

THE REPUBLIC OF YEMEN

YEMEN GENERAL CORPORATION FOR CEMENT INDUSTRY & MARKETING

FEASIBILITY STUDY
ON
THE EXPANSION PROJECT
OF
MAFRAQ CEMENT PLANT

MAIN REPORT

NOVEMBER, 1992

OSAKA CEMENT CO., LTD.

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Preface

In response to a request from the Government of the Republic of Yemen, the Government of Japan decided to conduct a study on the Expansion Project of the Mafraq Cement Plant and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Yemen a study team headed by Mr. Kazuo Endo, Osaka Cement Co., LTD., three times between March 1992 and September 1992.

The team held discussions with the officials concerned of the Government of Yemen, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

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

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

November 1992



Kensuke Yanagiya
President

Japan International Cooperation Agency

November 1992

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

Dear Mr. Yanagiya

Letter of Transmittal

We are pleased to submit to you the feasibility report on the Expansion Project of Mafraq Cement Plant located in southern area of The Republic of Yemen.

This feasibility study was carried out for the purpose of improving infrastructure and development of various industries in Yemen which requires increasing cement demand in the future.

The result of this study presents that current cement production is 800,000 t/y by two plants and even with addition of the production of 500,000 t/y by Mafraq Cement Plant to be completed in 1993, it will be still far from solving the supply-demand gap which means a serious problem to the country.

In particular, southern area of Yemen is forecasted to need more cement from now on for their development. Consequently, the expansion of the Mafraq Cement Plant with an additional 500,000 t/y production capacity is required to meet the demand.

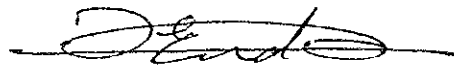
The projected plant equipment is better to be provided with latest advanced technology considering interchangeability of the existing plant together with paying attention to environmental protection in the vicinity of the plant as well. Power supply is recommended to be covered with private-owned diesel generators at the plant site due to expected power shortage in Yemen.

Water supply is necessitated to develop deep wells in order to reserve permanent water source near the plant. In conclusion, this project is regarded as feasible enough judging from economic and financial analysis with the figures, 11.8% FIRR and 15.4% EIRR respectively.

Therefore, soonest possible realization of this project as a high priority project among National Development, is hereby strongly recommended in order to meet the cement demand in the near future.

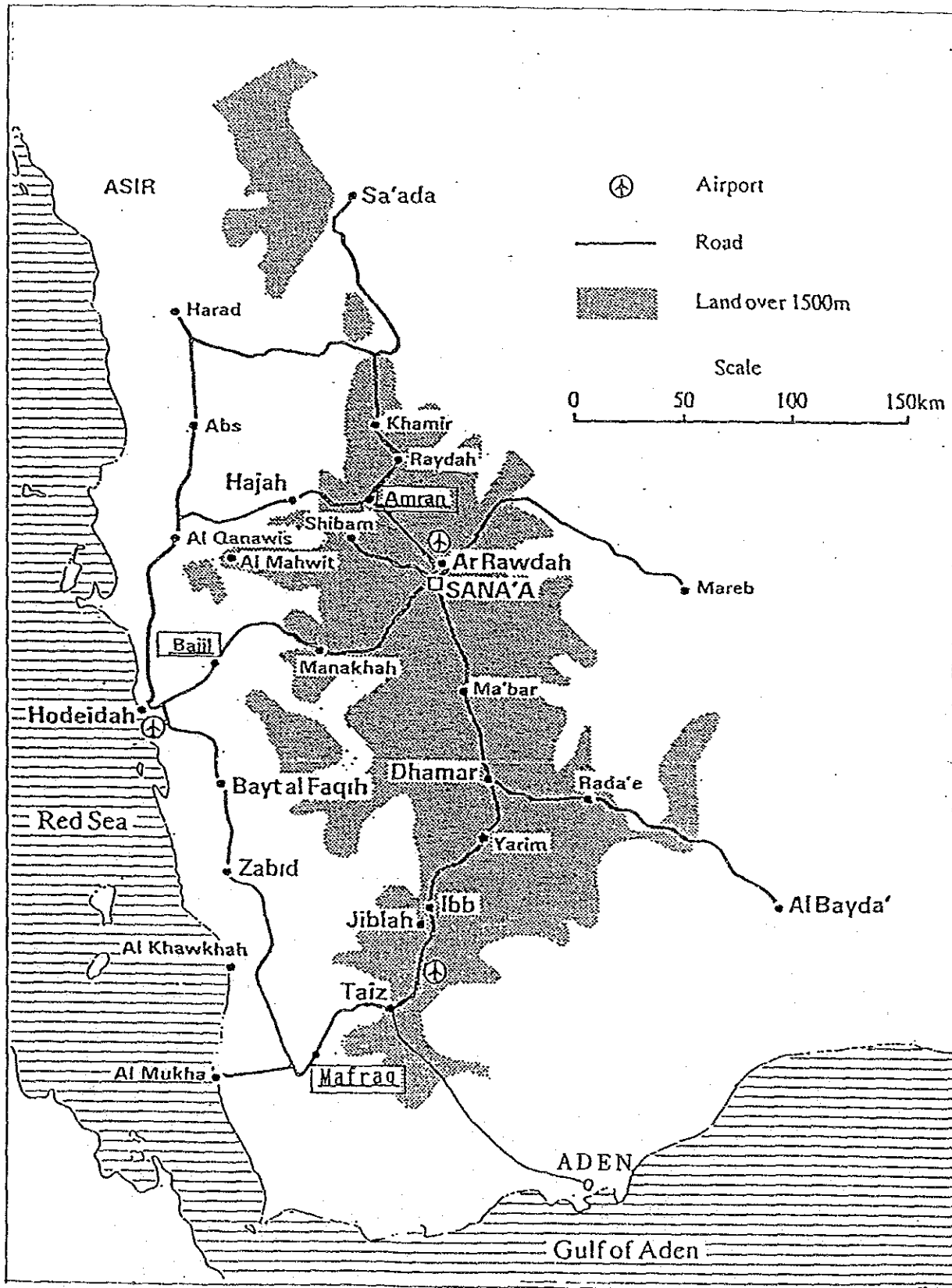
We wish to take this opportunity to express our sincere gratitude to your Agency ,the Ministry of Foreign Affair and the Ministry of International Trade & Industry. We also wish you to convey our deep gratitude to Yemen General Corporation for Cement Industry & Marketing, other authorities concerned in Yemen and Embassy of Japan for their kind cooperation and assistance extended to us during our investigations and study.

Very truly yours,



Kazuo Endo
Team Leader
Feasibility Study on
Expansion Project of
Mafraq Cement Plant

Republic of Yemen



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List of Abbreviation

MOPD	: Ministry of Planning of Development
MOI	: Ministry of Industry
MOST	: Ministry of Supply and Trade
MEW	: Ministry of Electricity and Water
YCC	: Yemen General Corporation for Cement Industry and Marketing
PEC	: Public Electricity Corporation
MOMR	: Ministry of Oil and Mineral Resources
GDE	: General Department of Hydrogeology
EPC	: Ministry of State Environment Protection Council
YGCGFT	: Yemen General Corporation for Grain and Foreign Trade
MCP	: Mafraq Cement Plant
ACP	: Amran Cement Plant
EOJ	: Embassy of Japan
OECD	: Overseas Economic Cooperation Fund
JETRO	: Japan Export and Trading Organization
JICA	: Japan International Cooperation Agency
F/S	: Feasibility Study
YR	: Yemen Ryals
\$,USD	: United States Dollars
¥,YEN	: Japanese Yen
FOB	: Free on Board
GDP	: Gross Domestic Product
FIRR	: Financial Internal Rate of Return

EIRR : Economic Internal Rate of Return
ROI : Return of Investment
NSP : New Suspension Preheater
PC : Precalciner
AQC : Air Quenching Cooler
GCT : Gas Conditioning Tower
EP : Electrostatic Precipitator
CRT : Cathode Ray Tube
T/Y, TONS/Y: Metric Tons per Year
T/M, t/m : Metric Tons per Month
T/W, t/w : Metric tons per Week
T/D, t/d : Metric Tons per day
T/H, t/h : Metric Tons per Hour
D/W, d/w : Days per Week
H/D, h/d : Hours per Day
H/W, h/w : Hours per Week
T-CL, t-cl : Metric Tons Clinker
T-CM, t-cm : Metric Tons Cement
Kcal/kg-cl: Kilocalorie per Kilogram Clinker
Kwh/t-cl : Kilowatt Hours per Tons Clinker
Nm³/h : Normal Cubic Meters per Hour
m³/h : Cubic Meters per Hour
m³/min : Cubic Meters per Minutes
m/min : Meters per Minute
m/s : Meters per Second
T/m³, t/m³ : Tons per Cubic Meters
kg/cm² : Kilogram per square centimeter
cst : Centi Stokes

MVA : Megavolts Ampares
KVA : Kilovolts Ampares
MW : Megawatt
mA : Miliampare
ASTM : American Standard of Testing Materials
BS : British Standard
JIS : Japanese Industrial Standard
SM : Silica Modulus
HM : Hydraulic Modulus
IM : Iron Modulus
LSF : Lime Saturation Factor

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1.1 Background of the Study

Cement production in republic of Yemen, as of March, 1992, is 800,000 Ton per year (Bajil Cement Plant: 300,000 Ton/Y, Amran Cement Plant: 500,000 Ton/Y), whereas, domestic demand is as high as around 1,800,000 Ton per year, leaving the balance of the demand to be taken care of by import.

Presently, a new cement plant, "Mafrag Cement Plant" is under construction with production capacity of 500,000 Ton per year under the official finance aid from Japan, of which start of operation is expected in 1993.

However, even with this production increase, it is still difficult to meet the increasing demand for those infrastructure enhancement such as road, public utilities and housings. Furthermore, as the above-mentioned existing plants are located in the northern area which cannot meet the increasing demand in the southern part, it is reasonably understandable that Mafrag cement Plant, located in the south of the Country shall be extended to meet the demand increase.

In the light of the above situation, extension of Mafrag Cement Plant, 1st line of which is being constructed as planned in the 3rd Five-Year Plan, was considered by the Government. As a result of the project selection study carried out in December, 1988 by Japan International Cooperation Agency(JICA), this project was selected as a most promising one, which was followed after that by the project confirmation mission also dispatched from the same agency in March 1989 and technical aspects of the project were confirmed. In July, 1990 official request by the Yemen Government was made to the Japanese Government for

the feasibility study. Preparatory Study Team was, therefore, dispatched in December, 1991 and scope of work(S/W) was agreed and signed between Yemen Central Corporation for Cement Industry & Marketing (YCC) and the said Agency in the wake of the discussions with the governmental departments and site surveys.

In succession to the above, the feasibility study itself has been commenced since March, 1992.

1.2 Objective of the Study

This study aims to analyze the possibility of expanding the present capacity of 500,000 Ton/Y of Mafraq Cement Plant to 1,000,000 Ton/Y in order to meet the predicted demand, both technically and economically, and to obtain conclusion and to make recommendations toward the realization of the Project.

1.3 Scope of the Study

In accordance with the scope of the study which was agreed and signed on December 15,1991 between YCC and JICA, following items were studied.

1. General aspects of the project
 - (1) Present situation of the economy
 - (2) Government policy of the cement industry
 - (3) Related laws and regulations
 - (4) Necessity of the Mafraq 2nd line plant
 - (5) Other related aspects

2. Study on the cement market in the Republic of Yemen
 - (1) Present situation of the cement industry
 - (2) Transition in cement demand and supply
 - (3) Demand forecast of cement
 - (4) Prospective market situation
 - (5) Cement price and distribution

3. Study on the Amran Cement Plant
 - (1) Outline of the plant
 - (2) Condition of the production
 - (3) Situation of the operation
 - (4) Condition of the profit
 - (5) System of training service and technical assistance service

4. Confirmation of the project of Mafraq cement plant under construction
 - (1) Schedule
 - (2) Plan of plant and related infrastructure
 - (3) Procurement of raw materials and fuels
 - (4) Plan of manpower and organization
 - (5) Plan of training service and technical assistance service
 - (6) Construction costs and production costs

5. Study on Availability to raw materials and fuel necessary for the project
 - (1) Limestone
 - (2) Clay and other sub-materials
 - (3) Fuels
 - (4) Utility

6. Study on the expansion plant and infrastructure
 - (1) Site and layout
 - (2) Technology to be introduced
 - (3) Production capacity

- (4) Possibility of the utilization of the infrastructure of the 1st line plant
 - (5) Conceptual design
7. Implementation plan of the expansion project of Mafraq Cement Plant
 - (1) Schedule
 - (2) Project organization
 - (3) Procurement of construction materials
 - (4) Enhancement of manpower and organization
 - (5) Construction costs and production costs
 - (6) Training service and technical assistance service
 - (7) Sales strategy
 8. Environmental assessment
 - (1) Related laws and regulations
 - (2) Related organizations
 - (3) Environmental assessment of the project (including 1st line)
 9. Financial and economic analysis
 10. Conclusions and recommendations

1.4 Construction of the Study Team

The study team's members and the roles are as follows;

- | | |
|-------------------------|--------------------------|
| 1. Mr. Kazuo Endo | Leader of the study team |
| 2. Mr. Yasumaru Inoue | Economist : |
| 3. Mr. Masanori Nakano | market research |
| 4. Mr. Kenji Tokuda | Quarry engineer : |
| 5. Mr. Yuji Fujii | raw material |
| 6. Mr. Tsuneo Kobayashi | Hydro-geologist : |
| | utilities(water) |
| | Electrical engineer : |
| | utilities(electricity) |
| | Mechanical engineer : |
| | plant design |

7. Mr. Haruo Araki	Production engineer : plant management
8. Mr. Takehiro Yoshimoto	Process engineer : environment
9. Mr. Masanobu Kita Mr. Yasuji Uekawa	Economist : financial/ economic analysis

1.5 Schedule of this Study

1) Preparation in Japan

The inception report and the questionnaires to Yemen were submitted after the study on the project selection study report of July, 1989, the Pre-feasibility study report of January, 1991, the feasibility study report of Mafrag existing plant and statistic data of Yemen.

2) First site investigation

The study team consisted of nine members were dispatched to Yemen on March 12, 1992 and studied the following items (See Figure 1-1):

- (1) Visit with YCC, Ministry of Industry, Ministry of Planning and Development and other governmental authorities
- (2) Survey in Amran Cement Plant and Bajil Cement Plant
- (3) Market survey in Taiz, Aden, Hodeidah
- (4) Survey in Mafrag Cement Plant
- (5) Survey in Mocha Port
- (6) Discussion with YCC

3) Analysis in Japan

Necessary analysis of the site survey and obtained documents was performed, upon which a drafting of report was started. Some supplementary items to the first survey were picked up and preparation for the 2nd field survey.

4) Second Site Investigation

5 members were dispatched for 15 days from May 15, 1992 and had meetings with YCC to explain and discuss the interim results and about the plant expansion plan. Supplementary items were surveyed through the visit with Amran Cement Plant, Mafrag Cement Plant and cities in the central and southern Yemen.
(See Figure 1-2)

5) Preparation of the Report

Based on the results of the second site investigation draft feasibility study report on the expansion project of Mafrag Cement Plant was elaborated which, through the discussion and confirmation in Yemen with YCC and sent it to YCC on the middle of August 1992.

6) Explanation and Discussion for the draft report at site

3 members including team leader were dispatched for 9 days from September 4, 1992 and had meetings with YCC to explain, discuss and confirm the content of the draft report. (See Figure 1-3)

7) Preparation of final report

Final report on the expansion project of Mafrag Cement Plant based on the mutual confirmation between YCC and JICA Study Team at the site was completed on October of

1992 and shall be sent to YCC on the beginning of November of 1992.

Figure 1-1 MAF (11) F/S 1st Site Study Schedule

Mar.12	Lv. Tokyo (AF275)				
(Thu)					
Mar.13	Lv. Paris (IY749)				
(Fri)					
Mar.14	Ar Sana'a	PM Visit to Japanese embassy, YCC, etc.			
(Sat)					
Mar.15	YCC, MOI, etc.				
(Sun)					
Mar.16	Endo	Inoue	Kobayashi	Araki/Kita/ Yoshimoto	Tokuda/Fujii/ Nakano
(Mon)	AM YCC PM to Taiz		Amran		AM YCC PM to Taiz
Mar.17	Taiz	Mafraq	AM YCC	PM to Taiz	Mafraq, Power Stat., Quarry
(Tue)					
Mar.18	Taiz	PM to Aden	Mafraq		Do
(Wed)					
Mar.19	Aden	PM to Taiz	Do		Do
(Thu)					
Mar.20	to Hodeidah			to Sana'a	
(Fri)					
Mar.21	Bajil	to Sana'a	Amran		
(Sat)					
Mar.22	YCC				
(Sun)					
Mar.23	YCC				
(Mon)					
Mar.24	Lv. Sana'a (IY740)				
(Tue)					
Mar.25	Lv. Frankfurt (LH710)				
(Wed)					
Mar.26	Av. Tokyo				
(Thu)					

Member: 1. K. Endo 6. T. Kobayashi
 2. Y. Inoue 7. H. Araki
 3. M. Nakano 8. T. Yoshimoto
 4. K. Tokuda 9. M. Kita
 5. Y. Fujii

Figure 1-3 MAF (11) F/S 3rd Site Study Schedule

Date	Schedule
Sep 4 (Fri)	Lv. Tokyo (JL 405)
5 (Sat)	Ar. Sana'a (AF 8006)
6 (Sun)	Visit to Japanese Embassy, YCC etc.
7 (Mon)	Visit to YCC
8 (Tue)	Visit to YCC, MOPD (Signed on M/M)
9 (Wed)	Internal meeting
10 (Thu)	Lv. Sana'a (LH653)
11 (Fri)	On the way (JL 408)
12 (Sat)	Ar. Tokyo

Member: 1. K. Endo
 2. T. Kobayashi
 3. Y. Uekawa

1.6 List of Contacted Personnel

Followings are the persons we have met during the site surveys.

1) Yemen General Corporation for Cement Industry & Marketing (YCC)

(1) Head Office

- a) Mr. Ali M. Hashem Chairman
- b) Mr. Ibrahim Al-Iryani General Manager
- c) Mr. Mohamaed Al-Khatari Director, Technical Bureau
- d) Mr. Husein Kabairi Assist. General Manager MCP
- e) Mr. M. Abdul Hakim Manager Technical Dept.
- f) Mr. Abdul Hakim Hadi Public Relation
- g) Mr. Ibrahim Alnahari Mafraq Project, Chairman Office
- h) Mr. Mohammed Abdul Financial Manager
 Malik
- i) Mr. Abdul Azia Nagad Cost Accountant Manager

(2) Mafraq Cement Plant

- a) Mr. Ahmed A. Othman Director General, Mafraq Cement Project
- b) Mr. Ali Ali Jubari Technical Manager
- c) Mr. Ahmed Hikel Electrical Engineer
- d) Mr. Ameen Mining Engineer

(3) Amran Cement Plant

- a) Mr. Mohammed Al-Anssi General Manager
- b) Mr. Nasser Al-Wail Assist General Manager
- c) Mr. Mohammed Moharram Technical Manager

- d) Mr. Nasser Hashim Financial Manager
- (4) Bajil Cement Plant
a) Mr. Ahmed Majam Technical Manager
- 2) Ministry of Industry (MOI)
(1) Head Office
a) Dr. Aida Salem Abood General Director of
Public and Mix
Enterprises
- (2) Aden
a) Mr. Taha Sakel General Director for
Investment
- 3) Ministry of Supply & Trade (MOST)
(1) Head Office
a) Mr. Nagib A. Hamim Director General of
Imports
- (2) Taiz
a) Mr. Mohmed Abdlah Otman General Director
- (3) Aden
a) Mr. Ali Ahmed Al-Seiagi Deputy Minister
- 4) Ministry of Planning of Development (MOPD)
a) Dr. Jaffar Hamed Deputy Minister of
Projects Programming
Sector
b) Mr. Anwar Al. Harazi Deputy Assistance for
the Sector
c) Mr. Hisham Sharaf Director General,
Abdalla Cooperation with
Industrialized States

d) Mr. Hamoud M. Al-Hamdani Director, Bilateral
Cooperation with USA,
Japan & Other
Countries

5) Ministry of Electricity & Water (MEW) (Electricity)

(1) Head Office

a) Mr. Salim Bahakim

(2) Public Electricity Corporation

a) Mr. Mohammed Abdul Malik Technical Manager

b) Mr. Ali Mahmood Abdul-Hamid G.P.M. of Sana's
Substation

c) Mr. Abudul Aziz H. Alfattah Grid Supplies to
Amran & Bajil Cement
Facilities,
Project Manager

(3) Al-Mukha Steam Power Station

a) Mr. Abdul Mageed Dahbali Manager

b) Mr. Ali Al-Attab Deputy Power Start
Manager

c) Mr. Gamssz Thabet Deputy Maintenance

d) Mr. Abdul Ghani Al-Kamshi

f) Mr. Anwar Abdo Sallah

6) Ministry of Electricity & Water (MEW) (WATER)

(1) Department of Rural Water Supply

a) Mr. Forje Technical Manager

(2) National Water and Sanitation Authority

a) Mr. Mohamed Al-Arrosi Technical Director

7) Ministry of Oil and Mineral Resources (MOMR)

General Department of Hydrogeology (GDH)

a) Mr. Mohamed Danekh General Manager

- 8) Ministry of State Environment Protection Council
(EPC)
- a) Mr. Nohsen Al-Hamdani Chairman
 Minister of State
- 9) Yemen General Corporation for Grain & Foreign Trade
(YGCGFT)
- (1) Taiz
- a) Mr. Khlid Ali-Ahmed Head Section of Sales
- 10) Port Authority
- (1) Al-mukha
- a) Mr. Mustafa Motyadin Captain
- (2) Aden
- a) Mr. Abker Hassan Dabla Captain
- 11) Ishikawajima-Harima Heavy Industries (IHI)
Mafraq Site Office
- a) Mr. T. Uchida Project Engineer
- b) Mr. R. Katoh Acting Site Manager
- c) Mr. T. Ishii Administration
 Manager
- 12) Embassy of Japan
- (1) Sana'a
- a) Mr. Kazuo Wanibuchi Ambassador Extra-
 ordinary and
 Plenipotentiary
- b) Mr. Yuichi Ishii Counselor
- c) Mr. Mitsuru Murase First Secretary
- d) Mr. Yasuo Nakano First Secretary
- (2) Aden
- a) Masashi Ikeno Minister Counselor
 & Consul, Consular
 Office of Japan

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2.1

Outline of the Country

Republic of Yemen (Yemen) is located in the South West corner of Arabian Peninsula sharing its border with Saudi Arabia to North and Oman to East and fronting to Red Sea to West and Arabian Sea to South.

It is topographically divided to four areas; the central highland area in which the capital of Yemen, Sana'a is located, the Tihamah Plains area along Red Sea coast, the hills area between the central highland and the Tihamah Plains, and the east desert area leading to Rub-Al-Khali desert from the central highland.

It has wide variety of climates such as a temperate to a tropics or a desert.

Republic of Yemen was born by the unification of Yemen Arab Republic (North Yemen) and People's Democratic Republic of Yemen (South Yemen) on May, 1990 and it has 528,000 km² domain and 12,000,000 population.

Numerous factors to the unification, such as North Yemen's consciousness to Saudi Arabia or the decline of South Yemen's dependence on USSR, can be considered and the unification has resulted in a large profit which enabled to accelerate the oil resource development in the border area of both countries, by which high economic progress is expected.

The political base is democracy with parties government and the foreign policy is neutral and anti-allied.

2.2 Present Situation of the Economy

Yemen is traditionally an agricultural country and agriculture and fishing account for about 20% of GDP as shown in Table 2.1 and about 50% of the work force is engaged in agriculture.

Recently the construction and the maintenance of dams, wadis and irrigation facilities is focused in order to introduce modern agriculture method.

Table 2-1 Industrial Structure in Yemen (GDP in 1990)

	1,000,000 YR	%
1. Agriculture, Forestry, Fishing	16,101	(20.9)
2. Mining, Quarrying	7,030	(9.1)
3. Manufacturing	6,586	(8.5)
4. Electricity, Water, Gas	1,400	(1.8)
5. Construction	3,394	(4.4)
6. Wholesale, Retail Trade	9,590	(12.4)
7. Transport, Storage, Communication	6,015	(7.8)
8. Financial Institution, Real Estate	4,929	(6.4)
9. Community, Social, Personal, Government and Other Services	18,773	(23.5)
10. Import Duties	3,996	(5.2)
<hr/>		
Total GDP	77,159	(100.0%)

For the manufacturing industry, Yemen has an oil refinery and two cement factories as a leading sector. Trade account has been chronically in deficit due to lack of exportable product except oil resource. The government strictly limits the import goods within the foreign currency reservation which affects not only medium and small scale manufacturers who mostly depend upon import for their raw materials but also the necessary supply of goods for living. Therefore, it is essential for Yemen to promote the manufacturing industry utilizing local natural resources, which will contribute to improve the balance of payment.

Before the unification each of North and South Yemen has executed their own economic plans but the new 5-year plan after unification is still under study and the interim annual plans are applied for the economic development of the unified Yemen. Each of Table 2.2 and Table 2.3 shows the construction of 5-year plans in North Yemen and the one of Governmental investment in South Yemen.

The Government is constructing the strategy of future economic development as follows:

1. Expansion of the agriculture
2. Acceleration of the oil resource development
3. Identification of the non-oil productive sector
4. Improvement of the balance of payment
5. Reinforcement of the infrastructure
6. Human resource development and generation of employment
7. Establishment of the duty-free zones in Aden

Table 2-2 CONSTRUCTION OF 5 YEAR PLAN IN YAR (%)

	1973-76		1977-81		1982-86		1987-91	
	ACTUAL	PLAN	ACTUAL	PLAN	ACTUAL	PLAN	ACTUAL	PLAN
AGRICULTURE , FORESTRY , FISHING	14.8	14.3	7	13.8	11.6	8		
MINING , QUARRYING	9.8	22.2	8.4	11.7	6.6	8.9		
MANUFACTURING			7	8.4	15.8	6.7		
ELECTRICITY , WATER , GAS				3.2	1.6	14.1		
CONSTRUCTION	10.4	2.8	6.9	3	1.6	0.5		
HOUSING		13.1	17	13.3	17.1	8		
WHOLESALE , RETAIL TRADE	4.4	3.9		10.2	4.1	5.1		
TRANSPORT , STORAGE , COMMUNICATION	31.2	30.8	24.8	16.5	14.8	12.5		
FINANCIAL INSTITUTIONS , REAL ESTATE		0.6		6.7	1.1	0.8		
OTHER SERVICES	29.4	12.3	15.9	19.4	25.7	35.4		
TOTAL	100	100	100	100	100	100		
TOTAL AMOUNT (MILLION RYALS)	936	16550	11558	28100	19871	38582		

SOURCE : CPO

Table 2-3 CONSTRUCTION OF 5 YEAR PLAN IN PDYR (%)

	1981-85	
	ACTUAL	ACTUAL
AGRICULTURE , FISHING	17	
MINING , QUARRYING	5.6	
MANUFACTURING	3.5	
ELECTRICITY , WATER	-16	
CONSTRUCTION	8.8	
HOUSING	15.4	
FOREIGN TRADE	0.9	
TRANSPORT , STORAGE , COMMUNICATION	7.9	
MEDICAL SERVICE , EDUCATION	6.7	
OTHER SERVICES , PRIVATE SERVICES	18	
TOTAL	100	
TOTAL AMOUNT (MILLION DINARS)	555.8	

SOURCE : EIU COUNTRY PROFILE

Two years have passed since the unification and the political and economic situation is still in a state of transition with numerous difficulties to be overcome. Additionally the migrations from Saudi Arabia due to Gulf Crisis and from Horn of Africa due to the civil war are causing further difficulties of unemployment and shortage of goods.

Considering present difficulties, the significant economic improvement seems to be difficult at this stage and it is expected that oil resource will vitalize the economic activities. On the other hand, such migrations from Saudi Arabia and Horn of Africa are optimistically considered that it may lead to the increasing of work force and domestic demand after successful oil resource development and economic improvement.

The oil production on a significant scale is very recent in Yemen with oil exports beginning in 1987. Until now production has been dependent on the Marib-Jawf area where production levels have reached up to 200,000 B/D. The unification has permitted an orderly oil development upon the ending of disputes over the ownership of the land adjacent to the previous borders between north and south. The pace of development is now rapid with some 20 international companies which are participating directly in exploration. Yemeni government is considering two alternative scenarios of oil production; the optimistic one involves production levels rising up to 650,000 B/D by 1996 and the realistic one is 455,000 B/D.

The significant economic progress is expected with the oil resource development and the 190% of the present GDP is set up as the middle period target of the Government up to 1996.

It shall be noted that the Government's general strategy of long period to avoid excessive dependency on the oil resource and to promote the non-oil productive sector especially in private investment, which will raise GDP, generate employment and improve the balance of payment.

2.3 Government Policy of the Cement Industry

Though the definite strategy of cement industry with quantified target is not available, following are the Government strategy for the manufacturing industry.

1. To improve the manufacturing industry;
 - which utilizes local natural resource.
 - which product should be effectively altered to import.
 - which contributes to the improvement of the balance of payment.
2. To generate the employment
3. To support reinforcement of infrastructure

Considering that improvement of the cement industry has certain relations with above conditions and the present serious shortage of the cement, the government has given the highest priority to the cement industry.

2.4 Necessity of Mafrag Expansion Plant

The present cement production capacity in Yemen is 800,000 T/Y (Bajil plant: 300,000 T/Y, Amran plant: 500,000 T/Y) whereas 10 years average consumption is at a level of 1,600,000 T/Y and the peak reaches 2,500,000 T/Y. The gap between demand and supply has been supported by import.

On the other hand, cement is essential for the targeted economic improvement and the infrastructure reinforcement of housing and road construction and about 500,000 T/Y cement import is considered to be necessary even after 1993 when new Mafraq cement plant which has 500,000 T/Y production capacity is expected to start operation.

In order to cope with, especially, future demand of the ex-South Yemen area, together with adjacent Taiz, Ibb areas which are the second and third largest cement consuming market, it shall be noted that only Mafraq cement plant has the priority for the expansion of its production capacity in comparison with the existing two cement plants (Amran, Bajil), both of which are located in North to cover the Sana'a area. Establishment of the duty-free zones in Aden is now planned which plays the important role of the economic development strategy and by which further cement demand is expected in the Southern part.

