832	2,159	2,253	2,330	1,998	69.2%	-0.3%
·Others	192	269	227	185	146	135	181	218	7.6%	1.8%
Flat Products	549	646	509	517	630	525	691	670	23.2%	2.9%
Total	2,688	3,074	2,649	2,534	2,935	2,913	3,202	2,886	100.0%	1.0%
Growth Rate	54.40%	14.4%	-13.8%	-4.3%	15.8%	-0.7%	9.9%	-9.9%		
Real Growth Rate of GDP* (% p.a.)	6.6	2.6	2.5	3.9	3	2.5	2.3			

(Note) Excluding pipes and wires

*Source : IMF

3.1.5. Current steel consumption by sector

An estimated present steel consumption classified by industrial sector is as follows:

Table 3.1.5-1 Present Steel Consumption by Sector

(Unit : 1,000 t)

Sectors	Long Products			Flat Products	Total
	Bars & Rods	Others	Total		
	(%)	(%)	(%)	(%)	(%)
Construction	2,128(98)	176 (99)	2,304 (98)	311(50)	2,615(88)
Cars & Trucks	0 (0)	0 (0)	0 (0)	62(10)	62 (2)
Electrical Equipment & Industrial Machinery	2 (-)	2 (1)	4 (-)	125(20)	129 (4)
Others	44 (2)	0 (0)	44 (2)	124(20)	168 (6)
TOTAL	2,174(100)	178(100)	2,372(100)	622(100)	2,974(100)

The following is taken into consideration to estimate the above.

In an attempt to figure out the real consumption excluding the impact of stock fluctuation, the present steel consumption is calculated by averaging the last three years' (1990, 1991 and 1992) apparent consumption.

A basis for the estimation of the steel consumption by sector is obtained from the field survey and the data of Thailand and Philippines which are relatively similar to Egypt in the economic scale as well as in the steel consumption level.

(Reference data is attached in APPENDIX 4.)

The following are characteristics in the present steel consumption by sector in Egypt:

- The construction sector takes a very large share in the total steel consumption, which is reflected from the large consumption of bars.
- The sectors of automotive, industrial machinery and electric machinery take a small share in the total steel consumption, which is reflected from the low consumption level of steel sheets. These industries are at the stage of development.

3.2. Forecast of Steel Demand and Supply

3.2.1. Forecast of steel demand

1) Methods of forecast

The following four methods are adopted to forecast the steel supply and demand.

- Micro method : Forecast based on unit steel consumption by sector and activity level of each sector
Correlation between bar consumption and cement consumption
- Macro method : Correlation between GDP and steel consumption
Forecast based on unit steel consumption/GDP by sector and GDP forecast

The microscopic method is suitable for a medium-term forecast and the macroscopic method is suitable for a long-term forecast.

2) Microscopic forecast of steel demand

a) Forecast with unit steel consumption by sector

(1) Estimation of unit steel consumption by sector

The unit steel consumption by sector is given from the present steel consumption by sector in Egypt (Table 3.1.5-1) and the activity level of respective sector.

The present unit steel consumption by sector in Egypt is as follows:

Table 3.2.1-1 Present Unit Steel Consumption by Sector in Egypt

Sector	Activity Level	Steel Consumption	Unit Steel Consumption
Construction	6,983 *	2,615	0.3745
Cars & Trucks	11.1 **	62	5.5856
Electrical Equipment & Industrial Machinery	4,964 *	129	0.0260
Others	39,123 *	168	0.0042

(Note) *L.E. million, **1,000 units for Activity level
 1,000 tons for Steel Consumption
 1,000 tons/unit of Activity Level for Unit Steel Consumption

The following indices for the activity level of respective sector are adopted.

Sector	Index	Source
Construction	GFCF (1985 price)	IMF
Cars & Trucks	Number of products	CAPMAS
Electrical Equipment & Industrial Machinery	Production amount (1991 price)	CAPMAS
Others	GDP (1985 price)	IMF

(2) Forecast of activity level by sector

The activity level of respective sector is forecasted based on the third national economic & social development plan of Egypt as much as

possible. The information obtained from the field survey was also taken into consideration in the forecast.

The forecasted figures are as follows:

Table 3.2.1-2 Forecast Figures for Activity Level

Sector	Index	Unit	1991	1997	2002
Construction	GFCF	Million L.E.	6,983	11,092	17,461
Cars & Trucks	No. of products	1,000 units	11.1	25.1	41.7
Electrical Equipment & Industrial Machinery	Production amount	Million L.E.	4,964	7,336	11,933
Others	GDP	million L.E.	39,123	51,474	70,524

(Note) Refer to APPENDIX 4 concerning the details of this forecast.

(3) Forecast of steel demand

The steel demand in 1997 and 2002 is forecasted from the unit steel consumption by sector (Table 3.2.1-1) and the forecasted activity level of respective sector (Table 3.2.1-2).

Table 3.2.1-3 Forecast of Steel Demand by Sector & by Product Category (Unit : 1,000 t)

Sector	1997	2002	Steel Products	1997	2002
Construction	4,154	6,539	Long products	3,723	5,849
Cars & Trucks	140	233	(Bars)	(3,440)	(5,404)
Electrical Equipment & Industrial Machinery	191	310	(Others)	(283)	(445)
Others	216	296	Flat products	978	1,529
Total	4,701	7,378	Total	4,701	7,378

(Note) Pipes and wires are excluded.

- b) Forecast with correlation between steel consumption and cement consumption

The bar demand is forecasted according to its correlation with cement consumption which is closely related.

The correlation formula obtained is as follows:

$$Y = 1.068 X + 410.703$$

Y : Bar consumption (unit : 1,000 tons)

X : Cement consumption (unit : 10,000 tons)

n=11, R=0.799, DW=2.060

The forecast of cement consumption is as follows:

Fiscal Year	Cement Consumption	Source
1997	22,770 thousand tons (growth rate : 8% p.a.)	Third 5-year plan (1992-1997 growth rate) Construction : 7.2% p.a. Public utilities/fabricated structure : 9.3% p.a.
2002	31,940 thousand tons (growth rate 7% p.a.)	Fourth 5-year plan (1997-2002 growth rate) Public utilities/fabricated structure: 6.4% p.a.

From the above correlation and the forecasted cement consumption, the bar consumption is forecasted as follows:

- Year 1997 : 2,843,000 tons
- Year 2002 : 3,822,000 tons

3) Macroscopic forecast of steel demand

a) Forecast by correlation with GDP factors

The correlation between the steel consumption and GFCF (gross fixed capital formation) is obtained as follows:

$$Y = 0.979 X_1 + 0.241 X_2 - 892.499$$

Y : Steel consumption (unit : 1,000 tons)

X₁: GDP (1985 price, unit: L.E. 10 million)

X₂: GFCF (1985 price, unit : L.E. 10 million)

n=15, R=0.944, DW=2.053

The forecast figures for GDP and GFCE are as follows:

Fiscal Year	GDP	GFCE	Source
1997	51,474	11,092	Third 5-year plan GDP:5.1% p.a.(1992-1997 growth rate) GFCE/GDP elasticity:0.345 (1991/1978)
2002	70,524	17,461	Fourth 5-year plan GDP:6.5% p.a.(1997-2002 growth rate) GFCE/GDP elasticity:0.345 (1991/1987)

(Note) 1985 price; unit : L.E. million

According to the above correlation formula with the forecast figures of GDP and GFCE, the steel consumption is forecasted as follows:

- Year 1997 : 4,414,000 tons
- Year 2002 : 6,433,000 tons

b) Forecast with unit steel consumption/sector-wise GDP

The steel consumption is forecasted from steel consumption per GDP by sector and forecast of GDP by sector.

The following unit steel consumption per GDP by sector is prepared by EGITALEC in terms of 1987 price as adjusted from that estimated by MIC in June 1978.

Estimation of GDP by Sector in 1988

(Unit: tons/L.E. million*)

Agriculture	Industry & Mining	Electricity	Transport & Communication	Construction & Housing**
15 (134)	100 (745)	75 (42)	75 (298)	500 (1,508)

(Note) * 1988 price

** Includes public utilities and fabricated structure.

Figures in () show the steel consumption in 1,000 tons.

The total steel consumption is 2,727,000 tons.

Source : EGITALEC

The above unit steel consumption/GDP by sector is converted in terms of 1992 price as shown in the following table.

Table 3.2.1-4 Estimation of Unit Steel Consumption/GDP by Sector

(Unit: tons/L.E. million*)

Agriculture	Industry & Mining	Electricity	Transport & Communication	Construction & Housing**
7 (125)	42 (692)	25 (39)	46 (277)	213 (1,401)

(Note) * 1992 price

** Includes public utilities and fabricated structure.

Figures in () show the steel consumption excluding pipes and wires (unit : 1,000 t).

The total steel consumption is 2,534,000 tons.

The forecast of GDP by sector in the third and fourth 5-year plans is reorganized in terms of 1992 price as follows:

Table 3.2.1-5 Gross Domestic Products of Egypt by Sector
(Unit: L.E. billion. 1992 price)

F.Year	Agriculture	Industry & Mining	Electricity	Transport & Communication	Construction & Housing*
1988	18,235	16,600	1,590	5,960	6,566
1991	20,003	20,166	1,895	7,480	8,213
1997	24,555	30,090	2,755	10,358	11,636
2002	30,287	48,497	3,978	14,443	17,046

(Note)* Includes public utilities and fabricated structure.

Source: 1988 and 1991:MOP (as adjusted in 1992 price),
1992-2002 : MOP

From the unit steel consumption/GDP by sector (Table 3.2.1-4) and GDP by sector, the steel consumption is forecasted as follows:

Table 3.2.1-6 Forecast of Steel Consumption
by GDP Sector

(Unit : 1,000 t)

F. Year	Agriculture	Industry & Mining	Electricity	Transport & Communication	Construction & Housing	Total
1997	160	1,195	64	458	2,636	4,240
2002	197	1,926	92	639	3,462	6,316

(Note) Pipes and wires are excluded.

4) Summary of steel demand forecast

The forecast of steel demand by both microscopic and macroscopic methods is summarized as follows:

Table 3.2.1-7 Summary of Steel Demand Forecast

(Unit: 1,000 t,%)

Forecast Method	Fiscal Year			Growth Rate	
	1991	1997	2002	97/91	02/97
Micro-(1)	2,974	4,701	7,378	7.9	9.4
-ditto- (bars)	(2,174)	(3,440)	(5,404)	(7.9)	(9.5)
Micro-(2) (bars)		(2,843)	(3,822)	(4.6)	(6.1)
Macro-(1)		4,414	6,433	6.8	7.8
Macro-(2)		4,240	6,316	6.1	8.3
Average of forecasts		4,452	6,709	7.0	8.5
(bars)		(3,142)	(4,613)	(6.3)	(8.0)

(Note) Pipes and wires are excluded.

The forecast results might be rather optimistic in the light of the current stagnant steel demand in Egypt.

It will take a lead time also in Egypt to achieve the transition to the market economy, privatisation of industries and restructuring of the national economy, which will have an adverse impact on the growth of the steel demand as well as the national economy from both the macro- and micro-economic viewpoints in the short or medium term, as is the case with the East European countries.

Therefore, the lowest forecast among the aforementioned forecasts is conservatively adopted in this study.

The final forecast of the steel demand by product category is as follows:

Table 3.2.1-8 Forecast of Steel Demand by Product Category (Final)

(Unit: 1,000 t,%)

Product Category	Fiscal Year			Growth Rate	
	1991	1997	2002	97/91	02/97
Long Products	2,352	3,390	5,000	6.3	8.1
· Bars & Rods	2,174	3,140 (2,800)	4,610 (3,650)	6.3	8.0
· Others	178	250	390	5.8	9.3
Flat Products	622	850 (900)	1,310 (1,200)	5.3	9.0
TOTAL	2,974	4,240	6,310	6.1	8.3

(Note) 1. Pipes and wires are excluded.

2. Figures in () are estimation in EGITALEC report in February 1993. (Bars in the EGITALEC report indicate re-bars.)

3.2.2. Forecast of steel production

1) Forecast of steel production capacity in future

The public steel companies in Egypt are confronted with difficulties due to the aged equipment and excess number of employees, and recent stagnant demand for their products.

According to MIC, there are a few plans for expanding the rolling capacity as listed in the following table, though a number of steel projects have been planned or announced in these years.

Taking the recent situation of the steel companies into consideration, these future plans listed by MIC are adopted in this study.

Table 3.2.2-1 Rolling Capacity in Future

(Unit : 1,000 t)

Products/Company	1992	1997	2002
<u>R/C bars and rods</u>			
ANSDK	1,000	1,000	1,000
DSM	94	94	244
NMI	190	190	190
ECW	75	75	75
HADISOLB	40	40	40
OTHERS	750	750	750
TOTAL	2,149	2,149	2,299
<u>Sections</u>			
HADISOLB	465	465	465
DSM	40	40	40
OTHERS	50	50	50
TOTAL	555	555	555
<u>Flat products</u>			
HADISOLB			
·Plate	93	93	93
·Hot strip	500	650	650
TOTAL	593	743	743

Source : MIC

(Note) The new bar rolling for NMI (to be completed in 1998) is regarded as the replacement, since there is no plan for expanding the capacity of steelmaking.

2) Forecast of steel production in future

The steel production in future is forecasted in Table 3.2.2-2, where the present capacity utilization rate is applied to the steel production capacity in future (Table 3.2.2-1).

Table 3.2.2-2 Forecast of Steel Production in Future
(Unit : 1,000 t)

Fiscal Year	1992	1997	2002
Long Products	2,053	2,056	2,170
· Bars & Rods	1,875	1,878	1,992
· Others	178	178	178
Flat Products	474	594	594
TOTAL	2,527	2,650	2,764

(Note) Production capacity multiplied by the present capacity utilization rate

3.3. Forecast of Steel Demand and Supply Balance in Future

The steel demand and supply balance by product category in Egypt is forecasted in Table 3.3-1, which is derived from both forecast of steel demand by product category (Table 3.2.1-8) and forecast of steel production in future (Table 3.2.2-2).

Table 3.3-1 Forecast of Steel Demand and Supply Balance in Future

(Unit : 1,000 t)

	1991			1997			2002		
	D	P	P-D	D	P	P-D	D	P	P-D
Long Products	2,352	2,016	-336	3,390	2,056	-1,334	5,000	2,170	-2,830
·Bars & Rods	2,174	1,863	-311	3,140	1,878	-1,262	4,610	1,992	-2,618
·Others	178	153	-25	250	178	-72	390	178	-212
Flat Products	622	475	-147	850	594	-256	1,310	594	-716
TOTAL	2,974	2,491	-483	4,240	2,650	-1,590	6,310	2,764	-3,546

(Note) D:Demand; P:Production; P-D:Gap between production and demand
 Import and export are not considered into the above gap.
 Pipes and wires are excluded.

It is forecasted that the gap between the demand and the domestic supply will increase without import taken into account, especially the gap in bars is the largest: bars of 1,262,000 tons will be in shortage in 1997. The supply shortage in other products than bar will be too small in 1997 to install a new production line, which might be possible after 2002.

The above resulted from the fact that the characteristic of the steel demand by product category in Egypt is that the bars' share is very large.

On the other hand, it is estimated that the indirect demand for steel in Egypt is 700,000 tons per year according to the report prepared EGITALEC and based on IISI data. The largest part of the indirect demand will be flat products and special quality steel. In view of the above context, there might be a possibility for a new flat mill even in 1997. However, severe requirements for flat products will be met in various aspects including quality, since the users are only limited machinery industries which can easily procure their required flat products from abroad under the free market economy in Egypt.

On the contrary, in the case of bars it will be practically feasible to install a new rolling mill, since there are numerous users and a sellers' market is expected in future in Egypt.

Concerning pipes whose future demand is not forecasted in detail in this study, it is expected that the demand for welded pipes might increase in the market, mainly for construction application. Then, there might be a room for studying the possibility of a new mill for welded pipes of such general use. In addition, the hot coils for the

materials of welded pipes will be procured rather easily from international sources.

The future demand for wires is not forecasted in detail in this study because the scale of demand for wires is too small to install a new mill except a very small one.

3.4. Steel Price

3.4.1. Changes of steel price policy

The restructuring of the national economy in Egypt has been in active progress since 1991, which started from the second economic and social development plan.

In line with the adoption of thorough market price mechanism and abolishment of control prices, it was an epoch-making event on the steel price policy that Cement Sales Office was closed in July 1992. Then, steel companies in the public sector are able to decide prices of their products depending on the supply-demand conditions in the market with some exceptions.

In the meanwhile, the import duty of steel products, which had been imported by the Ministry of Housing, was 5%. Such import mechanism of steel caused the inflow of a large quantity of steel products at a dumping price around the time of collapse of COMECON, which made a very serious impact on the Egyptian steel industry which had been under restructuring. In order to get out of such a serious situation, the Government of Egypt discontinued the exclusive import of steel products by the Ministry of Housing for achieving the thorough market economy on the one hand, and raised the import duty up to 20% for protecting the domestic steel industry on the other hand.

3.4.2. Present steel price

The present price of rebars in Egypt is around L.E. 1,100/t on an average. As the market price mechanism has been functioning currently to an almost thorough extent in

Egypt, the steel price is determined in accordance with the supply-demand condition of steel products. The influence of the price of import steel is currently not so large as was in the past because of the raised import duty together with sales tax of 5%, and unloading charge of 2% and other charges like LC and transportation charged on the import steel. In addition, the recent weak trend of L.E. against US\$ functions as a kind of import barrier.

3.4.3. Prospect of steel price

The market economy will prevail furthermore in Egypt, where the steel price will be determined especially by reflecting the market condition. The fundamental factors for affecting the steel price are firstly the supply-demand condition in the domestic market, secondly the same in the international market, and then the changes of foreign exchange rate.

It is difficult to grasp in its reality as well as to forecast not only the supply-demand condition in the domestic steel market but also the trend of the national economy as the basis for the steel demand. Furthermore, the view of the future prospect is difficult to be fixed when the available statistics and data are limited.

However, it is certain that the steel price in Egypt will follow the trend in the changes in wholesale prices.

For reference, the recent situations of steel companies in the neighboring Arab countries are explained in APPENDIX 4, which are presumed not to affect Egypt seriously.

3.4.4. Distribution system

As the result of the thorough transition to the market economy in Egypt, the distribution system of steel products has been diversified. Instead of the Cement Sales Office and the Ministry of Housing, traders are performing the functions of import and distribution of steel products or steel companies deliver their products directly to customers.

Such flexible distribution system leads to higher sensitiveness of steel price in the market.

CHAPTER 4. RAW MATERIALS

4.1. Iron Ore (Pellets and Lump Ores)

4.1.1. General

Raw materials for DR plant (MIDREX Process) are iron oxide in the form of pellets or lump ores. To ensure productivity of the subsequent steelmaking process by electric arc furnaces (EAF), pellets and lump ores used in DR plant should have favorable quality such as high Fe content, compressive strength, low gangue (SiO_2 , Al_2O_3) and low impurities (P, S) as shown in Table 4.1-1.

In view of the past performance of DR plants, it is considered desirable for achieving the higher productivity that lump ores and pellets are blended at a ratio of lump ore 30% and pellets 70% in order to keep high operation temperature in the reduction furnace. However, depending on location condition (availability of pellet plant, closeness to oremines, etc.), it is necessary to take into consideration economic loss resulting from ore fines (5-10%) to be generated during transportation and handling of lump ores.

At present, there is not so much price difference between pellets and lump ores. Therefore, with the exception of DR plants which have captive mines or those which can procure lump ores at low cost as in Argentina, it is necessary to evaluate technical and economical aspects of blending of lump ores.

Table 4.1-1 Typical Specification Limits for DR-Grade Pellets and Lump Ore

	Pellets	Lump Ore
	Typical	Typical
Chemistry		
%Fe	67.0 min.	67.0 min.
%(SiO ₂ +Al ₂ O ₃)	2.0 max.	2.0 max.
%S	0.015 max.	0.015 max.
%P	0.015 max.	0.015 max.
%Cu	0.01 max.	0.01 max.
%TiO ₂	0.15 max.	0.15 max.
Size Nominal	6x16 mm	10x35 mm
% 10x35 mm	-	84.5 min.
% 9x16 mm	95 min.	-
% -5 mm	3 max.	5 max.
Tumble Strength (%+5mm)	95 min.	90 min.
% -28 mesh	4 max.	7 max.
Compressive Strength Av. (kg)	250 min.	-
% less than 50 kg	2 max.	-
MIDREX Linder (760°C)		
% metallization	93 min.	93 min.
% -3 mm degradation	2 max.	5 max.
Hot Load Test (815°C)		
Tumble strength (%+3 mm)	95 min.	90 min.
Av.comp. strength (kg)	100 min.	-
Clustering	none	none