

15-4-2 オリジナルケースにおけるオプティマムシナリオ

第 15-3-3 項におけるオリジナルケースにおいては、製品（棒鋼）の販売価格はコンサーバティブにみたのに対して、この“オリジナルケースにおけるオプティマムシナリオ”では回復、改善した鉄鋼市場にて想定される製品の販売価格を採用した。製品の販売価格を除く他の条件、前提はオリジナルケースと同じ。

(1) 販売価格及び販売計画

このシナリオでは、輸入棒鋼の C&F 価格は 305 ドル/トンと想定した。
(オリジナルケースでは 300 ドル/トン)

更に、立地上のメリットは 15 ドル/トンと想定した。
(オリジナルケースでは 10 ドル/トン)

このシナリオにおける国内、輸出別の販売価格の想定は以下の通り。

Sales prices assumption

Domestic

	(US\$/ton)
CIF price of imported steel bars	305
Import duty (5%)	15
Location advantage	15
<u>Transportation cost to Dhofar area</u>	<u>(-) 3 (US\$ 30/ton x 10%)</u>
Ex-factory domestic price	332

立地上のメリット（Location advantage）とは輸入製品との比較において輸入業者が負担しなければならない以下の費用をメリットとして考慮。（1）LCの開設費用、（2）輸入鋼材の在庫ヤードおよび在庫の維持、（3）輸入関連経費を最小限に押さえるための大量購入、（4）出荷までの諸経費。

<u>Export</u>	(US\$/ton)
CIF price of imported steel bars	305
Import duty	
(4% is accounted for GCC countries)	14
Location advantage	15
(applied for only UAE)	
(-) Transportation cost	- (T)
<u>Ex-factory export prices</u>	
for UAE	324
for Saudi, Kuwait, Bahrain	297
for Yemen, Jordan, Syria, Kenya, Tanzania, Pakistan	275
for Asia	265
<u>Weighted average export price</u>	306 309.5
	(in 2005) (in 2010)

販売計画は以下の通り。

Table 15-4-6 Sales Plan (Optimum Scenario)

Year	1st year			2nd year			3 - 7 year		
	Tonnage (‘000 tons)	@ (US\$/T)	Amount (mill. US\$)	Tonnage (‘000 tons)	@ (US\$/T)	Amount (mill. US\$)	Tonnage (‘000 tons)	@ (US\$/T)	Amount (mill. US\$)
Domestic	400	332	132.8	400	332	132.8	400	332	132.8
Export	356.6	306	109.1	662.7	306	202.8	764	306	233.8
Total	756.6	319.7	241.9	1,062.7	315.8	335.6	1,164	314.9	366.6

Year	8th year and after		
	Tonnage (‘000 tons)	@ (US\$/T)	Amount (mill. US\$)
Domestic	570	332	189.3
Export	594	309.5	183.8
Total	1,164	321	373.1

(2) 財務分析

財務分析の結果は以下の通り。

1) 損益予想

予想損益は以下の通り。

Table 15-4-7 Profit and loss (Optimum Scenario of Original Case)

(US\$ million)

Year	1	2	3	4	5	10
Sales Amount	260	336	367	367	367	373
Net Profit	(-) 24	3	18	25	31	73
Profit/sales (%)		(1%)	(5%)	(7%)	(8%)	(20%)
Cumulative profit	(-) 24	(-) 21	(-) 4	21	52	335

2) 内部収益率 (IRR)

本ケースの IRR は以下の通り。

(after tax base)

IRR (on Investment) : 12.2%

IRR (on Equity) : 13.4%

このケースにおいては、本製鉄所はオリジナルケースに比較してより高い収益と内部収益率 (IRR) を享受する事となる。しかしながら、オプティマムシナリオ (早期に実現するのは難しいと予想される) での財務分析に準拠して投資家及び融資銀行を招聘し説得するのは困難と思われる。

従って本ケースは参考として本レポートに表記した。

15-4-3 リコメンディッドケースのオプティマムシナリオ

リコメンディッドケースにおいては製品 (棒鋼) の販売価格はコンサーバティブにみたのに対して、この“リコメンディッドケースにおけるオプティマムシナリオ”では、“オリジナルケースに於けるオプティマムシナリオ”同様に、回復、改善した鉄鋼市場にて想定される製品の販売価格を採用した。

製品の販売価格を除く他の条件、前提はリコメンディッドケースと同じ。

(1) 販売価格及び販売計画

販売価格及び販売計画は“オリジナルケースにおけるオプティマムシナリオ”と同じ。

Table 15-4-8 Sales Plan (Optimum Scenario of Recommended Case)

Year	1st year			2nd year			3 - 7 year		
	Tonnage (‘000 tons)	@ (US\$/T)	Amount (mill. US\$)	Tonnage (‘000 tons)	@ (US\$/T)	Amount (mill. US\$)	Tonnage (‘000 tons)	@ (US\$/T)	Amount (mill. US\$)
Domestic	400	332	132.8	400	332	132.8	400	332	132.8
Export	356.6	306	109.1	662.7	306	202.8	764	306	233.8
Total	756.6	319.7	241.9	1,062.7	315.8	335.6	1,164	314.9	366.6

Year	8th year and after		
	Tonnage (‘000 tons)	@ (US\$/T)	Amount (mill. US\$)
Domestic	570	332	189.3
Export	594	309.5	183.8
Total	1,164	321	373.1

(2) 財務分析

財務分析の結果は以下の通り。

1) 損益予想

予想損益は以下の通り。

Table 15-4-9 Profit and loss (Optimum Scenario of Recommended Case)

Year	(US\$ million)					
	1	2	3	4	5	10
Sales Amount	260	336	367	367	367	373
Net Profit	(-) 7	24	41	48	54	96
(%)		(7%)	(11%)	(13%)	(15%)	(26%)
Cumulative profit	(-) 7	17	58	106	160	558

(2) 内部収益率 (IRR)

本ケースの IRR は以下の通り。

	(after tax base)
IRR (on Investment) :	14.8%
IRR (on Equity) :	18.2%

このケースにおいては、本製鉄所はリコメンディッドケースに比較してより高い収益と内部収益率 (IRR) を享受する事となる。しかしながら、オプティマムシナリオ (早期に実現するのは難しいと予想される) での財務分析に準拠して投資家及び融資銀行を招聘し説得するのは困難と思われる。従って本ケースは参考として本レポートに表記した。

第 16 章 国民経済分析

本製鉄所の影響、効果は以下が予想される。

- 1) 関連産業およびサポーターティング産業の発展
- 2) 直接、間接の雇用機会の増加
- 3) 人材育成の促進
- 4) オマーン国の GNP（付加価値）の増加
- 5) 外貨獲得および節約

(1) 関連産業およびサポーターティング産業の発展

製鉄所の建設及び操業を通じて、各種の経済活動が促進され、関連産業及びサポーターティング産業が発展することが期待される。

関連する産業としては

- transportation industry
- stores and warehouse
- port related services
- maintenance and repair
- energy industries including IPP

将来的には、この製鉄プロジェクトからさらには線材、高級棒鋼、鋼板のような他の鉄鋼産業への発展へとつながることも期待され、オマーン国の工業化および経済発展の基礎となることが期待される。

(2) 直接、間接の雇用機会の増加

このプロジェクトは製鉄所の操業だけで 1,239 名のジョブを創設する。

製鉄所の建設中は別途多くのジョブが創設される。

間接効果としては、関連産業およびサポーターティング産業の発展を通じて直接雇用機会の増大の数倍の雇用機会の増加が期待される。

(3) 人材育成の促進

本製鉄所の操業及びマネジメントの為には様々な技術、技能及び能力が必要であり、これらは操業開始初期における海外製鉄会社よりの技術協力を通じて修得され、技術移転されることが期待される。

かかる技術移転をスムーズに良好に行う為には、オマーン国の基礎教育および訓練システムの拡充を図ることが肝要と考えられる。

(4) オマーン国の GNP (付加価値) の増加

本製鉄所の操業を通じて、オマーン国の GNP (付加価値) の増加が期待される。

本製鉄所による付加価値の増加期待額は以下の通り。

Table 16-1-1 Expected increase of GNP (value added)

							(US\$ million)	
Year	1	2	3	4	5	10	20 year total	
GNP	47.2	76.5	92.2	99.7	105.9	146.2	2,592.0	

average: 129.6/year

Note: added value = profit before tax + depreciation + amortization + labour cost

更に、オマーン国の GNP (付加価値) は関連産業への波及効果を通じて更に増加するものと思われる。

参考に、日本の一次金属産業はその GNP (付加価値) の 1.4 - 1.5 倍の GNP を追加に創造している。

(5) 外貨獲得および節約

本プロジェクトは直接外貨を獲得すると共に、輸入棒鋼の国産品代替により外貨節約することが期待される。

一方、プラント機器代金の支払いおよび操業中の原材料および資材の購入のために外貨の支払いが行われる。

Table 16-1-2 に示す如く、外貨の獲得および外貨節約額は 20 年間で US 3,259 百万ドルと予想される。

(年平均 US 163 百万ドル)

(注): The figures for the expected increase of GNP の期待増加額及び外貨獲得、節約額はリコメンディッドケースによる。

Table 16-1-2 Foreign Currency Saving and Earning

(Original Case)

(Unit: US\$ million)

YEAR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Foreign currency earning																				
Export of bars	106.3	197.5	227.7	227.7	227.7	227.7	227.7	178.8	178.8	178.8	178.8	178.8	178.8	178.8	178.8	178.8	178.8	178.8	178.8	178.8
Foreign currency payment																				
Raw materials & supplies	82.2	115.5	126.5	126.5	126.5	126.5	126.5	126.5	126.5	126.5	126.5	126.5	126.5	126.5	126.5	126.5	126.5	126.5	126.5	126.5
Maintenance	7.3	9.5	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4
Other fixed cost	14.3	15.4	15.9	14.6	14.6	13.2	13.2	12.0	10.7	10.7	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Repayment of loans			68.6	68.6	68.6	68.6	68.6	68.6	68.6	68.6										
Repayment of interest	49.4	49.4	46.3	40.1	33.9	27.8	21.6	15.4	9.3	3.1										
Total of FC payment	153.2	189.9	287.8	260.3	254.1	246.6	240.4	233.0	225.6	219.4	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0
Net foreign currency earning	-46.9	7.6	-40.1	-32.6	-26.4	-18.9	-12.7	-54.2	-46.8	-40.6	33.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8
Foreign currency saving																				
Domestic sale of bars	128.8	128.8	128.8	128.8	128.8	128.8	128.8	128.8	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5
Total FC earning & saving	81.9	136.4	88.7	96.2	102.4	109.9	116.1	74.6	136.7	142.9	217.3	217.3	217.3	217.3	217.3	217.3	217.3	217.3	217.3	217.3

20 years total: 3,259.4

第 17 章 結論及び提言

直接還元製鉄所関連施設建設計画のフィージビリティ調査の結論は下記のとおりである。

本製鉄所の投資総額は、新発電所を除いて、設備費、操業前費用、初期運転資金および建中金利を含め 783 百万 US ドルになる。財務計算の結果は、リコメンディッドケースにおける投資総額に対する内部収益率 (ROI) が 13.7% であり、これは投資家にとって受け入れられるものである。本還元製鉄所建設計画はリコメンディッドケースにおいてフィージブルであり、建設計画に対する投資は有益であると言える。

しかしながら、発展途上国で建設される場合の経営は、金利及び為替レートの変動に左右されやすい。したがって、経営環境の変化によらず、より安定した経営基盤を整え、投資を促進するためには、輸入設備に対する輸入税や売上税の減免等の優遇措置を講ずることが望まれる。更に、生産開始後のある一定期間の法人税及び売上税の免除も望まれる。

加えて、ソハール地区におけるアルミニウム精錬プロジェクト、ペトロケミカルプロジェクトおよび本製鉄所プロジェクトに電力を供給するための民間セクターによる新発電所建設についてもオマーン政府の支援が望まれる。

一方、オマーンの国家経済への効果として、製鉄所の建設と操業は、膨大な建設用資材とスクラップや石灰石などの原料、ユーティリティを必要とし、また、本製鉄所はもとより関連産業において多くの雇用機会を創設する。

本製鉄所の製品は、その 65% 以上を輸出し、約 34% を国内に供給することで、それまでの輸入品に代替する。その結果、20 年間では US 32.6 億ドルの外貨節約となる。

したがって、本製鉄所プロジェクトは、オマーンにおける雇用機会の創設と関連産業の発展および国際収支の改善などに多くの利益をもたらすものと考えられる。

以上の結果より、調査団は、オマーンにおける還元製鉄所の建設は妥当であり、オマーンの経済発展に大きく貢献すると考える。

付 属 資 料

Appendix A1-3-1 List of Authority and Personnel (The First Field Survey - Common)

DATE	NAME OF THE ORGANIZATION	PERSON ATTENDED	TITLE	REMARKS
14-Feb-98	Embassy of Japan	H.E. Tadatsuna Koda Mr. Keiichi Matsumoto Mr. Mihara	Ambassador extraordinary and plenipotentiary First Secretary Second Secretary	All members
	Ministry of Commerce & Industry	H.E. Ali Masoud Al-Sunaidy	Undersecretary	All members
	Steering Committee;			
	Ministry of Commerce & Industry	Dr. Hamed H. Al-Dhahab	Chairman / Director General of Industry	
	Ministry of Commerce & Industry	Dr. Faisal Mohamed Elamir	Technical Adviser	
	Sultan Qaboos University	Dr. Saeed Ali Al-Araimi	Assistant Professor	
	Ministry of Foreign Affairs	Ms. Khadija Hassan	Deputy Chief of Economic & Technical Co-operation Department	
	Ministry of National Economy	Mr. Hussain Yousuf Al-Balushi	Director of Macro-planning & Studies	All members
	Ministry of National Economy	Ms. Munira M. Al-Batrani	Economic Researcher	
	Ministry of Communication	Mr. Hassan Sulaiman	Director of Port Affairs	
	Ministry of Communication	Dr. Kazuo Kudo	Adviser to the Minister (Port Affairs)	
	Ministry of Oil & Gas	Mr. Adnan Ali Al-Mudailwy	Directorate General of Gas & Petroleum Industry	
	Ministry of Electricity & Water	Mr. Saleh Al-Rashdy	Economic Researcher, Directorate General of Industry	
	Ministry of Commerce & Industry	Mr. Nabil Mubarak Al-Mukhaini		
21-Feb-98	Ministry of Commerce & Industry Salalah Branch	Mr. Abdullah Nasser Al-Ghassani Mr. Taher Abdullah Ibrahim Mr. Sami Al-Zubaidi Mr. Abdullah Al-Mamari Mr. Mohamed Ramadhan Jumman Mr. Said Salim Ali Mr. Salim Ghamem Al-Rawaj	Director General Adviser Director of Industry Financial Analysis Head of Industrial Development Section Tourism Department Manager of Commerce Department	All members
	Ministry of Communication, Directorate General of Ports & Maritime Affairs	Mr. Abdullah Bin Salem Abdul Qader Mr. Hassan Bukhit Agham Fadal	Acting General Manager, Port Raysut Director of Engineering & Maintenance	All members
22-Feb-98	Raysut Cement Company	Mr. Said Bin Ahmed Al Rawas	Managing Director	All members
24-Feb-98	Dhofar Municipality	H.E. Abdullah Aqeel	Chairman of Dhofar Municipality	Leader + 3
	Dhofar Governorate	H.E. Musallam Bin Ali Al-Busaidi	Minister of State & Governor of Dhofar	Leader + 6

Appendix A1-3-1 List of Authority and Personnel (The First Field Survey - Common)

DATE	NAME OF THE ORGANIZATION	PERSON ATTENDED	TITLE	REMARKS
25-Feb-98	Ministry of Commerce & Industry Salalah Branch	Mr. Abdullah Nasser Al-Ghassani Mr. Taher Abdullah Ibrahim Mr. Sami Al-Zubaidi Mr. Abdullah Al-Mamari Mr. Mohamed Ramadhan Jumman H.E. Tadatsuna Koda Mr. K. Matsumoto	Director General Adviser Director of Industry Financial Analysis Head of Industrial Development Section Ambassador First Secretary	Leader + 10 Leader + 2
28-Feb-98	Embassy of Japan	Dr. Hamed H. Al-Dhahab Ms. Khadija Bint Hassan Dr. Kazuo Kudo Mr. Adnan Ali Al-Mudailwy	Chairman / Director General of Industry Deputy Chief of Economic & Technical Co-operation Department Adviser to the Minister (Port Affairs) Directorate General of Gas & Petroleum Industry Directorate of Development Planning	All members
1-Mar-98	Steering Committee; Ministry of Commerce & Industry Ministry of Foreign Affairs Ministry of Communication Ministry of Oil & Gas Ministry of National Economy Ministry of Electricity & Water Ministry of Commerce & Industry Ministry of Commerce & Industry Ministry of Commerce & Industry Ministry of Commerce & Industry Sohar Industrial Estate Buraimi Industrial Estate Ministry of Commerce & Industry Sohar Municipality Ministry of Commerce & Industry Oman Mining Company LLC Ministry of Commerce & Industry Sharq Sohar Steel Rolling Mills LLC Ministry of Commerce & Industry Sohar Industrial Estate Ministry of Commerce & Industry	Mr. Hameed Bin Abdullah Al-Sadi Mr. Saleh Bin Hamoud Al-Rashidy Ms. Manal Mohammad Al-Abdawani Mr. Nabil Mubarak Al-Mukhaini Mr. Majed Bin Al-Mahroqi Eng. Hamad Bin salem Al-Mahdali Eng. Ahmed Nasser Al Bulushi Mr. Nabil Mubarak Al-Mukhaini H.E. Sheik Ahmed Bin Abdullah Al-K Mr. Nabil Mubarak Al-Mukhaini Mr. Ali Said Abdullah Al-Waily Mr. Nabil Mubarak Al-Mukhaini Mr. Sundeep Rao Mr. Nabil Mubarak Al-Mukhaini Mr. Abdul Nabi Ahmed Al-Baloushi Mr. Nabil Mubarak Al-Mukhaini	Estate Director Supervisor Economic Researcher, D.G. of Industry Wali of Sohar Economic Researcher, D.G. of Industry Deputy General Manager Economic Researcher, D.G. of Industry Economic Researcher, D.G. of Industry Director General of Industrial Estate Economic Researcher, D.G. of Industry	All members Leader + 2 All members All members Leader + 1
2-Mar-98	Ministry of Commerce & Industry	Mr. Nabil Mubarak Al-Mukhaini	Economic Researcher, D.G. of Industry	Leader + 1

Appendix A1-3-1 List of Authority and Personnel (The First Field Survey - Common)

DATE	NAME OF THE ORGANIZATION	PERSON ATTENDED	TITLE	REMARKS
7-Mar-98	Ministry of Commerce & Industry	Mr.Hamed H. Al-Dhahab	Chairman of Steering Committee	Leader
9-Mar-98	Ministry of Commerce & Industry	H.E.Maqbool Bin Ali Sultan	Minister of Commerce & Industry	All members
	Ministry of Commerce & Industry	Dr.Hamed H. Al-Dhahab	Director General of Industry	All members
9-Mar-98	Ministry of Commerce & Industry	Dr.Faisal Mohamed Elamir Mr.Nabil Mubarak Al-Mukhaini	Technical Adviser Economic Researcher, Directorate General of Industry	All members
		Mr.Majed Bin Al-Mahroqi	Directorate of Industry	
	Ministry of Foreign Affairs	H.E. Yousuf Bin Alawi Bin Abdullah Mr. H.B.Nasser B.Mansoor Al Tobi	Minister of Foreign Affairs Chief of Asian Department	
	Embassy of Japan	Mr.Awadi B.Badr B.Maree Al Shanfar H.E. Tadatsuna Koda Mr.K. Matsumoto	Chief of Economic & Technical Cooperation Ambassador First Secretary	Leader + 2
10-Mar-98		H.E.Mohammed Bin Al Zubair Bin Al	His Majesty the Sultan's Adviser for Economic Planning Affairs, President of Sultan Qaboos University	Leader +2
	Embassy of Japan	H.E. Tadatsuna Koda Mr.K. Matsumoto	Ambassador of Japan First Secretary	
11-Mar-98	Steering Committee	Dr.Hamed H. Al-Dhahab and other members	Chairman / Director General of Industry	Leader + 9
14-Mar-98	Steering Committee	Dr.Hamed H. Al-Dhahab and other members	Chairman / Director General of Industry	Leader + 9
15-Mar-98	Embassy of Japan	H.E. Tadatsuna Koda Mr.K. Matsumoto	Ambassador of Japan First Secretary	Leader + 9

Appendix A1-3-1 List of Authority and Personnel (The First Field Survey - Gr.-A)

DATE	NAME OF THE ORGANIZATION	PERSON ATTENDED	TITLE	REMARKS
Mar. 04	Ministry of Oil & Gas	Mr. Adnan A. Al-Mudaiby Mr. Suleiman S. Al Balushi Mr. Adnan. Dhalher Mr. Paul C. Den. Reijer Mr. Kevin J. Pascoe	Directorate General of Gas Deputy Director General of Gas & Petroleum Industry Advisor of Gas Project Government Gas Studies Team Leader AEG/1 POD Head of Government Gas Operation & Engineering AGG PDO	
Mar. 07	Muscat Municipality	Mr. Said Mohammed Al-Qasimi Mr. Salem Al-Sheedy Mr. Majed Al-Mahrogi	Director of Health Engineering Dept. Muscat Municipality Engineer of Health Engineering Dept. Muscat Municipality MOCI	
	Telegraph & Telephones General Telecommunications	Mr. Abdullah Issa Salim Al-Rawahy Mr. Majed Al-Mahrogi	Directorate General Strategic Planning and Projects MOCI	

Appendix A1-3-1 List of Authority and Personnel (The First Field Survey - Gr.-B)

DATE	NAME OF THE ORGANIZATION	PERSON ATTENDED	TITLE	REMARKS
Feb. 17	Ministry of Finance	Mr. Ali Mohd. Redha Jafar	Director- Loan Department	
	Ministry of Finance	Ms. Saif Al-Shemly	Director General of Income Tax Dept.	
Feb. 18	Ministry of Commerce & Industry	Mr. Salah Mohamed Abd	Industrial Engineering Expert	
	Central Bank of Oman	Mr. Ali Hamdan Al-Raesi	Manager, Research & Statistics	
	Ministry of Finance	Mr. Raji	Tax Expert, Income Tax Dept.	
	Ministry of Finance	Mr. Sultan	Director, Custom Duty	
Feb. 23	MOCI Salalah Branch	Mr. Sami Al-Zubaidi	Director of Industry	
	Hamdan Trading Group	Mr. Thomas Jacob	Supervisor	
Mar. 3	Amiantit Oman	Mr. C. N. Raorane	General Manager	Manufacturer
	Al-Khouth Steel Furniture Industrial Co.	Mr. Thomas Joseph	General Manager	Manufacturer
	Chain link Fencing Co.	Mr. Subash Kumar. P. T.	Production Engineer	Manufacturer
	Muscat Industry Company	Mr. Ravi K. Toprani	General Manager	Manufacturer
Mar. 4	Ministry of National Economy	Mr. Mahmood Al Bahlan	Acting Director General	
	Ministry of National Economy	Mr. Hussain Yousuf Al Balushi	Director of Macroplanning & Studies	
	Ministry of National Economy	Dr. R. L. Chawla	Consultant	
	Ministry of National Economy	Dr. Mahmood El Sayed Mahgoub	Economic Consultant	
	Ministry of National Economy	Mr. Al Bahlani	Macro Economy	
	Ministry of National Economy	Mr. Humaid Al Saadi	Macro Economy	
	Ministry of National Economy	Mr. Said Mohammed Al Masoud	Director of Natural Resource	
	Ministry of National Economy	Mr. Khalid Al Zakwani	Director of Manpower Planning	
	Ministry of National Economy	Eng. Khamis A Al Shandoudi	Director of Regional Development & Infrastructure	
	Ministry of National Economy	Mr. Ali M. Hassan	Director of Social Statistics	
	Suhail & Saud Bahwan Building Materials	Mr. Ajay Aggarwal	General Manager	
	Oman Cans Industry LLC	Mr. Afroz Hadi	Sales Manager	
	Oman Cans Industry LLC	Mr. S. V. Sanil	Plant Engineer	

Appendix A1-3-1 List of Authority and Personnel (The First Field Survey - Gr.-C)

DATE	NAME OF THE ORGANIZATION	PERSON ATTENDED	TITLE	REMARKS
16-Feb-98	Ministry of Communications Directorate General of Port & Maritime	Mr. Jamal T. Aziz Mr. Hussan Slamam Dr. Kazuo Kudo Mr. Masataka Oyadomari	Director General Manager Adviser to the Minister (JICA)	
17-Feb-98	Ministry of Communications Directorate General of Port & Maritime	Mr. Jamal T. Aziz Dr. Kazuo Kudo Mr. Masataka Oyadomari	Director General Adviser to the Minister (JICA) Adviser to the Minister (JICA)	Leader + C
18-Feb-98	Ministry of Communications Directorate General of Port & Maritime	Dr. Kazuo Kudo Mr. Masataka Oyadomari	Adviser to the Minister (JICA) Adviser to the Minister (JICA)	
21-Feb-98	Ministry of Communications, Raysut Port Directorate General of Communications	Mr. Abudullah Bin Salem Abdul Qader Mr. Hassan Bukit Agham Fadal	AG Manager, Port Raysut Director of Engineering & Maintenance	Leader + C
22-Feb-98	Ministry of Housing Physical Planning Section Han-Padoron Associates	Mr. Ahmed Ali Alhabshi Mr. Abdul Manan A. Jabal Mr. John H. Rosser B. SC Mr. Jack Fernandez Mr. Gavin D. Lloyd	Director Planning & Survey Town Planner Resident Engineer Consulting Engineer Asst. Resident Engineer	
23-Feb-98	Han-Padoron Associates	Mr. John H. Rosser B. SC Mr. Gavin D. Lloyd	Resident Engineer Asst. Resident Engineer	
25-Feb-98	Ministry of Communications, Raysut Port Directorate General of Communications	Mr. Abudullah Bin Salem Abdul Qader Mr. Hassan Bukit Agham Fadal	AG Manager, Port Raysut Director of Engineering & Maintenance	Leader+C+E
3-Mar-98	Ministry of Communications Directorate General of Port & Maritime	Dr. Kazuo Kudo Mr. Masataka Oyadomari	Adviser to the Minister (JICA) Adviser to the Minister (JICA)	
4-Mar-98	Wimoy Alawi LLC Galfar Engineering & Contracting LLC	Mr. A.J.Barclay Mr. Salem Saeed Hamed Al fannab Al Araimi Mr. A. Naushad	Regional Quantity Surveyor Group Chairman Business Development Manager	
7-Mar-98	Bahwan Engineering Co. LLC	Mr. Suresh K. Virmani Mr.C.K.Khanna Mr.DC.Munshi	General Manager Senior Manager Manager	

Appendix AI-3-1 LIST OF AUTHORITY AND PERSONNEL (THE FIRST FIELD SURVEY "01.98")

DATE	NAME OF THE ORGANIZATION	PERSON ATTENDED	TITLE	REMARKS
16-Feb-98	Ministry of Higher Education	Mr.Soud M. Al-Timani Dr. Adnan A. Al-Haji	Director General Director, Department of Information & Statistics	
		Dr. Taha Sultan Al-Mugheiry Mr.Rashid Mr.Nabil Mubarak Al-Mukhaini	Technical Expert Directorate General Institute and College Economic Researcher, MOCI	
17-Feb-98	Ministry of Regional Municipalities and Environment	Eng. Fatima Al-farsy Mr. Leszek Kuczynski Mr.Nabil Mubarak Al-Mukhaini	Environmental Planning Expert Environmental Planning Expert Economic Researcher, MOCI	
18-Feb-98	Caledonian College of Engineering	Dr. Raveendra K. Rao Mr. A. Nizamuddin Ahmed Mr.M. Madhava Rao Mr.Majed Rashed Al-Mahroqi	Deputy Principal Chief Administrator Head of Mechanical Engineering MOCI	
23-Feb-98	Department Salalah Airport	Mr.Mohamed Dhofar Mr. Amin Saad	System Manager MOCI, Salalah	
24-Feb-98	Environment / Governorate of Dhofar	Mr.Salim Mussdrim Ali Boit Saeed Mr. Fayez Bataunch Mr. Abdullah Seif	Director General of Environment Senior Inspector Water and Waste Pollution MOCI, Salalah	
	High Institute of Administrative and Technical Sciences	Mr.Taniyan Bin Bakheet M. Al-Ghazal Mr. Mohammad A.A.Matarnek Ms. Carys Cororan Mr. Abdullah Seif	General Manager Dy. Manager Quality Control Administration Internal Verifier MOCI, Salalah	
	Ministry of Health	Mr. Salim Hassan Ba-Alim Mr. Abdullah Seif	Director General Health Services-Dhofar MOCI, Salalah	
25-Feb-98	Ministry of Education, Salalah	Mr. Salim Ahmed Al Ghassani Mr.Mohamed Hussain Al Mashoor Mr. Abdullah Seif	Director of Planning Department Dy. Director of Planning Department MOCI, Salalah	
	Ministry of Housing, Salalah	Mr.A.Al Habshi Mr. Abdullah Seif	Director of Planning and Survey MOCI, Salalah	
3-Mar-98	Ghubrah Power and Desalination Plant	Mr. Ribhi Hamdan Mr.P.K.Mukerjee Mr.Ahmed K.M.Kenawy Mr. Mohammad Salem Al Chailani Mr.Majed Rashed Al-Mahroqi	Plant Manager, SOGEX Chief Chemist, SOGEX Training Officer, SOGEX MOEW MOCI	

Appendix A1-3-1 List of Authority and Personnel (The First Field Survey -Gr.-D)

DATE	NAME OF THE ORGANIZATION	PERSON ATTENDED	TITLE	REMARKS
4-Mar-98	Ministry of Regional Municipalities and Environment	Mr. Leszek Kuczynski	Environmental Planning Expert	
5-Mar-98	United Engineering Services	Mr. Vishwanarayan Mr. Sriram Iyer Mr. V.R.Jayarajan Mr. Pramod Balakrishnan Mr. Oswal Jacob	Manager Senior Sales Engineer Sales Engineer Financial Controller Production Manager, Grit Blasting & Planning Dept.	
7-Mar-98	Ministry of Social Affairs & Labor	Mr. Ahmed Bin Salem A. Al-shanfari Mr. Odeh El Majali Mr. Nabil Mubarak Al-Mukhaini	Director General, Vocational Training Vocational Counselor Economic Researcher, MOCI	
17-Mar-98	Hitachi Zosen, Ghubrah Power & Distribution Plant IHI, Oman Cement Co. (Rusayl Cement Works Expansion)	Mr. Kunio Shigemasa Mr. Takeshi Miyazawa Mr. Takeshi Kimura	Site Manager Site Manager Manager	

Appendix A1-3-1 List of Authority and Personnel (The First Field Survey - Gr.-E)

DATE	NAME OF THE ORGANIZATION	PERSON ATTENDED	TITLE	REMARKS
Feb. 15	Ministry of Commerce and Industry	Dr. Hamed H. Al-Dahab	Director General of Industry	Clarification of questionnaire
Feb. 17	Ministry of Commerce and Industry (MOCI)	Dr. Faisal Mohamed Elamir	Advisor	1. Explanation of preliminary conceptual study on the planned steel plant 2. Clarification of raw materials
Feb. 18	Ministry of Commerce and Industry	Dr. Hamed H. Al-Dahab Dr. Faisal Mohamed Elamir	Director General of Industry Advisor	Clarification of questionnaire
Feb. 22	Salalah Branch of MOCI	Mr. Khalid Ahmed Bamkhalif Mr. Mohammed Ishag Khalifa	General Manager of Mineral Geologist of Mineral	Clarification of burnt lime and limestone in Salalah
Feb. 23	Raysut Cement Co. Salalah Branch of MOCI	Mr. Said Bin Ahmed Al-Rawas Mr. Mohammed Ishag Khalifa Mr. Said Mongher Balhaf	Managing Director Geologist of Mineral Mining Engineer	Hearing of cement plant Visit to the limestone deposits
Feb. 24	ASSAG ADDHABI TRADING CO.	Mr. Ameen S. Juman Mr. Omer Mohamed Fadhil with other two persons	Salalah Branch of MOCI Managing Director	Investigation of operational consumables and materials
Mar. 02	SHANFARI AND PARTNERS CO. Oman Mining Co. SHARQ SOHAR STEEL ROLLING MILLS LLC	Mr. Ameen S. Juman Mr. Ahmed Bin Abdullah Mahfooz Al-Shaikh Mr. Ali Said Abdullah Al-Waily Mr. Sundeeep Rao	Salalah Branch of MOCI Managing Director Deputy General Manager Engineer	Investigation of construction Hearing of copper refinery Hearing of rolling mill
Mar. 03	OMAN METAL INDUSTRIES BILAD (OMAN) LLC OMAN STEEL CO. LLC.	Mr. Suresh K. Pillai Mr. Osama M. M. H. Nimer Mr. Ghassan Souki Mr. V. S. Govindrajan Mr. V. V. Subramaniam Mr. R. Venkataraman Mr. George Carr Mr. T. Ashraf Ali A. V. Balakrishnan B. R. Srikanth	Sr. Marketing Engineer Design Dept. Manager General Manager General Manager Contracts Manager Project Manager - Power Project General Manager Manager (Design & Estimation) Engineering Manager Operations Manager	Investigation of fabrication Investigation of fabrication Investigation of fabrication
Mar. 04	AL MUTAHIDHA CO. LLC. ELCO INDUSTRIAL & TRADING Co. LLC	Mr. M. S. Vishwanarayan Mr. Sriam Iyer Mr. V. R. Jayarajan Mr. Oswald Jacob Mr. Pramod Balakrishnan	Manager Senior Sales Manager Sales Manager Production Manager Financial Controller	Investigation of fabrication
Mar. 05	United Engineering Services LLC			

Appendix A1-3-2 List of Authority and Personnel (The Second Field Survey - Common)

DATE	NAME OF THE ORGANIZATION	PERSON ATTENDED	TITLE	REMARKS
24-Jun-98	Embassy of Japan	Mr. Iwata Mr. Keiichi Matsumoto	Councilor First Secretary	All members (10 persons)
	Ministry of Commerce & Industry	Dr. Hamed H. Al-Dhahab Dr. Faisal Mohamed Elamir Mr. Saoud Bin Nasser Al-Khusaibi Mr. Nabil Mubarak Al-Mukhaini	Director General of Industry Technical Adviser Director of Industrial Planning & Studies Economic Researcher, Directorate General Industry First Secretary	All members (10 persons)
27-Jun-98	Observer, Japan Embassy	Mr. Keiichi Matsumoto	First Secretary	
	Steering Committee;			
	Ministry of Commerce & Industry	Dr. Hamed H. Al-Dhahab	Chairman / Director General of Industry	All members (13 persons)
	Ministry of Commerce & Industry	Dr. Faisal Mohamed Elamir	Technical Adviser	
	Ministry of Commerce & Industry	Mr. Saoud Bin Nasser Al-Khusaibi	Director of Industrial Planning & Studies	
	Ministry of Commerce & Industry	Mr. Nabil Mubarak Al-Mukhaini	Economic Researcher, Directorate General of Industry	
	Ministry of Foreign Affairs	Mr. Mabrook Mubarak Al-Hinai	Director of Macro-planning & Studies	
	Ministry of National Economy	Mr. Hussain Yousuf Al-Balushi	Director of Port Affairs	
	Ministry of Communication	Mr. Hassan Sulaiman Almugaini	Adviser to the Minister (Port Affairs)	
	Ministry of Communication	Mr. Hiroshi Sasajima	Directorate General of Gas & Petroleum Industry	
Ministry of Oil & Gas	Mr. Adnan Ali Al-Mudailwi	First Secretary		
Observer, Japan Embassy	Mr. Keiichi Matsumoto	First Secretary		
29-Jun-98	Ministry of Foreign Affairs	H.E. Yousuf Bin Alawi Bin Abdullah Mr. H.B. Nasser B. Mansoor Al Tobi Mr. Awadi B. Badr B. Maree Al Shanfari Mr. Iwata	Minister of Foreign Affairs Chief of Asian Department Chief of Economic & Technical Cooperation Councilor	Leader + 2
	Embassy of Japan	Mr. K. Matsumoto	First Secretary	
30-Jun-98	Sohar Industrial Estate	Eng. Hamad Bin Salem Al-Mahdali	Estate Director	All members (13 person)
	Ministry of Commerce & Industry	Eng. Abdulqader Salem Al-Bulushi Mr. Nabil Mubarak Al-Mukhaini	Civil Engineer Economic Researcher, Directorate General of Industry	
	Ministry of Commerce & Industry	Mr. Ahmed Nasser Mr. Sulaiman	In charge of Industry In charge of Tourism	
4-Jul-98	Ministry of Commerce & Industry	Mr. Abdullah Nasser Al-Ghassani	Director General	All members
	Salalah Branch	Mr. Abdulaziz Awad Al-Ghassani Mr. Taher Abdullah Ibrahim	Acting Director General Adviser	

Appendix A1-3-2 List of Authority and Personnel (The Second Field Survey - Common)

DATE	NAME OF THE ORGANIZATION	PERSON ATTENDED	TITLE	REMARKS
		Mr.Sami Omar Al-Zubaidi Mr.Mohamed Ramadhan Jumman Mr.Abdullah Saif Al Mamari Mr.Amin Saad Jumaan	Director of Industry Head of Industrial Development Section Financial Analyst Head of Follow-up Section	(11 persons)
5-Jul-98	Ministry of Commerce & Industry Salalah Branch	Mr.Abdullah Nasser Al-Ghassani Mr.Taher Abdullah Ibrahim Mr.Sami Omar Al-Zubaidi Mr.Abdullah Al-Mamari Mr.Mohamed Ramadhan Jumman	Director General Adviser Director of Industry Financial Analyst Head of Industrial Development Section	All members (11 persons)
6-Jul-98	Ministry of Commerce & Industry	Dr.Hamed H. Al-Dhahab Mr.Nabil Mubarak Al-Mukhaini	Chairman / Director General of Industry Economic Researcher, Directorate General of Industry	Leader+1
8-Jul-98	Ministry of Commerce & Industry Steering Committee; Ministry of Commerce & Industry Ministry of Commerce & Industry Ministry of Communications Ministry of Communications Ministry of Oil & Gas Ministry of National Economy Ministry of Electricity & Water Ministry of Commerce & Industry Ministry of Commerce & Industry	H.E. Ali Masoud Al-Sunaidy Dr.Hamed H. Al-Dhahab Dr.Faisal Mohamed Elamir Mr. Hiroshi Sasajima Mr.Hassan Sulaiman Almugaini Mr.Adnan Ali Al-Mudailwy Mr.Hameed Bin Abdullah Al-Sadi Mr. P.C. Cherian Mr.Saoud Bin Nasser Al-Khusaibi Mr.Nabil Mubarak Al-Mukhaini	Undersecretary Chairman / Director General of Industry Technical Adviser Adviser to the Minister (Port Affairs) Director of Port Affairs Directorate General of Gas & Petroleum Industry Directorate of Development Planning Director of Industrial Planning & Studies Economic Researcher, Directorate General of Industry	All members (13 persons)
11-Jul-98	Ministry of Communications Embassy of Japan	H.E. Salim bin Abdullah al Ghazali Mr.Iwata Mr.K.Matsumoto	Minister of Communications Councilor First Secretary	Leader + 2
12-Jul-98	Embassy of Japan	Mr.Iwamoto Mr.K.Matsumoto	Councilor First Secretary	All members (13 persons)

Appendix A1-3-2 Authority and Personnel (The Second Field Survey - Gr.-A)

DATE	NAME OF THE ORGANIZATION	PERSON ATTENDED	TITLE	REMARKS
28-Jun-98	Ministry of Oil & Gas	Mr. Adnan Ali Al-Mudailwi Mr. Kevin J. Pascoe	Directorate General of Gas & Petroleum Industry Head of Government Gas Operation & Engineering AGG PDO	
29-Jun-98	Ministry of Electricity & Water Ministry of Commerce & Industry	Mr. Mohd. Redha Hassan Ali Mr. Nabil Mubarak Al-Mukhaimi	Director General of Electric Economic Researcher, Directorate General of Industry	
30-Jun-98	Wadi Jizzi Power Station Ministry of Commerce & Industry	Mr. Manny Arquero Mr. Nabil Mubarak Al-Mukhaimi	Head of Wadi Jizzi P/S Manager Economic Researcher, Directorate General of Industry	
1-Jul-98	Sohar Fishery Department Ministry of Commerce & Industry	Mr. Yaqub Al Ghassany Mr. Ali Al A Jami Mr. Nabil Mubarak Al-Mukhaimi	Director of department of MOAF Technician of Fishery Tools Economic Researcher, Directorate General of Industry	
	Sohar Development Office Ministry of Commerce & Industry	Mr. Saleh Ali Al Hashme Mr. Mohamed Ali Al Kishri Mr. Khadeem Ali Al Omrani Mr. Nabil Mubarak Al-Mukhaimi	Director General of SDO Director of Water Dept. Dy. Director of Water Dept. Economic Researcher, Directorate General of Industry	
4-Jul-98	Salalah Sanitary Drainage Services Co. SSD. Co.	Mr. Barik Saeed Ahmed Amer Al-Rawas Mr. Yusri Ali Hassan	Acting General Manager Technical Adviser	
5-Jul-98	Ministry of Electricity & Water MOCI, Salalah	Mr. Said Omar Al-Abadi Mr. Mohamed Ramadhan Jumaan	Generation Manager	Leader + A
6-Jul-98	Ministry of Regional Municipalities & Environment Ministry of Commerce & Industry	Mr. Salim Abdullah Hamid Al-Jufail Mr. Nabil Mubarak Al-Mukhaimi	Head of Marine Pollution Section, Directorate General of Environment Affairs Economic Researcher, Directorate General of Industry	

Appendix A1-3-2 List of Authority and Personnel (The Second Field Survey - Gr.-B)

DATE	NAME OF THE ORGANIZATION	PERSON ATTENDED	TITLE	REMARKS
1-Jul-98	Al Mutahida Transportation Co.	Mr. George Car	General Manager	
4-Jul-98	Ministry of Commerce & Industry	Dr.Faisal Mohamed Elamir	Technical Adviser	

Appendix A1-3-2 List of Authority and Personnel (The Second Field Survey - Gr.-C)

DATE	NAME OF THE ORGANIZATION	PERSON ATTENDED	TITLE	REMARKS
28-Jun-98	Ministry of Communications Directorate General of Port & Maritime	Mr. Jamal T. Aziz Mr. Khalid Mirza Mr. Hiroshi Sasajima	Director General Engineer Adviser to the Minister (JICA) Adviser to the Minister (JICA)	
29-Jun-98	Ministry of Communications Directorate General of Port & Maritime	Mr. Hiroshi Sasajima		
1-Jul-98	Oman LNG LLC. Sur Office TAISEI Corporation	Mr. Ali Juma Al-Musharafi Mr. Mikio Takeda Mr. Masaru Furukawa Mr. H. Kobayashi	Head of Sur Office General Project Manager Oman LNG Proj. Adm.. Manager Oman LNG Proj. Chief Executive and Project Director	
4-Jul-98	Chiyoda-Foster Wheeler and Co. LLC. Ministry of Communications, Raysut Port Han-Padoron Associates	Mr. Abudullah Bin Salem Abdul Qader Mr. Gavin D. Lloyd	AG Manager, Port Raysut Asst. Resident Engineer	
5 Jul. 98	Han-Padoron Associates	Mr. Gavin D. Lloyd	Asst. Resident Engineer	
8-Jul-98	Ministry of Communications Directorate General of Port & Maritime	Mr. Hiroshi Sasajima	Adviser to the Minister (JICA)	

Appendix A1-3-2 List of Authority and Personnel (The Second Field Survey - 2002)

DATE	NAME OF THE ORGANIZATION	PERSON ATTENDED	TITLE	REMARKS
28-Jun-98	Ministry of Regional Municipalities and Environment	Mr. Nabil Habib Al-Lawatiya Mr. Leszek Kuczynski Mr. M/S. Hashami Mr. Nabil Mubarak Al-Mukhaini	Act. Head Environment Div. Sec. Environmental Planning Expert Controller of Air Pollution Economic Researcher, MOCI	
29-Jun-98	SPECO	Mr. Ullas Mr. Morita	Nissho Iwai	
4-Jul-98	High Institute of Administrative and Technical Sciences	Mr. George Robert Mr. Tanyan Bin Bakheet M. Al-Ghazal Mr. Amin Saad	Project Manager for HIAT General Manager MOCI, Salalah	
5-Jul-98	Salalah Technical Industrial College	Dr. Hasan M. Tantawi Dr. Ayman Al-Maaitah Mr. Amin Saad	Director Head of Engineering Dept. MOCI, Salalah	
6-Jul-98	Ministry of Regional Municipalities and Environment	Mr. Salim Abdullah Hamid Al-Jufaili	Head of Marine Pollution Section	

Appendix A1-3-2 List Of Authority and Personnel (The Second Field Survey - Gr.-E)

DATE	NAME OF THE ORGANIZATION	PERSON ATTENDED	TITLE	REMARKS
June 28	MOCI (Mineral) Mr. Ahmed Nasser Khalfan	Dr. Hayat AAEQidwai Mr. Ahmed Nasser Khalfan	Geological Expert, DGM Geologist of Geological Survey Department	Clarification of questionnaire for limestone in Sohar
	MOCI	Dr. Hamed H. Al-Dahab Dr. Faisal Mohamed Elamir	Director General of Industry Advisor	Explanation of the main process facilities for the Steel Complex in INTERIM REPORT
June 29	SPECO (Scrap Processing & Earth Moving Co. LLC.)	Mr. Ullas	Officer	Hearing of steel crap in Oman
June 30	MOCI (Mineral)	Mr. Ahmed Nasser Khalfan	Geologist of Geological Survey Department	Visit to the limestone deposits in Sohar
	Oman Mining Co. (Mining Site of Limestone)	Mr. Farah	Mobile Crusher Foreman Site Quarry	Hearing of limestone in Sohar
July 01	MOCI	Dr. Hamed H. Al-Dahab Dr. Faisal Mohamed Elamir	Director General of Industry Advisor	Explanation of the main process facilities for the Steel Complex in INTERIM REPORT
July 05	Salalah Branch of MOCI (Mineral)	Mr. Khalid Musallem Rawas Mr. Mohammed Ishag Khalifa	Director of Quarries Geologist of Mineral	Hearing of limestone in Salalah
July 06	MOCI (Mineral)	Mr. Salim Omer Abdullah Ibrahim Dr. Hilal Mohammed Sultan Al Azri Dr. Hayat AAEQidwai Mr. Ahmed Nasser Khalfan Mr. Ryoichi Nobumoto	Director of Mineral Exploration Deputy Director General of Mineral Geological Expert, DGM Geologist of Geological Survey Department Directorate General of Minerals (from JICA)	Hearing of limestone in Sohar

Appendix A1-3-3 List of Authority and Personnel (The Third Field Survey - Common)

DATE	NAME OF THE ORGANIZATION	PERSON ATTENDED	TITLE	REMARKS
2-Sep-98	Embassy of Japan	Mr. Yoshimasa Iwata Mr. Kiyoshi Mihara	Minister Special Assistant	All members (4 persons)
	Steering Committee; Ministry of Commerce & Industry Ministry of Commerce & Industry Ministry of Commerce & Industry Ministry of Commerce & Industry Ministry of Commerce & Industry Ministry of Commerce & Industry Ministry of Foreign Affairs Ministry of Communications Ministry of Communications Ministry of Oil & Gas Ministry of Electricity & Water Observer; Embassy of Japan Greeting; Ministry of Commerce & Industry Ministry of Communications Embassy of Japan	Dr. Hamed H. Al-Dhahab Dr. Faisal Mohamed Elamir Mr. Saoud Bin Nasser Al-Khusaibi Ms. Manal bint Mohammad Al-Abdawani Mr. Nabil Mubarak Al-Mukhaini Mr. Majed Al-Mahrogi Mr. Yousef Said Al-Amri Mr. Khalid Mirza Mr. Hiroshi Sasajima Mr. Adnan Ali Al-Mudailwi Mr. Salem bin Hashim Al-Rashdi Mr. K. Mihara	Chairman / Director General of Industry Technical Adviser Director of Industrial Planning & Studies Director Economic Researcher, Directorate General of Ind. Directorate General of Industry Engineer of Port Affairs Adviser to the Minister (Port Affairs) Directorate General of Gas & Petroleum Ind. Special Assistant	All members
4-Sep-98	Embassy of Japan	H.E. Maqbool Bin Ali Sultan H.E. Salim bin Abdullah al Ghazali Mr. Jamal Aziz Mr. Khalid Mirza Mr. Hiroshi Sasajima Mr. Y. Iwata Mr. K. Mihara	Minister Minister Director General of Port & Maritime Engineer of Port Affairs Adviser to the Minister (Port Affairs) Minister Special Assistant	All members
5-Sep-98	Ministry of Oil & Gas Embassy of Japan Ministry of Foreign Affairs Embassy of Japan	H.E. Dr. Mohammad bin Hamad bin Saif al Rumhi Mr. Suleiman Shambah al Balushi Mr. Adnan Ali Al-Mudailwi Mr. Y. Iwata Mr. K. Mihara H.E. Yousuf Bin Alawi Bin Abdullah Mr. H.B.Nasser B.Mansoor Al Tobi Mr. Awadi B.Badr B.Maree Al Shanfari Mr. Y. Iwata Mr. K. Mihara	Minister Dy. Director General of Gas Affairs & Petrol Production Directorate General of Gas & Petroleum Ind. Minister Special Assistant Minister Chief of Asian Department Chief of Economic & Technical Cooperation Minister Special Assistant	All members All members

Appendix A1-3-3 List of Authority and Personnel (The Third Field Survey - Common)

DATE	NAME OF THE ORGANIZATION	PERSON ATTENDED	TITLE	REMARKS
6-Sep-98	Steering Committee;			
	Ministry of Commerce & Industry	Dr. Hamed H. Al-Dhahab	Chairman / Director General of Industry	All members
	Ministry of Commerce & Industry	Dr. Faisal Mohamed Elamir	Technical Adviser	
	Ministry of Communications	Mr. Hiroshi Sasajima	Adviser to the Minister (Port Affairs)	
	Ministry of Communications	Mr. Khalid Mirza	Engineer of Port Affairs	
	Ministry of Oil & Gas	Mr. Adnan Ali Al-Mudailwy	Directorate General of Gas & Petroleum Ind.	
	Ministry of Foreign Affairs	Mr. Yousef Said Al-Amri	Director of Macro-planning & Studies	
	Ministry of National Economy	Mr. Hussain Yousuf Al-Balushi		
	Ministry of National Economy	Mr. Humaid Al Saadi		
	Ministry of Electricity & Water	Mr. Saleh Bin Hamoud Al-Rashidy		
	Ministry of Finance	Mr. Awadh Bader Alsharfa		
	Ministry of Commerce & Industry	Mr. Saoud Bin Nasser Al-Khusaibi	Director of Industrial Planning & Studies	
Ministry of Commerce & Industry Observer;	Mr. Nabil Mubarak Al-Mukhaini	Economic Researcher, Directorate General of Industry		
Embassy of Japan	Mr. K. Mihara	Special Assistant		
Office of the Sultan's Adviser for Economic Planning Affairs	H.H. Mohammed Bin Al Zubair Bin Ali	His Majesty the Sultan's Adviser for Economic Planning Affairs and President of Sultan Qaboos University		
Embassy of Japan	Mr. Y.Iwata	Minister	All members	
Embassy of Japan	Mr. K. Mihara	Special Assistant		
Ministry of Commerce & Industry	H.E. Ali Masoud Al-Sunaidy	Under Secretary		
	Dr. Hamed H. Al-Dhahab	Director General of Industry		
	Mr. Nabil Mubarak Al-Mukhaini	Economic Researcher, Directorate General of Industry	All members	
Embassy of Japan	Mr. Y.Iwata	Minister		
Embassy of Japan	Mr. K. Mihara	Special Assistant	All members	

Appendix A1-3-4 List of Authority and Personnel (The Fourth Field Survey - Common)

DATE	NAME OF THE ORGANIZATION	PERSON ATTENDED	TITLE	REMARKS
16-Dec-98	Embassy of Japan	Mr. Zenji Kaminaga Mr. Keiichi Matsumoto	Ambassador First Secretary	All members (8 persons)
	Steering Committee; Ministry of Commerce & Industry	Dr. Hamed H. Al-Dhahab	Chairman / Director General of Industry	
	Ministry of Foreign Affairs	Mr. Nabil Mubarak Al-Mukhaimi Ms. Khadija Hassan	Economic Researcher, Directorate General of Ind. Deputy Chief of Economic & Technical Co-operation Department	
	Ministry of National Economy	Mr. Husain Yousuf Al-Bulushi	Director of Macro-planning & Studies	All members
	Ministry of Oil & Gas	Mr. Humaid Al Saadi	Directorate General of Gas & Petroleum Ind.	
	Ministry of Electricity & Water	Mr. Adnan Ali Al-Mudailwi		
	Zubair Enterprise	Mr. Adil Hamed Al-Shuhaibi	Manager	
	Observer; Embassy of Japan	Mr. M.A.Baqi Mr. K. Matsumoto	First Secretary	
19-Dec-98	Steering Committee; Ministry of Commerce & Industry	Dr. Hamed H. Al-Dhahab	Chairman / Director General of Industry	
	Ministry of Foreign Affairs	Mr. Saoud Bin Nasser Al-Khusaibi Ms. Manal bint Mohammad Al-Abdawani Mr. Nabil Mubarak Al-Mukhaimi Ms. Khadija Hassan	Director of Industrial Planning & Studies Director Economic Researcher, Directorate General of Ind. Deputy Chief of Economic & Technical Co-operation Department	All members
	Ministry of National Economy	Mr. Humaid Al Saadi	Directorate General of Gas & Petroleum Ind.	
	Ministry of Oil & Gas	Mr. Adnan Ali Al-Mudailwi		
	Ministry of Electricity & Water	Mr. Adil Hamed Al-Shuhaibi	Manager	
	Zubair Enterprise	Mr. M.A.Baqi	Expert	
20-Dec-98	Ministry of Regional Municipalities and Environment	Mr. Leszek Kuczynski Mr. Nabil Murtaza Habib Al Lowatiya Mr. Khamis Al-Zidi Mr. Khalaf Al-Mawali Mr. Salim Al-Suqri Mr. Mohammad Saeed Al-Masroory Mr. Nabil Mubarak Al-Mukhaimi	Acting Head of Environment Dev. Section Inspector of Air & Noise Pollution Section Inspector of Air & Noise Pollution Section Marine Pollution Section Water and Waste Inspector Economic Researcher, Directorate General of Ind.	Leader & 5 persons
	Ministry of Commerce & Industry	Mr. Husain Yousuf Al-Bulushi	Director of Macro-planning & Studies	
	Ministry of National Economy	Mr. S.L. Narasimhan	Advisor Privatisation	2 persons
	Ministry of Commerce & Industry	Mr. M.R. Karmachandran	Chief Engineer Industrial Project	

Appendix A1.3-4 List of Authority and Personnel (The Fourth Field Survey - Common)

DATE	NAME OF THE ORGANIZATION	PERSON ATTENDED	TITLE	REMARKS
20-Dec-98	Ministry of Foreign Affairs	H.E. Yousuf Bin Alawi Bin Abdullah Mr. Awadi B.Badr B.Maree Al Shanfari Mr. H.B.Nasser B.Mansoor Al Tobi Mr. Zenji Kaminaga Mr. Keiichi Matsumoto	Minister Chief of Economic & Technical Cooperation Chief of Asian Department Ambassador First Secretary	All members
21-Dec-98	Ministry of Oil & Gas Embassy of Japan	H.E. Dr. Mohammad bin Hamad bin Saif al Rumbhi Mr. Zenji Kaminaga Mr. Keiichi Matsumoto	Minister Ambassador First Secretary	All members
22-Dec-98	Ministry of Commerce & Industry Embassy of Japan	Dr. Hamed H. Al-Dhahab Mr. Nabil Mubarak Al-Mukhaini Mr. Zenji Kaminaga Mr. Keiichi Matsumoto	Chairman / Director General of Industry Economic Researcher, Directorate General of Ind. Ambassador First Secretary	Leader 3 persons All members

THE FEASIBILITY STUDY OF THE DIRECT REDUCTION PLANT BASED STEEL COMPLEX IN THE SULTANATE OF OMAN

METHODOLOGY FOR PLANT SITE SELECTION

The Scope of Work for the Feasibility Study of the Direct Reduction Plant Based Steel Complex Project was signed in September, 1997 by the Government of Oman and JICA. The Scope of Work indicates that the site for the Steel Complex is in the Salalah District. JICA Study Team made the first field survey from February 12 to March 15, 1998 based on the Scope of Work. The Government of Oman requested to JICA to study site selection of the Salalah District and the additional site of the Sohar District in March, 1998.

1. Importance of Plant Location

In the construction of the Steel Complex with production capacity of 1.2 million ton of steel products a year, a huge amount of investment will be required. Furthermore, if all infrastructure necessary for the Steel Complex such as port and port facilities, road, electric power, natural gas and industrial water supply, etc. are newly constructed simultaneously, a huge amount of the investment will be required also for such infrastructure.

Port and port facilities for unloading raw materials, scraps, and the same for shipping products and road network are dominant conditions of the site.

Energy and utilities supply such as electric power, natural gas, industrial water and waste water sewerage are also indispensable for operation of the plant.

The plant site requires 1.2 million square meters with solid soil and the regional area and geographical location influence the activities of plant operation.

Construction of the Steel Complex will facilitate new relevant industry to grow. It is necessary to assure that no deterioration of environment nor bad influence to the ecosystem are generated by construction and operation of the Steel Complex.

It is obvious that if all amount of investment for infrastructure are imposed on or borne by the Steel Complex, the project of the Steel Complex shall no longer be feasible. Dominant conditions to be investigated in selecting the appropriate site include regional development plan and implementation schedule of infrastructure.

2. Evaluation Criteria for Site Selection

In general, following nine items are considered to study for the site selection of a steel plant;

- access to the market
- facilities capability of unloading the raw materials and shipping the products
- utilities supply such as water, electric power, natural gas
- natural condition such as meteorological condition and soil condition
- supporting industries
- availability of expertise of management, technologies and skilled labors
- environmental assessment such as air, water, etc.
- investment cost
- operation cost

2.1 Flow of Site Selection

JICA Study Team made the first field survey and collected the answer to the questionnaire attached to the Inception Report and visited the Salalah District to collect the necessary information for the feasibility study of the Steel Complex.

Step 1. Additional questionnaire which are related to the above basic items for the Sohar District similar to that for the Salalah District will be sent to the Steering Committee of Oman by two weeks previous to the second field survey by the Study Team.

Step 2. Collection of the answer to the additional questionnaire and data and information necessary for the site selection both Salalah and Sohar will be done during the second field survey by the Study Team.

Step 3. The Study Team will analyze the data and information based on agreed evaluation criteria and send the site selection report in the middle of August, 1998 and visit Oman to explain and discuss with the Steering Committee of Oman in the beginning of September, 1998 and the Steering Committee will decide one site within three weeks and inform JICA Study Team of the site.

JICA Study Team will make the feasibility study of the Steel Complex on the selected site (one site only).

2.2. Evaluation Criteria

Evaluation will be made of technical evaluation and economical evaluation.

(1) Technical evaluation

Evaluation procedures are shown below.

Three columns are prepared on each item. The first column is base point depended on importance and the second and third columns are rating and scores.

Alphabetical signs and evaluation scores shall be given in the rating column and scores column.

A : Present status gives satisfactory conditions and/or situations existing or committed by the government (score range : seven to ten points). Sign " A " represents acceptable.

B : Present status is not satisfactory, but conditions and/or situations are expected to be improved in the future (score range : five to seven points). Sign " B " represents insufficient but can be improved.

C : Present status is not satisfactory conditions and/or situations or environment is not expected to be improved in the future (score range : five points and less). Sign " C " represents unacceptable.

Summary of the technical evaluation shall be indicated in Table 2-2-1.

Table 2-2-1 Summary of the Technical Evaluation

Item to be considered	Importance	Rating		Score	
		Salalah	Sohar	Salalah	Sohar
1. LAND					
1.1. Dimension and area of the site	5				
1.2. Geographical conditions	5				
1.3. Soil condition	5				
2. TRANSPORTATION					
2.1. Port and port facilities	20				
2.2. Berth and berth facilities	5				
2.3. Road	5				
3. UTILITIES					
3.1. Electric power	15				
3.2. Natural gas	15				
3.3. Industrial water and waste water sewerage	10				
4. SOCIAL CONDITION					
4.1. Supporting industries	5				
4.2. Human resources and housings	5				
4.3. Environmental and pollution	5				
TOTAL	100				

(2) Economical comparison

Data and information on energy costs, utilities costs and land purchase price and/or rental fee will be collected in addition to the port and berth tariffs. Based on these data and information, calculation shall be made site by site to figure out magnitude of the initial investment amount, and long term operation costs generated from regional differences. Then, economical comparison for both sites shall be carried out.

Table 2-2-2 Comparison in Total Amount of Initial Investment and Operation Costs by Site

Cost factors	Salalah	Sohar
1. LAND		
1.1. Acquisition of land or rental fee		
1.2. Land preparation		
1.3. Slope protection		
2. PORT AND BERTH FACILITIES		
2.1. Port and berth tariffs		
2.2. Berth		
2.3. Berth facilities		
3. FACILITIES IN PLANT		
3.1. Piping and conveyer		
3.2. Foundation		
3.3. Desalination Plant		
3.4. Waste water sewerage		
4. ENERGY AND UTILITIES COSTS		
4.1. Unit cost of electric power		
4.2. Unit cost of natural gas		
4.3. Unit cost of industrial water		
5. TRANSPORTATION COST (FINISHED PRODUCTS)		
5.1. Road		
5.2. Sea		
TOTAL		

(3) Regional conditions such as regional development plan, relevant industries and environmental restriction shall be studied as social factor. But, it is difficult to carry out by quantitative evaluation.

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
THE STEERING COMMITTEE OF THE SULTANATE OF OMAN
THE FEASIBILITY STUDY
ON
THE DIRECT REDUCTION PLANT BASED
STEEL COMPLEX PROJECT
IN
THE SULTANATE OF OMAN

EXECUTIVE SUMMARY
OF
SITE EVALUATION REPORT
ON
SALALAH AND SOHAR

AUGUST, 1998

KOBE STEEL, LTD.
IN ASSOCIATION WITH
NKK CORPORATION

GENERAL

With regard to the Feasibility Study on the Direct Reduction Based Steel Complex Project in the Sultanate of Oman, the Government of Oman and JICA agreed in May, 1998 that a comparative evaluation of the plant site for the Steel Complex would be made for Salalah and Sohar.

In accordance with " METHODOLOGY FOR PLANT SITE SELECTION" which was agreed by the Steering Committee of the Sultanate of Oman during the second field survey of JICA Study Team from June 23 to July 13, 1998, JICA Study Team made the technical evaluation and the economic comparison of Salalah and Sohar districts based on the data and information obtained in the first and the second field surveys, and further study in Japan.

RECOMMENDATION

(1) Conclusion of the Site Selection

It is concluded that Sohar would be more appropriate for conducting further feasibility study, after due consideration of features and results of the technical and economic evaluations on both sites of Salalah and Sohar, as summarized below;

1) Summary of Technical Evaluation Results

The scores of technical evaluation for both sites based on the Methodology for Site Selection are 79.0 points for Salalah and 80.0 points for Sohar.

This result indicates that both sites are technically eligible as the Steel Complex site. Salalah is judged to have a relative disadvantage, however, because the small short circuit level of electricity in Salalah makes it inevitable to have a bigger flicker compensation system than in Sohar, to avoid harmful fluctuation of electricity in order to assure the smooth operation of the Electric Arc Furnaces.

2) Summary of Economic Evaluation Results

2)-1 Financial Evaluation from the Investor's Point of View

- There is not much difference in the initial investment costs between the two sites. The figure is estimated to be slightly higher by US\$ 0.1 million in Salalah than in Sohar.

- With respect to the operation costs, Sohar has a definite advantage over Salalah, with a difference of between US\$ 12.2 and US\$ 15.6 per ton of finished products. This difference in operation costs, equivalent to between US\$ 14,200,000 and US\$ 18,200,000 per year, will make

a considerable difference in the financial position of the Steel Complex Project.

2)-2 Economic Evaluation from the National Economy' s Point of View

- Sohar is judged to have an advantage over Salalah when evaluated from the national economy' s point of view. This is because the real resource cost for supplying natural gas, regardless of the actual price applied, will inevitably be lower with Sohar than in Salalah, given the shorter length of the pipeline connecting Sohar with the gas source and hence its smaller construction costs. If the Steel Complex is to be constructed in Salalah, this difference of natural gas supply cost should somehow be subsidized by the Government of Oman or any third parties.
- The two sites are evaluated equally with respect to the economic cost of electric power supply.

(2) Technical Evaluation

- Land

Area and dimension necessary for the Steel Complex (1,200,000 m²=800 m x1,500 m) is available in both sites. However, only Sohar has a space for future expansion. Geographical condition in Sohar is flat and preferable for the Steel Complex, and the site for the Steel Complex in Salalah has to have three (3) ground levels because the site is considerably undulating (DL +5 m to 30 m). Soil conditions at both sites are acceptable for the Steel Complex. The location of site for the Steel Complex in Salalah is about 1 km away from the berth facilities whereas Sohar is adjacent to berth facilities and this is preferable for the Steel Complex.

- Port and Location of Port

In Salalah, the port is located at 1,000 km southern east of Muscat. It is far from both domestic and export markets. And Sohar port is located at 250 km northern west of Muscat and is near to the domestic market and the GCC export market.

Both ports have -16m in water depth and berths of 700 m in length to which vessels for raw materials of iron ore are accessible up to 100,000 DWT.

- Natural Gas

The construction of new natural gas pipelines to both sites are scheduled to be completed in 2001. Length of new pipelines is estimated at 700 km to Salalah and 300 km to Sohar.

- Electric Power

No electric power is available for the Steel Complex at present in either site and a new power

generation plant with a capacity of 200 MW needs to be constructed by the Steel Complex or any private sector in either site.

In Salalah, however, short circuit capacity, which is necessary for the stable operation of EAF (Electric Arc Furnace) in steel making plant, is only 1,500 MVA. This is not enough for stable operation even with a bigger flicker compensation equipment installed in the Steel Complex and with 400 MW in total power generation capacity in Salalah district.

In Sohar, short circuit capacity will have maximum 6,000 MVA with more than 2,240 MW in total power generation capacity of interconnection line at 132 kV between Muscat system and Sohar (including Wadi Jizzi power station) by the year of 2004. Short circuit capacity in Sohar is enough for stable operation of EAF with small flicker compensation equipment.

- Industrial Water

The waste water treatment plant, which is now under construction in Salalah, has the capacity to supply industrial water for the Steel Complex .

In Sohar, a new desalination plant has to be constructed in the Steel Complex.

- Social Conditions

There is no difference in social conditions at both sites of Salalah and Sohar.

(3) Economic Evaluation

1) Financial Evaluation

- There is not much difference of initial investment cost between Salalah site and Sohar site.

Initial investment cost caused by the difference of each site conditions is US\$ 39.0 million in Salalah site made up of ;

US\$ 20,7 million for site preparation,

US\$ 7.3 million for piping and conveyer,

US\$ 1.9 million for foundation of equipment,

US\$ 9.1 million for flicker compensation equipment

and US\$ 38,9 million in Sohar site made up of :

US\$ 1.2 million for site preparation,

US\$ 3.0 million for piping of sea water,

US\$ 13.7 million for piling and foundation of equipment,

US\$ 17.0 million for desalination plant,

US\$ 4.0 million for flicker compensation equipment.

- Difference of annual operation cost is between US\$ 14.2 million and 18.2 million. Annual operation cost of Sohar site is much less than that of Salalah site. (The cost related with

industrial water is less by US\$ 0.8 million per year in Salalah site, and the cost related with transportation for finished products is less by between US\$ 15.0 and 19.0 million per year in Sohar site.)

2) Economic Evaluation for National Economy

- In view of national economy of Oman, investment cost of constructing gas pipeline to Salalah is much higher than that to Sohar because its length to Salalah is longer by 400 km than that to Sohar. Consequently unit technical cost of natural gas is to be different at each site. If the Government of Oman applies the same price for natural gas to each site, the supply of the price difference would be a big burden on the Government of Oman.

There is not much difference on electric power.

The Steering Committee of the Government of the Sultanate of Oman shall make its decision based on this report and inform the selected site (one site) to JICA and the Study Team by the 14th of September 1998.

SUMMARY OF THE TECHNICAL EVALUATION

Item to be considered	Importance	Rating		Score	
		Salalah	Sohar	Salalah	Sohar
1. LAND					
1.1.Dimension and area of the site	5	A-8	A-10	4.0	5.0
1.2.Geographical conditions	5	A-7	A-10	3.5	5.0
1.3.Soil conditions	5	A-10	A-9	5.0	4.5
2. PORTAND ROAD					
2.1Port and port facilities	20	A-10	A-9	20.0	18.0
2.2.Berth and berth facilities	5	B-7	B-7	3.5	3.5
2.3.Road	5	A-10	A-10	5.0	5.0
3. UTILITIES					
3.1.Electric power	15	B-5	B-7	7.5	10.5
3.2.Natural gas	15	A-7	A-7	10.5	10.5
3.3.Industrial water and waste water	10	A-9	B-7	9.0	7.0
4. SOCIAL CONDITION					
4.1.Supporting industries	5	B-6	B-6	3.0	3.0
4.2.Human resources and housings	5	B-6	B-6	3.0	3.0
4.3.Environment and pollution	5	A-10	A-10	5.0	5.0
TOTAL	100.0			79.0	80.0

COMPARISON IN TOTAL AMOUNT OF INITIAL INVESTMENT AND OPERATION COSTS

Cost Factors	Salalah		Sohar		Remarks
	Initial Investment Cost (Unit: Million US\$)*2	Operation cost (Unit: Million US\$/year)	Initial Investment Cost (Unit: Million US\$)*2	Operation cost (Unit: Million US\$/year)	
1. LAND					
1.1 Acquisition of land or rental fee	*1	100baiza/m ² /year	*1	100baiza/m ² /year	
1.2 Land preparation	20.7		1.2		
1.3 Slope protection					
2. PORT AND BERTH FACILITIES					
2.1 Port and berth tariffs	*1	same	*1	same	
2.2 Berth	*1	same	*1	same	
2.3 Berth facilities	*1	same	*1	same	
3. FACILITIES IN PLANT					
3.1 Piping	3.1		3.0		
3.2 Conveyor	4.2		0.0		
3.3 Foundation	1.9		13.7		
3.4 Desalination plant	0.0		17.0		In case of water supplied from industrial area at SUR
3.5 Waste water	-		-		
3.5 Electric	9.1	*1	4.0	*1	Flicker compensation equipment
4. ENERGY AND UTILITIES					
4.1 Unit cost of electric power	-	*1	-	*1	
4.2 Unit cost of natural gas	-	*1	-	*1	
4.3 Unit cost of industrial water	-	0.22 RO/m ³	-	0.8 (0.515 RO/m ³) (0.66RO/m ³) (1.3)	In case of installation of desalination plant in case of supply water from industrial area
5. TRANSPORTATION COSTS OF FINISHED PRODUCTS					
5.1 Road and sea	-	15.0 -19.0	-	-	
TOTAL OF INVESTMENT AND OPERATION COSTS	39.0	15.0 -19.0	38.9	0.8	

*1 Conditions of Salalah and Sohar are even.

*2 These figures of Initial Investment Cost are the differences caused by the site conditions.

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ON
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STEEL COMPLEX PROJECT
IN
THE SULTANATE OF OMAN

SITE EVALUATION REPORT
ON
SALALAH AND SOHAR

AUGUST, 1998

KOBE STEEL, LTD.
IN ASSOCIATION WITH
NKK CORPORATION

CONTENTS

GENERAL

I. TECHNICAL EVALUATION

1. LAND
2. PORT AND ROAD
3. UTILITIES
 - 3.1 Electric Power
 - 3.2 Natural Gas
 - 3.3 Industrial Water and Waste Water Sewerage
4. SOCIAL CONDITION
 - 4.1 Supporting Industries
 - 4.2 Human Resources and Housings
 - 4.3 Environment and Pollution
5. SUMMARY OF THE TECHNICAL EVALUATION (TABLE)

II. ECONOMICAL COMPARISON

1. LAND AND FOUNDATION
2. PORT
3. FACILITIES IN PLANT
 - 3.1 Piping and Conveyer
 - 3.2 Foundation
 - 3.3 Desalination Plant
 - 3.4 Waste Water
 - 3.5 Electric
4. ENERGY AND UTILITIES
 - 4.1 Unit Cost of Electric Power
 - 4.2 Unit Cost of Natural Gas
 - 4.3 Unit Cost of Industrial Water
5. TRANSPORTATION COSTS FOR FINISHED PRODUCTS
6. COMPARISON IN TOTAL AMOUNT OF INVESTMENT AND OPERATION COSTS (TABLE)

III. RECOMMENDATION

APPENDIX : METHODOLOGY FOR PLANT SITE SELECTION

GENERAL

With regard to the Feasibility Study on the Direct Reduction Plant Based Steel Complex Project in the Sultanate of Oman, the Government of Oman and JICA agreed in May 1998 that the plant site selection of the Steel Complex was studied for Salalah and Sohar.

In accordance with " METHODOLOGY FOR PLANT SITE SELECTION" which was agreed by the Steering Committee of the Sultanate of Oman during the second field survey of JICA Study Team from June 23 to July 13, 1998, JICA Study Team made the technical evaluation and the economical comparison of Salalah and Sohar districts based on the data and information obtained in the first and second field surveys, and further study in Japan.

The result of the plant site evaluation is described in the following pages.

I. TECHNICAL EVALUATION

I. LAND

The site in Sohar is adjacent to berth facilities and there is a space for future expansion. It is flat and its soil conditions is comparatively good. However, machine foundation needs piling and soil improvement work.

On the other hand, the site in Salalah is 1 km away from berth facilities and there is no space for future expansion. It is undulating and a large-scale land preparation work is necessary. Its soil condition is very good and it does not need to pile.

The detailed technical evaluation of the conditions of two sites are tabulated below.

Table 1-1 Comparison of Two Sites

Item	SALALAH	SOHAR
Location	- About 1 km away from the berth facilities.	- Located at the adjacency of the berth facilities.
Dimension and Area	- Area : 1,200,000 m ² (800 m x 1,500 m) - No space for expansion in the future.	- Area : 1,200,000 m ² (800 m x 1,500 m) - There is a space for expansion in the future.
Geographical Conditions	- The site is considerably undulating (DL +5 m to +30 m), and necessary to do large-scale land preparation work. - The prepared land will have three ground levels. - The average ground level after the land preparation will be about 15 m higher than sea level, raising the cost for sea water intake. - WADI runs through the site; necessary to take measures.	- The site is almost flat but the ground level is low for most parts (+ 0~3 m.) It is necessary to raise the level by about 3 m. - Dredged soil can be used as filling materials, which can save the land preparation cost. - The site will have only one ground level after the land preparation work.
Soil Conditions	- Soft rock layer spreads underneath the thin sandy gravel layer, thus it has a very good ground condition. - Machine foundation does not need piling. It decreases the founding cost. - In land preparation, a great deal of ripping work should be done to remove rocks. It raises the land preparation cost.	- Comparatively compacted sand layer exists from the ground level to the depth of about 10 m, and alternating layers of silt stone and sandstone spreads at the deeper portion. It can be judged the site has comparatively good ground conditions. However, 3 m thick dredged soil layer will be on the ground. Machine foundation should need piling or soil improvement work. - Soft clay layer called "Sabkha" occupies a part of the site. It is necessary to be measured.

2. PORT AND ROAD

The port in Sohar is located at 250 km from Muscat and near to the market.

The port in Salalah is located at 1,000 km from Muscat and far away to the domestic and export markets.

The other conditions of both ports are not different.

The detailed technical evaluation of conditions of two ports is tabulated on the next page.

Table 2-1 Comparison of Two Ports

		SALALAH	SOHAR
Port and Port Facilities	Location	Located about 1000 km southern east of Muscat, occupying a good location on the sea route between Suez Canal and Southeast Asia. Far from domestic demand locations and from product export destinations.	Located about 250 km northern west of Muscat, occupying a good location on the sea route between GCC and Southeast Asia. Near from domestic demand locations and from product export destinations as well.
	Construction Schedule	Already opened and being used. Expansion work is underway and to be completed on November, 1998.	New port construction project is underway. The construction work is to be commenced at the end of 1998 or at the beginning of 1999 and is expected to be completed and opened in 2003.
	Approach Channel	Water depth : -16.5 m Width : 250 m	Water depth : -16 m Width : 200 m
	Turning Basin	Water depth : -16 m Diameter : 500 m	Water depth : -16 m Diameter : 600 m
	Accessible Max. Ship	100,000 DWT	100,000 DWT
	Sailing Support Facilities	The port has most required facilities such as tag, pilot, water supply, and oil supply facilities. The port is to be further enriched with completion of Container Terminal.	Contents of the development plan is still unrevealed. It is assumed that required facilities will be provided by the time of the opening of the port.
Berth and Berth Facilities	Total length of usable berths	700 m	700 m
	Max. water depth	-16 m, (100,000 DWT)	-16 m, (100,000 DWT)
	The number of berths	Raw material : One berth (-16 m) Product : Two berths (-12 m)	Raw material : One berth (-16 m) Product : Two berths (-12 m)
	Soil conditions	Very good (limestone layer)	Good (Sandstone layer)
	Cargo handling facilities	Material : two 1000-ton/hr unloaders Product : four 20-ton gantry cranes	Material : two 1000-ton/hr unloaders Product : four 20-ton gantry cranes
	Calmness rate	95 % or over.	95 % or over.
Road	Road	Near to the trunk road	Near to the trunk road

3. UTILITIES

3.1 Electric Power

It is indispensable for both sites to construct a new power plant for the Steel Complex. However, in view of short circuit capacity for operation of electric arc furnace, it needs to construct a bigger flicker compensation equipment in Salalah site than in Sohar site.

3.1.1 Power supply to Sohar

(1) Present status

No power is available for the Steel Complex at present. MOEW does not have a plan to provide required power to the Steel Complex in Sohar.

(2) Future

A capacity of 200 MW power generation plant for the Steel Complex needs to be constructed by the Steel Complex or private sector. In Sohar, other big projects such as petrochemical, oil refinery and aluminum smelter shall be planned to construct. There is a possibility that one of the big projects would have surplus electricity. In addition to the above, this power generation plant would be interconnected to the power supply grid between Muscat system and Sohar (including Wadi Jizzi power station) at 132 kV line within a couple of years by the government. If it is interconnected, the Steel Complex would be able to overcome the difficulties in the normal running load of the Steel Complex, and to obtain higher short circuit level (fault level).

Total power generation capacity supplied by network will be more than 2240 MW by the year of 2004.

(3) Evaluation

With the above measures, short circuit capacity of min. 3,000 MVA - max. 6,000 MVA could be obtained, and flicker compensation equipment to minimize voltage fluctuation could be reduced. The Steel Complex in the future could be operated without any power problem.

3.1.2 Power supply to Salalah

(1) Present status

Total power generation in Dhofar is 152 MW with diesel generators. MOEW does not have a plan to provide required power to the Steel Complex in Salalah.

(2) Future

Existing diesel generators are planned to be replaced with a new 200 MW gas turbine power station in Raysut by private sector. In addition to the above, a capacity 200 MW or larger power station for the Steel Complex needs to be constructed by the Steel Complex.

(3) Evaluation

However, short circuit level (fault level) by the above measures (total generation capacity :400 MW) may be max. 1,400 - 1,500 MVA. It is rather small. It is the reason why the Steel Complex needs to construct a bigger flicker compensation equipment to minimize voltage fluctuation. To make matters worse, it would be difficult to operate the power generation plant smoothly because of power fluctuation by heavy load of the EAF. This means that the Steel Complex could not be operated continuously. To avoid this problem, a power generator of larger capacity of more than 200 MW needs to be installed to make total capacity of 1,000 MW or large. We think it would not be an economical investment.

Remarks:

1)The short circuit level (fault level) of the electricity supply system is generally required to be more than 70 times of the arc furnace transformer capacity in order to prevent voltage disturbance from causing flicker phenomena during operation of an arc furnace.

2)Flicker level determines the short circuit level of the electricity supply system.

If the short circuit level is small, the flicker level becomes large and also the flicker compensation equipment needs large capacity.

3)Short circuit level at the point of common coupling determines reactance figures of the power supply system such as total connection capacity of generators, transformers and wires / cables. Large capacity of power generation obtains large short circuit level.

4)Formula of Flicker (Voltage fluctuation) dV and Short circuit level

$$dV = r \cdot dP / 10 + x \cdot dQ / 10 \approx x \cdot dQ / 10 (\%) \text{ (in case } r < x \text{) at 10 MVA base}$$

r : Resistance, x : Reactance, dP : Active power fluctuation, dQ : Reactive power fluctuation

$$\text{Short circuit level (Fault level)} = 10 \cdot (100 / x) \text{ (MVA) at 10 MVA base}$$

From the above formula, if x is small, dV becomes small and short circuit level makes large.

3.2 Natural Gas

There is not much difference between Salalah site and Sohar site. Although the construction of gas pipeline to both sites is included in Fifth Five-Year Plan, the total length of pipeline to Salalah site is longer by 400 km than that to Sohar site.

(1) Requirement of natural gas for the Steel Complex

DR-based integrated Steel Complex and power station for the Steel Complex under study will require natural gas indicated in Table 3-2-1.

Table 3-2-1 Required Quantity and Quality of Natural Gas for the Steel Complex

	The Steel Complex	Power station for the Steel Complex
Supply capacity	Max. 66,000 Nm ³ /h Av. 54,000 Nm ³ /h 396,000,000 Nm ³ /year 14,700,000 MMBTU/year	Max. 50,000 Nm ³ /h Av. 45,000 Nm ³ /h 265,000,000 Nm ³ /year 9,800,000 MMBTU/year
Service	Reducing gas for DR plant (Direct Reduction plant) Fuel gas for furnaces	Fuel gas for gas turbine and/or steam boiler
Supply pressure and quality	4.0 ± 0.1 kg/cm ² G C5 + (Heavy hydrocarbon) : < 0.1 (mol %) Sulfur (as H ₂ S): < 5 ~ 10 ppm	27 ~ 30 kg/cm ² G

(2) Availability in each proposed Site

a) Salalah

< Present status >

No pipeline currently connects Salalah to the gas supply source.

The South Oman Gas Line (northern part : 16" ; southern part: 10") is dedicated to PDO

operations and connects Saih Nihayda to Marmul.
It is fully used, leaving no capacity for the Steel Complex.

<Future plan>

A new pipeline is scheduled as Salalah pipeline.

The distance from Saih Nihayda to Salalah is approximately 700 km and the pipe size will be 20" ~ 28" .

Front end design for the planned pipeline has started from June of 1998.

The construction of new pipeline is scheduled to be completed by the end of 2001.

[Required facilities outside the Steel Complex]

- Equipment :

Equipment will be prepared by Oman Government.

- Connection pipeline :

Pipeline will be prepared by Oman Government.

b) Sohar

<Present status>

The existing Government Gas System provides gas to Sohar area through a combined 20" and 36" pipeline from Yibal to Murayrat and a 16" pipeline from Murayrat to Sohar. In 1999, two new gas pipelines will be commissioned; a 48" pipeline from Saih Rawl to Sur and a 28" pipeline will link from Saih Rawl to the Government Gas System at Fahud. The supply capacity of the existing transmission system to Sohar is fully used and there is no capacity for the Steel Complex.

<Future plan>

A new pipeline is proposed from Fahud to Sohar to meet long-term domestic and industrial demands for the region. The distance from Fahud to Sohar is approximately 300 km. Front end design for the planned pipeline is based on a 32" diameter and design work has already been completed. The construction of new pipeline is scheduled to be completed by the summer in 2001.

[Required facilities outside the Steel Complex]

- Equipment :

Equipment will be prepared by Oman Government.

- Connection pipeline :

Pipeline will be prepared by Oman Government.

3.3 Industrial Water and Waste Water

Industrial water can be supplied in Salalah site because waste water treatment plant is under construction. However, it is necessary to construct desalination plant in Sohar site because there is no capacity to supply industrial water.

3.3.1 Industrial water

(1) Requirement of water for the Steel Complex

Requirement of water for the Steel Complex is estimated in Table 3-3-1.

Table 3-3-1 Requirement of Water for the Steel Complex

Water	Uses	Required quantity	Required quality
Potable water	For living in the Steel Complex	200 m ³ /d	As per WHO or Omani Standard
Fresh water	1. For cooling of equipment and products (cooling water) 2. Scrubber water for dust collectors	5,000 m ³ /d	As per Recommendation by Japanese Iron and Steel Federation"
Sea water	1. For cooling of cooling water through heat exchanger 2. For power station (if required)	25,000 m ³ /h (For the Steel Complex) 25,000 m ³ /h (For power station)	Sea water temperature: Less than 35 deg.C

(2) Availability in each proposed site

a) Salalah

<Present status>

-Quantitative view

Potable water is available within 0.2 km.

Fresh water is not available and waste water treatment plant is now under construction.
Sea water is available at Raysut port.

-Qualitative view

Quality of potable water is within the limit of Omani Standard.

The quality of TSW (Treated Sewerage Water) can be expected for the Steel Complex by using chemical treatment such as corrosion inhibitor, scale inhibitor and slime inhibitor.

The maximum sea water temperature is 30 deg.C and can be used for the Steel Complex.

<Future plan>

-Quantitative view

North Raysut water reclamation plant which has a capacity of 20,000 m³/d at phase-I will be completed by the end of 2001. TSW will be in time for the Steel Complex and has enough capacity.

[Required facilities outside the Steel Complex]

- Equipment :

Total head of circulation pumps in the sea water intake system requires more than 20 m water head compared with those of circulation pumps in Sohar. This is because the Steel Complex is located about one kilometer away from the sea water intake system (unloading berth) at Raysut port in the case of Salalah and the highest plant site of the Steel Complex is 15.0 m higher than that of Sohar site.

(Calculation)

Friction loss of 1 km sea water pipeline : 5.6 m

(calculated as per Hazen & Williams equation)

Pumping height of the highest plant site : 15.0 m

Total required head : 20.6 m

- Connection pipeline :

The connection pipelines are required between supply point and the Steel Complex and

the details of connection pipelines are indicated in Table 3-3-2.

Table 3-3-2 Connection Pipeline in Salalah

Required quantity	Max. (m ³ /h) Av. (m ³ /h)	Potable water	Fresh water	Sea water
		200 m ³ /d	5,000 m ³ /d	50,000 m ³ /h
Connection pipeline	From	Near port	North Raysut waste water treatment plant	Raysut port
	To	The Steel Complex	The Steel Complex	The Steel Complex
	Size (inch)	4	10	65
	Length (km)	0.2	3.0	1.0 x 2

b) Sohar

<Present status>

-Quantitative view

Potable water is available within 5.0 km ~ 7.0 km

Fresh water is not available.

Sea water is available at Sohar port.

-Qualitative view

Quality of potable water is within the limit of Omani Standard.

Quality of fresh water will be attained by desalination plant so that product water quality will be meet the requirement of the Steel Complex.

The maximum sea water temperature could be 32 deg.C and can be used for the Steel Complex.

<Future plan>

-Quantitative view

The desalination plant can be installed in the Steel Complex and the required quantity will be covered by product water. On the other hand, there is a possibility that one of the big projects such as aluminum smelter, petrol chemical and oil refinery would have surplus water to other industries. In this case, the surplus water could be used for the Steel Complex and the desalination plant need not be installed in the Steel Complex.

[Required facilities outside the Steel Complex]

- Equipment :

Desalination plant (5,000 m³/d) is required.

- Connection pipeline :

The connection pipelines are required between supply side and the Steel Complex and the details of connection pipelines are indicated in Table 3-3-3.

Table 3-3-3 Connection Pipeline in Sohar

Required quantity	Max.(m ³ /h)	Potable water	Fresh water	Sea water
	Av. (m ³ /h)	200 m ³ /d	5,000 m ³ /d	50,000 m ³ /h
			150	50,000
Connection pipeline	From	Existing distribution network	In the Steel Complex	Sohar port
	To	The Steel Complex	The Steel Complex	The Steel Complex
	Size (inch)	4	10	65
	Length (km)	5.0~7.0	(Not required)	(Not required)

c) Summary of connection pipeline in both proposed sites.

The required pipelines between supply side and the Steel Complex are summarized in Table 3-3-4.

Table 3-3-4 Connection Pipeline in Both Sites

Required quantity	Max.(m ³ /h)	Potable water	Fresh water	Sea water
		200 m ³ /d	5,000 m ³ /d	50,000 m ³ /h
	Av. (m ³ /h)		150	50,000
Connection pipeline in Salalah	From	Near port	North Raysut waste water treatment plant	Raysut port
	To	The Steel Complex	The Steel Complex	The Steel Complex
	Size (inch)	4	10	65
	Length (km)	Negligible	3.0	1.0x2
Connection pipeline in Sohar	From	Existing distribution net work	In the Steel Complex	Sohar port
	To	The Steel Complex	The Steel Complex	The Steel Complex
	Size (inch)	4	10	65
	Length (km)	5.0~7.0	(Not required)	(Not required)

3.3.2 Waste Water

(1) Waste water from the Steel Complex

Waste water from the Steel Complex is indicated in Table 3-3-5.

Table 3-3-5 Waste Water Quantity and Discharge Quality for the Steel Complex

	The Steel Complex	Power station (In case of GT/ST combined cycle)
Discharge quantity (m ³ /h)	25,000 m ³ /h	25,000 m ³ /h
Discharge quality	7.0 deg.C above ambient receiving sea water temperature	7.0 deg.C above ambient receiving sea water temperature
(Live sewerage water)	Live sewerage will be treated in the Steel Complex and the treated water will be reused for plantation of the Steel Complex.	

(2) Availability at the proposed site

a) Salalah

<Present status>

Sea water will be fed from Raysut port and hot waste water will be discharged via Wadi Adawni to the opposite side of container jetty.

[Required facilities outside the Steel Complex]

- Equipment :

Not required.

- Connection pipeline :

Not required.

b) Sohar

<Present status>

There is only the seashore.

<Future>

Sea water will be fed from Sohar port and hot water will be discharged to the sea outside of breakwater through 2 or 4 pipelines so that hot waste water will not be mixed with sea water intakes.

[Required facilities outside the Steel Complex]

- Equipment :

Not required.

- Connection pipeline :

Discharge pipeline from the Steel Complex to the outside of breakwater is required.

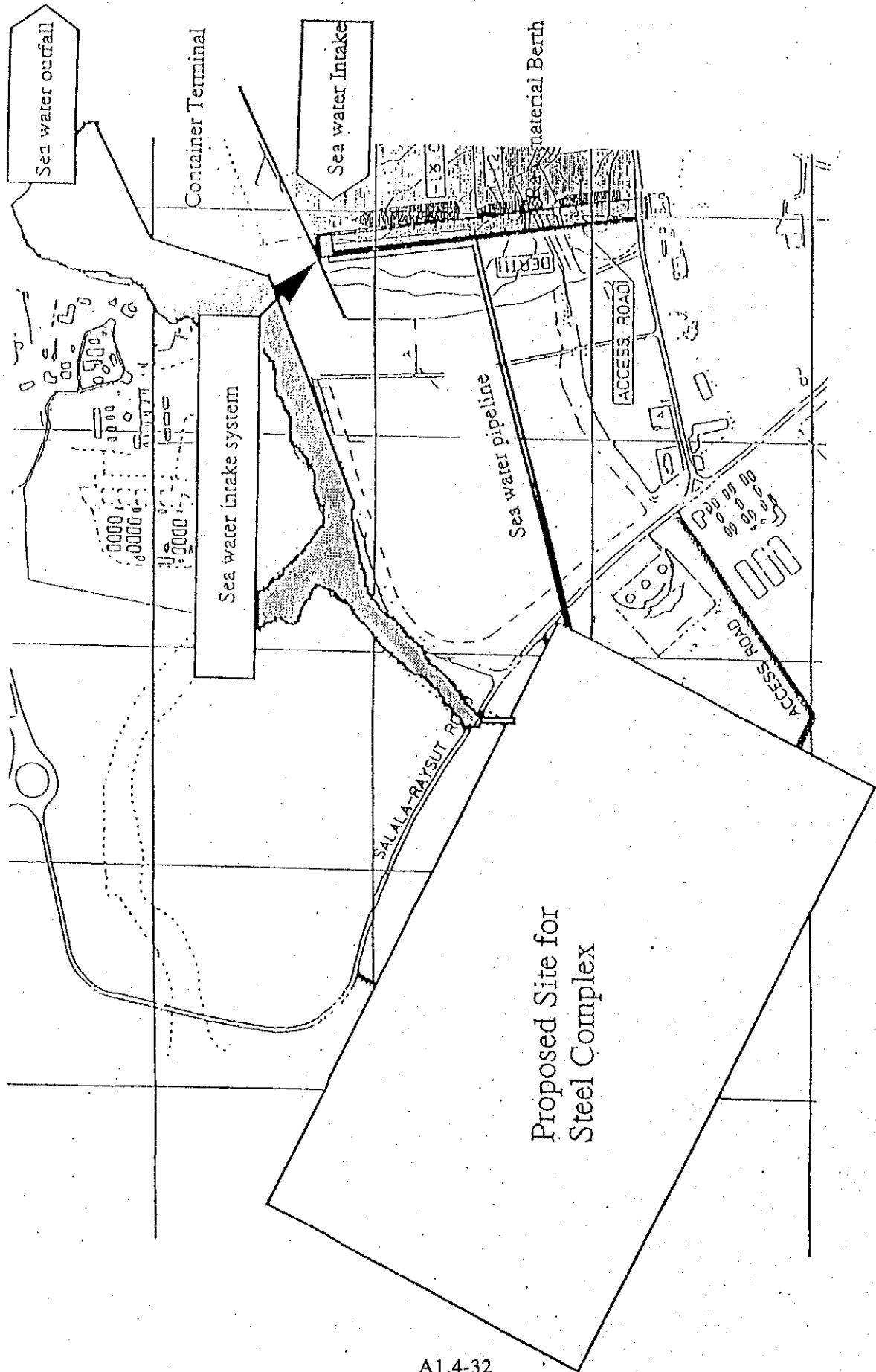


Figure Layout of Sea Water Intake and Outfall System in Salalah

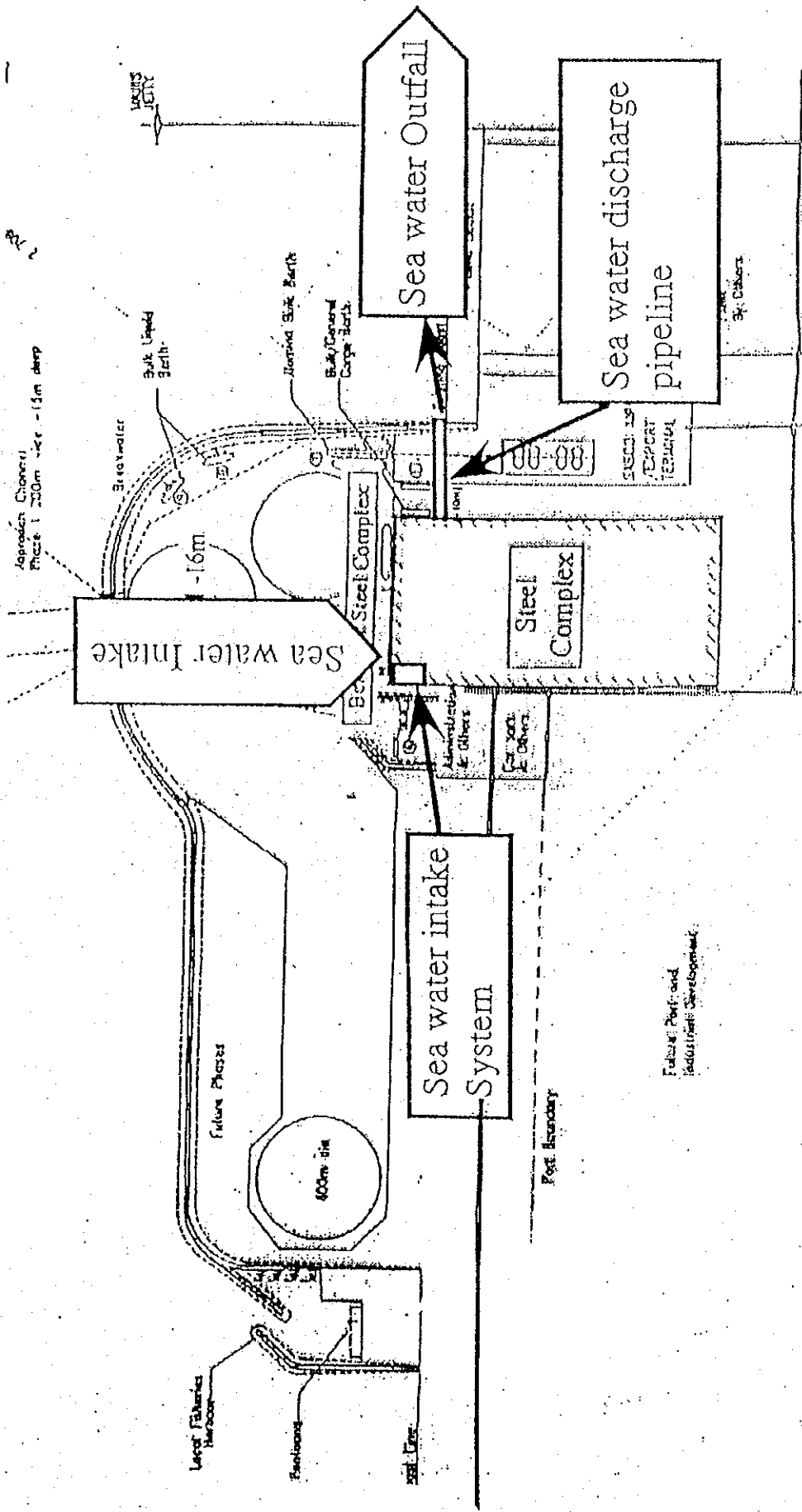


Figure Layout of Sea Water Intake and Outfall System in Sohar

4. SOCIAL CONDITIONS

There is no difference between Salalah site and Sohar site in social conditions. Especially, on environment and pollution, there is no difference because of no big industries.

4.1 Supporting Industries

According to the answer to our Questionnaire in February 1998, there are 248 companies in new-industrial area in Salalah, whose businesses are such as machining, steel member working, repair/maintenance work and transportation which could be subcontractors to the Steel Complex when necessary after the operation starts. The number of their employees are 3,880 in total, and among them 3,400 are employees in transportation companies.

In Sohar Industrial Area, there are about 200 companies in the same fields as above. Unfortunately, the Study Team could not get the number of employees of these companies in Sohar. But as far as we observed the Sohar Industrial Area, the numbers would not be less than that in Salalah because so many factories are already on operation there.

As already reported in the Interim Report (refer to 6.8 Maintenance, 6.10 Transportation), maintenance work and intra-works transportation are both planned to be done by the Company itself in principle. That means it would not be very fatal whether the number of companies or that of employees are big, or not. They will be helpful in case of some peaks of maintenance work or heaps of transportation work.

4.2 Human Resources and Housings

4.2.1 Human Resources

There is no integrated steel works in Oman at present, and there is not metallurgical or chemical engineering course in Sultan Qaboos University. As for vocational training, several numbers of public technical industrial colleges for secondary school graduates, and technical industrial institutes for dropouts are already established. Considerable number of private institutes have also started vocational training. Training expenses are paid by Government with some salary for student in case of public technical industrial colleges. The problem is, though the Study Team only observed Salalah Industrial Technical College (public) and High Institute of Administrative and Technical Sciences (private), that the number of trainers, especially well-specialized trainers are not enough compared with the experiment facilities. It will be indispensable for the Steel Complex to recruit most of engineers and skilled labor forces required from foreign countries, and qualified graduates in Oman will be adopted in accordance with Omanization policy, who must work together with experienced engineers and skilled workers to get necessary knowledge and skill.

According to the General Census of Population in 1993, the grand total of population in Oman is 2,018,074. That of Dhofar Governorate is 189,094 and among them economically active male population is 76,932. As for Al Batinah Governorate, the population is 564,677, among them economically active male population is 148,307. The Study Team learned that the population in Salalah city is around 140,000 and that of Sohar city is around 100,000. The Census shows that the population of boys aged between 10 and 15 in 1993 is about 139,000 (from the educational attainment table), and on a simple assumption, 7% and 5% ($140,000$ and $100,000/2,018,074$) of them, near 10,000 or 7,000 boys will be in Salalah city and Sohar city. From those figures, we do not see any problem on recruiting work forces for the Steel Complex since it will only need 1,200 workers at most, and in earlier stage it is also necessary, as described above, to recruit most part of work forces from outside.

4.2.2 Housings

There is a residential area in the Raysut region, and it is possible to build corporate houses and dormitories there. It will also be possible in Sohar to build corporate houses and dormitories near to the Steel Complex. According to the branch offices of Ministry of Housing, it is also possible to obtain enough number of good houses for rent in either city. Therefore it will not be necessary to worry about problems on the Steel Complex employees' housing matter.

4.3 Environment and Pollution

4.3.1 The environmental laws

There is only one law on pollution control in Oman. Local law or regulation does not exist. Therefore, it will be under the same condition whether the Steel Complex is located in Salalah or in Sohar.

4.3.2 Environmental condition of both sites

At present, there are no remarkable environmental problems at Salalah and Sohar due to their lower industrial activity and the geographical conditions.

Both proposed sites are located more than 1 kilometer far from the district of residence.

4.3.3 Evaluation

Two proposed sites are to be evaluated as same on environment and pollution.

There will not be any problems in installation of the Steel Complex at any sites if the plant is equipped with well designed environmental pollution control system.

5. SUMMARY OF THE TECHNICAL EVALUATION

Table 5-1 Summary of the Technical Evaluation

Item to be considered	Importance	Rating		Score	
		Salalah	Sohar	Salalah	Sohar
1. LAND					
1.1.Dimension and area of the site	5	A-8	A-10	4.0	5.0
1.2.Geographical conditions	5	A-7	A-10	3.5	5.0
1.3.Soil conditions	5	A-10	A-9	5.0	4.5
2. PORT AND ROAD					
2.1.Port and port facilities	20	A-10	A-9	20.0	18.0
2.2.Berth and berth facilities	5	B-7	B-7	3.5	3.5
2.3.Road	5	A-10	A-10	5.0	5.0
3. UTILITIES					
3.1.Electric power	15	B-5	B-7	7.5	10.5
3.2.Natural gas	15	A-7	A-7	10.5	10.5
3.3.Industrial water and waste water	10	A-9	B-7	9.0	7.0
4. SOCIAL CONDITION					
4.1.Supporting industries	5	B-6	B-6	3.0	3.0
4.2.Human resources and housings	5	B-6	B-6	3.0	3.0
4.3.Environment and pollution	5	A-10	A-10	5.0	5.0
TOTAL	100.0			79.0	80.0

II. ECONOMICAL COMPARISON

II. ECONOMICAL COMPARISON

I. LAND AND FOUNDATION

As for cost of land preparation, it is higher in Salalah by US\$ 19.47 million than in Sohar. However, as for cost of foundation it is higher in Sohar by US\$ 11.86 million than in Salalah.

The detailed economic comparison of two sites are tabulated below.

Table II-1-1 Comparison of Two Sites

ITEM	SALALAH	SOHAR
Land Preparation	7.220 million RO. (18.77million US\$) (Cutting & Filling of Rocky Soil and slope protection) 0.730 million RO. (1.90 million US\$) (WADI roundabout way)	0.480 million RO. (1.25 million US\$) (Leveling of dredged soil).
	Total 7.950 million RO. (20.67 million US\$)	Total 0.480 million RO. (1.25 million US\$)
Foundation	0.720 million RO. (1.87 million US\$) (Rock excavation)	3.480 million RO. (9.05 million US\$) (Piling work) 1.800 million RO. (4.68 million US\$) (Soil Improvement)
	Total 0.720 million RO. (1.87 million US\$)	Total 5.280 million RO. (13.73 million US\$)
Sea water	1.040 million RO. (2.70 million US\$) (Intake Line)	1.060million RO. (2.76 million US\$) (Discharge Line)
	Total 1.040 million RO. (2.70 million US\$)	Total 1.060 million RO. (2.76 million US\$)

2. PORT

There is not much difference on port between Salalah site and Sohar site.

The detailed economic comparison of port facilities is tabulated below.

Table II-2-1 Comparison of Two Port facilities

ITEM	SALALAH	SOHAR
Dredging	0.360 million RO. (0.94 million US\$)	
Quay wall and crane foundation	9.700 million RO. (25.22 million US\$)	10.890 million RO. (28.31 million US\$)
	Total 10.060 million RO. (26.16 million US\$)	Total 10.890 million RO. (28.31 million US\$)

Berth shall be constructed by the Government of the Sultanate of Oman.

3. FACILITIES IN PLANT

3.1 Piping and Conveyor

Cost of piping and conveyor is higher by US\$ 4.3 million in Salalah than in Sohar because Salalah site is 1 km away from the berth facilities.

(1) Piping

The required connection piping for the Steel Complex is indicated in Table 3-3-4 and the piping cost is estimated in each proposed site as follows :

a) Salalah

Table 3-1-a

	Potable water	Industrial water (TSW)	Sea water		
From	Near port	North Raysut waste water treatment plant	Raysut Port	Total	
To	Steel Complex	Steel Complex	Steel Complex		
Size (inch)	4	10	65		
Length (km)	Negligible	3.0	1.0 x 2		
Materials	Ductile cast Iron pipe	Ductile cast iron pipe	Steel pipe with tar epoxy coating		
Piping cost as installed (indicative value)	Negligible	US\$ 0.4 million	US\$ 2.7 million		US\$ 3.1 million

b) Sohar

Table 3-1-b

	Potable water	Industrial water (Desalination plant)	
From	Near port	Steel Complex	Total
To	Steel Complex	Steel Complex	
Size (inch)	4	10	
Length (km)	7.0	Not required	
Materials	Ductile cast iron pipe		
Piping cost as installed (indicative value)	US\$ 0.2 million	US\$ 0.0	US\$ 0.2 million

(2) Conveyor

If the belt conveyors are to be installed within the battery limit of the Steel Complex concerned, there is no difference between Salalah site and Sohar site. However, as the Steel Complex located about one kilometer away from the unloading berth at Raysut Port in the case of Salalah, unloaded iron ore (oxide pellets and/or lump ore) will have to be transported by a belt conveyor to the Steel Complex.

The belt conveyor is estimated to be as follows;

Quantity: One set
 Type: 30 deg. x 3 rollers, gallery frame
 Capacity: 2,000 t/h

Belt width:	1,200 mm
Horizontal length:	Approx. 1 km
Vertical lift:	Approx. 13 m
Motor horsepower:	150 kW
Cost as installed:	US\$ 4.2 million (indicative value)

The above cost has to be added to the capital investment cost in the case of Salalah site.

3.2 Foundation

Foundation cost is estimated in Table II-1-1.

3.3 Desalination Plant

Desalination plant is not necessary in Salalah site because waste water treatment plant is under construction. On the other hand, Sohar site will require desalination plant. Therefore the investment cost is higher by US\$ 17.0 million in Sohar site than in Salalah site.

Specification and cost estimation of desalination plant which is to be installed in Sohar are described in detail as follows;

(1) Specification of desalination plant

(a) Design criteria

- Raw sea water temperature :

Design condition : 30 deg.C

Maximum allowable temperature : 35 deg.C

Conductivity of sea water : 54,100 μ S/cm

- Product water quality :

The standard quality of drinking water in the Sultanate of Oman (OS8/1978)

TDS : < 110 mg/litter

Total hardness : < 20 ppm as CaCO₃

Chloride iron : < 50 mg/l as CaCO₃

- Production capacity : 5,000 m³/d

(b) Type of desalination plant : R-O (Reverse Osmosis) type

The following equipment will be included;

- R-O module unit
- Sand filter bed
- Safety filter
- Main pumps
- High pressure pump
- Chemical dosing unit

(2) Estimation of desalination plant

Cost as installed: US\$ 17.0 million (indicative value)

The above cost has to be added to the initial investment cost in the case of Sohar site.

3.4 Waste Water

Discharge pipeline is required in Sohar site. Although it is described in the column of Sea water in Table II-1-1, the details are as follows;

	Waste water (Discharge lines)
From	Sohar Port
To	Steel Complex
Size (inch)	65
Length (km)	0.8 x 2
Materials	Steel pipe with tar epoxy coating
Piping cost as installed (indicative value)	US\$2.8

3.5 Electric

The investment cost for flicker compensation equipment is higher by US\$ 5.1 million in Salalah site than in Sohar site.

Table 3-5-1 Flicker Compensation Equipment

Unit : Million

No	Description	Site			
		Salalah		Sohar	
		Equipment cost	Opert'n cost	Equipment cost	Opert'n cost
1	Flicker compensation equipment SVC capacity ; 127 MVA for Salalah 56 MVA for Sohar	US\$ 9.1	even	4.0	even

4. ENERGY AND UTILITIES

There is not much difference on energy and utilities between Salalah site and Sohar site. The difference is only the operation cost of industrial water in Sohar site, which is higher by US\$ 0.8 million than that in Salalah site.

4.1 Unit Cost of Electric Power

Table 4-1-1 Unit Cost of Electric Power

Unit : Million

Description	Site			
	Salalah		Sohar	
	Equipment cost	Operation cost	Equipment cost	Operation cost
Power generation plant 100MW GT with 220/h heat recover boiler x 2 sets				
(a) Constructed by the Steel Complex Equipment cost :US\$ 110.5 Construction cost : RO 8.85 (US\$ 22.8) Total : US\$ 133.3	US\$ 133.3*	18.9bz/kWh	US\$ 133.3*	18.9bz/kWh
(b) Constructed by private sector	NA		(US\$ -133.3)	(16bz/kWh)
(c) Generation cost difference Difference :2.9bz/kWh Power consumption : 1,223.2GWh/y				
1) Constructed by the Steel Complex		US\$9.2		US\$9.2
2) Constructed by private sector		NA		(US\$9.2)

Note ; () shows in case that a big project is executed in Sohar.

The figure with * mark is the case of Ghubra Power Station, given by MOEW.

4.2 Unit Cost of Natural Gas

PDO has explained to the Study Team about unit technical cost of natural gas (Supply facility + Transportation + Quality) and requested us to apply the same unit cost to both site cases.

Unit cost will be not less than 0.8 US\$/MMBTU.

4.3 Unit Cost of Industrial Water

a) Salalah

Unit cost of industrial water in Salalah will be 0.22 RO/m³ tentatively.

* Data of unit cost was collected from SSDCO (Salalah Sanitary Drainage Service Co.).

Operation cost in Salalah:

Consumption of industrial water = 1,090,000 m³/y

Total operation cost = 0.22 x 1,090,000 = 239,800 RO/y

b) Sohar

[In case of installation of desalination plant in the Steel Complex]

Unit cost of industrial water in Sohar will be 0.515 RO/m³.

* Data of unit cost was collected from JICA report in 1994.

Operation cost in Sohar:

Consumption of industrial water = 1,090,000 m³/y

Total operation cost = 0.515 x 1,090,000 = 561,350 RO/y

Difference cost between Sohar and Salalah = 320,550 RO/y (= US\$ 0.8 million)

[In case of supply water from industrial area]

Unit cost of industrial water in Sohar will be 0.66 RO/m³.

* Data of unit cost was collected at SDO (Sohar Development Office)

Operation cost in Sohar:

Consumption of industrial water=1,090,000m³/y

Total operation cost =0.66 x 1,090,000 =719,400 RO/y

Difference cost between Sohar and Salalah=479,600 RO/y (=US\$ 1.25 million)

5. TRANSPORTATION COSTS FOR FINISHED PRODUCTS

Sohar site has a great advantage in transportation costs of finished products because it is by far near to the market. The difference of its transportation costs is about US\$ 15 to 19 million per year.

Price of steel bars at each market : delivered price for each customer is the same, while the ex-works price of steel bars differs depending on the transportation cost from the Steel Complex to a customer.

In comparison of the location between two plant sites, Sohar site is nearer to the market than Salalah site.

(1) Sales plan of steel bars

According to our market study, the destination of steel bar shipment of the Steel Complex is as follows:

Steel Bar Shipment Plan

Country	Year 2005 ('000T/Y)
Oman	400
UAE	470
Kuwait	34
Bahrain	10
Saudi Arabia	30
Yemen	130
Jordan	5
Syria	10
Kenya	1
Tanzania	1
Pakistan	3
ASEAN	70
Total	1,164

Note) The above plan is revised from Table 4-5-3 of the Interim Report according to the Minutes of Meeting of July 8, 1998.

Regarding the regional demand in Oman, it is estimated as shown in the following table in proportion to the share of the investment in the Fifth Five-Year Plan (1996 - 2000).

Region of Oman	Steel Bar Shipment ('000T/Y)
Muscat	74
Al Batinah (Sohar)	67
Musandam	11
A'Dahirah	54
Ad Dakhlyah (Nizwa)	85
Ashharqiyah (Sur)	55
Al-Wusta	16
Dhofar (Salalah)	39
Total	400

(2) Estimated transportation cost of steel bars to each market from the Steel Complex

According to the field surveys and various information, transportation costs of steel bars from Salalah and Sohar to each destination are estimated as follows:

Estimated transportation Cost of Steel Bars

Region of Oman	Estimated Transportation Cost (US\$/T)			
	from Sohar		from Salalah	
Muscat	6	by road	25 - 30	by sea
Al Batinah (Sohar)	3	by road	25 - 30	by sea
Musandam	6	by road	30 - 35	by sea and road
A'Dahirah	6	by road	30 - 35	by sea and road
Ad Dakhlyah (Nizwa)	10	by road	25 - 30	by sea and road
Ashharqiyah (Sur)	15	by road	25 - 30	by sea and road
Al-Wusta	20 - 25	by road	6	by road
Dhofar (Salalah)	25 - 30	by road or sea	3	by road

Export/Country	Estimated Transportation Cost (US\$/T)			
	from Sohar		from Salalah	
	UAE	8	by road	30 - 35
Kuwait	25 - 30	by sea	30 - 35	by sea
Bahrain	15 - 20	by sea	20 - 25	by sea
Saudi Arabia	15 - 20	by sea	20 - 25	by sea
Yemen	30 - 35	by sea	25 - 30	by sea
Jordan	25 - 30	by sea	25 - 30	by sea
Syria	25 - 30	by sea	25 - 30	by sea
Kenya	30 - 35	by sea	25 - 30	by sea
Tanzania	30 - 35	by sea	25 - 30	by sea
Pakistan	20 - 25	by sea	20 - 25	by sea
ASEAN	35 - 40	by sea	30 - 35	by sea

(3) Difference of the steel bar transportation costs to the market between Salalah and Sohar

Judging from the sales plan by region/ country and estimated transportation costs to each market, the Steel Complex located in Sohar will have advantage of about US\$ 15 - 19 million per year in the transportation costs of finished products over the case of Salalah.

The advantage of US\$ 15 - 19 million per year is equivalent to US\$ 92 - 117 million of initial capital investment in terms of net present value for 10 operational years (discount rate: 10%/year).

The main reason for the above is that Sohar is located very close to the major target markets of the planned Steel Complex project: Muscat & northern regions of Oman and UAE.

6. Comparison in Total Amount of Initial Investment and Operation Costs

Cost Factors	Salalah		Sohar		Remarks
	Initial Investment Cost (Unit: Million US\$)*2	Operation cost (Unit: Million US\$/year)	Initial Investment Cost (Unit: Million US\$)*2	Operation cost (Unit: Million US\$/year)	
1. LAND					
1.1 Acquisition of land or rental fee	*1	100baiza/m ² /year	*1	100baiza/m ² /year	
1.2 Land preparation	20.7		1.2		
1.3 Slope protection					
2. PORT AND BERTH FACILITIES					
2.1 Port and berth tariffs	*1	same	*1	same	
2.2 Berth	*1	same	*1	same	
2.3 Berth facilities	*1	same	*1	same	
3. FACILITIES IN PLANT					
3.1 Piping	3.1		3.0		
3.2 Conveyor	4.2		0.0		
3.3 Foundation	1.9		13.7		
3.3 Desalination plant	0.0		17.0		In case of water supplied from industrial area at SUR
3.4 Waste water	-		-		
3.5 Electric	9.1	*1	4.0	*1	Flicker compensation equipment
4. ENERGY AND UTILITIES					
4.1 Unit cost of electric power	-	*1	-	*1	
4.2 Unit cost of natural gas	-	*1	-	*1	
4.3 Unit cost of industrial water	-	0.22 RO/m ³ 0.0	-	0.8 (0.515 RO/m ³) (0.66RO/m ³) (1.3)	In case of installation of desalination plant In case of supply water from industrial area
5. TRANSPORTATION COSTS OF FINISHED PRODUCTS					
5.1 Road and sea	-	15.0-19.0	-	-	
TOTAL OF INVESTMENT AND OPERATION COSTS	39.0	15.0-19.0	38.9	0.8	

*1 Conditions of Salalah and Sohar are even.

*2 These figures of Initial Investment Cost are the differences caused by the site conditions.

III. RECOMMENDATION

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The results and recommendation of the Study Team can be summarized as follow;

(1) Conclusion of the site selection

It is concluded that Sohar site would be more appropriate for conducting further feasibility study after due consideration of the features and results of the technical and economical evaluations on both sites of Salalah and Sohar based on Methodology for Plant Site Selection agreed by the Steering Committee of the Government of the Sultanate of Oman and the Study Team of JICA.

Followings are the briefing of the conclusion.

1) Technical evaluation

The scores of technical evaluation for both sites based on Methodology for Plant Site Selection are 79.0 points for Salalah and 80.0 points for Sohar. Both sites of Salalah and Sohar are technically acceptable as the Steel Complex site.

However, there is some concern for the operation of electric arc furnace with bigger flicker compensation because of small short circuit level of electricity in Salalah comparing with Sohar.

2) Economical evaluation

2)-1 Financial evaluation

- There is not much difference of the initial investment cost between both sites of Salalah and Sohar though it is higher by US\$ 0.1 million in Salalah site than in Sohar site.
- Difference of operation cost between Salalah site and Sohar site is estimated at around US\$12.2~15.6 per ton of finished products (US\$14,200,000~18,200,000 per year), which is higher in Salalah site.

2)-2 Economical evaluation for national economy

- In view of national economy of Oman, investment cost of constructing gas pipeline to Salalah is much higher than that to Sohar because its length to Salalah is longer by 400 km than that to Sohar. Consequently unit technical cost of natural gas is to be different at each site. If the Government of Oman applies the same price of natural gas to each site, the supply of the price difference would be a big burden to the Government of Oman.

3) Recommendation

In careful consideration of big flicker compensation, a big difference of annual operation cost (US\$14,200,000 ~ 18,200,000 per year) and of national economy of Oman, Sohar site would be more appropriate for conducting further feasibility study.

The Steering Committee of the Government of the Sultanate of Oman shall make its decision based on this report and inform the selected site (one site) to JICA and the Study Team by September 14, 1998.