4 Evaluation of Mineral Resources

4.1 Geological Features in Oman

In Oman, the Jabel Hajar mountain range lying in the northern region makes geological features of the country quite complex. It has the highest peak at 3,048m above the sea level and forms steep and rocky mountains having little surface soil. Geological formation is dominated by Paleozoic pre-middle Permian to Mesozoic Upper Cretaceous strata. Autochthonous mountains, which have been repeatedly subject to sinclinical and anticlinical folds, are covered by the allochthonous Hawasina formation and Samail Nappe that have been carried from other areas by recumbent fold and thrust, together forming the Oman mountain range. The Hawasina formation is mainly made up of red sandstone, chert, quartizite, silt, and limestone, which result in a very complex geological structure. It is then covered by Samile Nappe made up of ophiolite. The ophiolite is mainly comprised of basic rocks formed in pre-middle permian - upper Cretaceous period, containing serpentine, peridotite, basalt, diabase, and basic volcanices. These rocks are endowed with valuable metallic mineral resources and account for nearly one half the total area covering the Oman mountain range. In addition, the Tertiary formation is seen in the mountain area between Quryat and Sur, and portions of the Al Batinah coastal plain. It also extends into an inland area, up to the Salalah region in the south, also called the Dhofar region. The Quartenary sediment is mainly found in the Al Batinah plain and along wadis, as well as the inland desert areas. In addition, the Precambrian formation is present in a small portion of the southern coastal area.

In the above geological setting, there exist a variety of metallic and non-metallic mineral resources available (or expected to be available) in the country. The following sections describe estimated reserves of major resources and their availability for industrial use.

It should be noted, however, that mineral samples collected during the first field survey are being analyzed to determine their usability for industrial purposes. Thus, the following major findings are compiled on the basis of the First Field Survey, before the result from the ongoing quality analysis is obtained.

Also, potential usability of major mineral resources as industrial materials has been examined within a limited scope, to sufficiently determine quantitative availability and preliminary economic feasibility.

Finally, an analysis of the potential demand for industrial products using mineral resources available in the country, and their competitiveness in markets will be conducted separately.

4.2 Metallic Mineral Resources

In Oman, metallic mineral resources are mainly found in the northern mountain area, as well as Masirah Island. Major resources that have commercial value include copper, gold, chrome, manganese, and laterite.

4.2.1 Copper

Copper is the most important metallic mineral resource contained in opiolite that is widely found in Samail Nappe of Jabel Hajar. Commercial development of copper deposits in the country started 14 years ago. Today, there are three deposits located approximately 20km west of the Sohar region in the north, namely Lasail, Aarja, and Bayda. All of them are massive sulfide deposits that seem to have sedimented syngenetically during the Upper Cretaceous.

These deposits are mined by Oman Mining Co. LLC (OMCO), which produces crude ores with Cu grade of 1.65% - 2.0% at a rate of 3,000 tons/day, and processes and refines them. OMCO is currently producing 15,000 tons of anode annually.

Ore reserves at the Lasail deposit are reported to total 8 million tons, and 3 million tons at the Aarja deposit and 750,000 tons at the Bayda deposit. On the other hand, production by OMCO for 14 years amounts to an estimated 12.6 million tons (assuming annual production of 900,000 tons, although certain amounts of shipping ore were imported). Additional ore reserves have presumably been found in all the deposits due to subsequent exploration activities.

The Lasail deposit is scheduled to be closed by 1994, and Aarja remains to be the most actively-producing deposit at this moment. To maintain the current level of production, (900,000 tons annually) therefore, further exploration is crucial.

Other deposits are located in Hayl-as-Safil (copper and gold) and Rakar (copper), approximately 45km north-northeast of Ibri. They are being drilled by OMCO. A commercial development project is under way involving a deposit that mainly produces gold. The production was slated to have started last April 1994. However, due to the lack of infrastructure in and around the area, construction of mining facilities is expected to require significant time and cost.

Copper and gold resources in Samail ophiolite have high growth potential, since many of ophiolite areas still have to be explored, and thus additional ore reserves are likely to be discovered in the future exploration process. The result of an aerial geophysical

exploration project covering the entire ophiolite zone (World Geoscience Corp., July 1993) has been drawn to a 1:100,000 scale map. Further exploration activities are being considered for the areas identified in the report, and in other data sources. These include a boring survey that will soon be conducted on promising areas, selected on the basis of results from aerial and ground geophysical exploration surveys.

Recent copper production trends are summarized as follows:

Table 4-1 Smelter/Refinery Department Cathorde Production

(Unit: Ton)

Year	Anode Loaded	Production		
		EX OMCO	BOUGHT IN	EX TOLL
1983	6,932.852	4,372.944	–	–
1984	21,206.769	16,202.337	–	–
1985	18,889.339	14,405.547	–	–
1986	19,247.922	14,583.201	–	–
1987	20,730.959	15,493.793	5.373	–
1988	21,523.737	16,267.243	13.241	204.304
1989	20,068.990	14,956.347	8.875	352.913
1990	15,501.821	12,012.889	1.724	–
1991	15,046.241	11,401.644	–	–
1992	18,645.983	11,383.789	1,334.695	1,494.864
1993*	17,365.993	6,081.087	842.352	5,929.803

Note:* Jan-Aug

Source: MPM

Even if additional ore reserves are not discovered in the currently operated deposits, or if further exploration finds no new deposit, anode production, meanwhile, can be continued at the copper smelter by purchasing shipping ore from foreign sources, because of: (1) low power generation cost, and; (2) economic advantages offered by the present smelter over new projects. Meanwhile, the above-mentioned gold mining project is expected to proceed, although taking some time, and will also produce copper ores. Thus, regardless of prospect to discover additional ores or new deposits, it is worth examining feasibility of producing downstream products for anode.

4.2.2 Chrome

Chrome is the second important metallic mineral resource contained in ophiolite that is widely prevalent in the northern mountain range, and is produced as chromite. Country rock is ultrabasic rock, such as hartzbergite and dunite, where chromite is present in

podiform type, and choromite occurrences reportedly amount to as much as 450. Chromite's grade is Cr_2O_3 35–42%, $Cr_2O_3+Al_2O_3$>60%, and Cr/Fe>2.0, meeting the standard metallurgical grade as well as the refractory grade.

Ore reserves are estimated to be around 1 million tons in the northern area, and another 1 million tons in the southeast area. Further discovery is expected if boring and other additional exploration activities are conducted.

Nevertheless, the present deposits which are relatively small in size, are mostly a few thousand tons, with only a few exceeding 20,000 – 30,000 ton levels.

Also, the deposits crop out mostly on mountainsides without top soil coverage, which makes mining operations relatively difficult and costly due to geological reasons.

At present, chrome ores are exported without processing. In 1993, an estimated 10,000 tons are produced (exported). In 1994, 20,000 tons are planned to be produced (exported), consisting of 8,000 tons of refractory grade and 12,000 tons of metallurgical grade.

A project to construct a ferrochrome plant is contemplated in an OMCO's mining area in the north (approximately 20km west of Sohar), but has not been implemented so far partly due to a high electricity cost.

While chrome production projects undertaken in other parts of the world are very large in scale and achieve critical mass, the planned production capacity seems to be less competitive.

Chrome resources are predominantly found in South Africa and the former Soviet Union. In particular, southern Africa (including Zimbabwe) accounts for 80% of worldwide chrome reserves, leaving a small share to other producing areas. For instance, India, ranked fifth with 60 million tons of reserve, representing only 1.4% of the world total. Comparatively, production of chrome ore is dominated by South Africa, which churns out 4.24 million tons annually (36.3% of the world output), and India producing 760,000 tons (6.4%). In particular, metallurgical-grade ores are produced in relatively large scale.

The situation indicates that Oman does not offer a sufficient economy of scale for ferrochrome production, thereby making exportation of chrome ores as currently practiced more beneficial. On the other hand, refractory-grade ores can be locally processed because the chrome brick (refractory brick) production process can be economically operated in a relatively small scale, and other materials (quartzite and kaolinite) are locally available. This is an area, where feasibility is worth examining.

4.2.3 Gold

As mentioned in the previous section on copper, gold resources are found in the Hayl-as-Safil and Rakar deposits, situated approximately 15km northeast of Yanqul (37km north of Ibri). Their grade is Au 8.96gt, Ag 13.3g/t with thickness of 18.3m (JICA, 1989). OMCO is currently conducting detailed investigation and plans to start commercial production in 1994.

Needless to say, the economy of gold refining is governed by the grade of ore and the size of refining operation. This is particularly true in the planned development of large gold mines in Central Asian countries (part of the former Soviet Union), which render small-scale gold smelting operations uneconomical.

Another important factor governing the economy of gold smelting is the ability to extract by-products contained in gold ores. Again, the scale of smelting operation heavily affects the economy of extracting the by-products.

4.2.4 Manganese

Manganese is contained in the chert layers of the Hawasina formation, where metallic manganese deposits are found in the southern Sur region, and in Jabel Hammer located 15km south of the southern Al-Kamil region. They seem to have originated in sediments that occurred concurrently with chert and subjected to secondary enrichment. Neither of the deposits is likely to contain a few thousand tons in reserve, as measured by recoverable high-grade portions, besides it is difficult to launch commercial production unless major reserves are found in unexplored areas.

4.2.5 Laterite

Laterite is distributed in the Ibra region in the form of iron rich pisolitic laterite. It is already mined and used in Raysut Cement Company (SAOG) and Oman Cement Company (SAO). While it can also be used as a steelmaking material, the above product does not meet quality requirements.

4.2.6 Other metallic mineral resources

Other metallic mineral resources available in the country include lead, zinc, and laterite nickel, but no recoverable deposit has been found for any of them.

4.3 Non-metallic Mineral Resources

A variety of non-metallic mineral resources in the country, such as limestone, dolomite, and gypsum, has been known for some time, and recent study and research on these mineral resources reveal their reserves, qualities, and geographical distribution. In particular, BRGM conducted a comprehensive survey on non-metallic minerals in the country, under a contract with the Ministry of Petroleum and Minerals (MPM); a formal report in July 1991, was submitted together with a supplement dated September 1992, entitled "Industrial Rocks and Minerals: Preliminary Technical/Economic Assessment and 1:1,000,000 Scale Map of Potential Deposits, and Additional Occurrences and Deposits." Subsequently, MPM conducted mapping and drilling for prospective deposits, identified on the basis of the preliminary survey and collected detailed data and information.

The BRGM report covers aggregate and silt, asbestos, bentonite, sepiolite, celestite, guano, gypsum and anhydorite, heavy black sand, iron oxides, kaoline, limestone, dolomite, marble, granite, rock wool, silica sand and quartzite, clay, wollastonite, and miliolite.

In addition, detailed survey has been conducted for coal and brine.

Table 4-2 shows production and consumption of non-metallic minerals in 1992.

Table 4-2 Production and Consumption of Minerals in 1992

Material	Unit	Poduction	Consumption
Sand	m^3/y	2,584,446	2,706,977
Aggregate	m^3/y	2,574,338	2,874,850
Filling Material	m^3/y	985,964	1,010,706
Limestone	t/y	1,752,757	1,812,578
Limestone Salalah	t/y	341,788	314,788
Marble	m^3/y	31,407	34,669
Industrial Salt	t/y	4,743	5,023
Copper Slag	t/y	79,456	79,456
Chromite	t/y	1,764	1,764
Gypsum	t/y	48,150	48,150

Source: MPM

4.3.1 Limestone

Limestone is one of the most abundant resources available in Oman, widely found in the Oman mountains. In 1992, 2 million tons were mined and used by Oman Cement Company, Raysut Cement Company, and quick lime producers, as well as copper smelting. Raysut Cement Co. plans to triple its cement production from the current annual

production of 240,000 tons to 720,000 tons, and Oman Cement Co. is likewise contemplating on a production increase. Limestone reserves in the country are sufficient to meet increased production. Other than cement and quick lime, limestone is used for steelmaking, construction, and calcium carbonate. There is a large demand for steelmaking in Australia (more than 1 million tons annually). While the country has yet to secure low-cost transport to compete with other exporting countries which use large ships on return trip, existing port and harbor facilities are rather small to meet such requirements. On the other hand, production for other uses including as aggregates is not highly profitable.

4.3.2 Marble

Also available in abundance, marble has been locally used to produce terrazzo by mixing marble fragments with white cement. The shaping of marble slabs has started a few years ago.

At present, various companies including Oman Marble Co., Al Nasr Co., and ATT produce 35,000 m^3 annually, and further growth in exports is expected.

4.3.3 Dolomite

A large dolomite deposit covering a 3km x 6km area, called the Quryat deposit, has been discovered 15km to a port town of Quryat along the Muscat – Quryat road. Despite its potential for commercial exploitation, however, it is still left unmined at present. This is because the country does not have industries that consume dolomite-based products, such as plaster, magnecia fertilizer , and glass. On the other hand, there is also little export potential since dolomite is available in most of countries.

4.3.4 Gypsum

Gypsum is widely distributed in the east coast, from the Shuwaymiyah deposit to the Thumrait deposit located approximately 90km of Salalah. At present, two mining sites in Thumrait produce 48,000 tons annually, which are mainly supplied to 2 cement mills, the produce of which is being exported to the UAE. Boring survey was conducted in the Shuwaymiyah deposit by drilling 8 holes and was completed by November 1993. Analysis of core samples, revealed presence of very high grade gypsum (90 – 98%) in reserves exceeding 100 million tons.

Other potential use is gypsum board. If further study identifies its suitability for building designs adopted in the country and surrounding areas, a sizable potential market

for gypsum board is created, not to mention the GCC countries.

Also, there are huge export markets worldwide (more than 3.5 million tons in Japan), and proximity of the deposits to the coast (1km) may make the country competitive in the international marketplace. Thus, feasibility study is recommended, including investment requirements for the construction and improvement of inland transportation facilities as well as port and harbor facilities.

4.3.5 Silica sand

Preliminary survey was conducted for 5 deposits, followed by a boring survey for the most promising Abu Tan deposit, which indicated recoverable reserves of 5 million tons and a high grade of SiO_2 99.7% – 99.8%.

Silica sand is mainly consumed by the glass industry. However, it is available worldwide, and does not provide high export potential for the country, which must compete with major exporting countries offering cost advantage (including transportation).

4.3.6 Kaoline

Two deposits, Hawshi and Wadi Sumaynah, have been discovered. The result of the boring survey indicates presence of high grade kaolin, but its color makes it unsuitable for papermaking. It is being tested for other major application such as ceramics.

4.3.7 Aggregate

In the country, the rough obtained from wadis, after crushing and sieving, is used as aggregates for concrete making, road pavement, and building block. Coupled with debris produced from excavation in construction projects, the current supply sources are able to meet demand. Assessment of export demand is recommended.

4.3.8 Coal

Exploration is under way at the Al Kamil (Wadi Musuwa) coal field, located in the southern part of the Sur region. Exploration activity conducted under the UN's assistance started in December 1991. The result of the nearly 2-year survey indicates that the coal field contains high sulpher (5%) sub-bituminous coal with 12,000BTU and low ash content. Coal reserves are estimated to range between 40 million and 50 million tons, down to a depth of 600m. Obviously, the high sulpher content makes the coal resource unsuitable for commercial use (coal currently consumed worldwide is expected to have a

sulfur content of less than 1%), and the effective and economical removal of sulfur holds the key to commercial exploitation.

Coal samples are currently under the sub-industrial test.

4.3.9 Brine

Presence of brine has been discovered through exploration of petroleum resources, and it is mainly pumped up from oil fields. In Oman, salt-halite forms extensive underground deposits, covering as much as 70,000 km^2 and connecting 3 basins arranged in a north-south direction namely, the Fahud Salt Basin, the Ghaba Salt Basin, and the South Oman Salt Basin. The salt-halite layer is contained in the Ara formation (Upper Precambrian - Cambrian) and consists of a thin sulfate layer and a thick salt-halite layer which ranges between 0m and 1,700m. However, the analysis of brine obtained from various oil fields has not indicated the presence of economically useful elements. Thus, judging from the currently available data and information, brine is not likely to become a promising industrial material, except for production of industrial salt.

4.3.10 Other non-metallic mineral resources

Other non-metallic mineral resources include asbestos, bentonite, sepiolite, celestite, guano, heavy black sand, granite, rock wool, wollastonite, and miliolite, of which the prospects for commercial exploitation are summarized as follows:

a) Asbestos and wollastonite are considered as environmental pollutants and thus, no major growth is expected in the future.

b) Bentonite and sepiolite, found in Jam'at Qaboos and Fulayj, contain various types of clay minerals, and further analysis is required to identify possible applications.

c) Guano is found in Hamar an Nafur and Hallaniyah Island, but reserves are relatively small to allow commercial exploitation.

d) Celestite that contains strontium is found in Hawshi, but its reserves are not sufficient for commercial production.

e) Granite deposits are found in small scale and can be used as construction materials. However, it offers less commercial value than marble.

f) As for rock wool, presence of dolerite in the form of sheeted dyke is found in Rusayl, and BRGM's test indicates possibility of use as a raw material for rock wool. While rock wool cannot find a local building market because of design applicabilities, it can be developed into commercial operation if proper market development efforts are taken.

g) Heavy black sand is found in the coast of Hallaniyah. It contains 40% ilemenite,

but recoverable reserves amount to only 10,000 -- 15,000 tons, not suitable for commercial exploitation.

h) Miliolite is found in the Quartenary sediment consisting mainly coarse grain limestone sand, located in Taqah (Arzat) of the Salalah region. It is now mined on a small scale by using manual labor, and is shaped to 30cm x 15cm x 4.5cm blocks used for building decoration, including a palace in Salalah. However, reserves are found to be too small to justify large-scale commercial development.

5 Current Situation and Future Outlook for Production and Consumption of Oil and Natural Gas

5.1 Present State and Future Outlook of Oil Development

Exploration of oil and natural gas resources in Oman has been conducted predominantly by Petroleum Development Oman (PDO), a company 60% owned by the government of Oman. However, several foreign companies are also undertaking exploration with the concession granted by the government of Oman.

The government has been actively promoting the development of oil and natural gas resources by providing huge amounts of development funds for PDO's exploration and exploitation activities. Today, PDO's oil production accounts for approximately 94% of total output in the country.

Proven reserves of oil in the country have substantially increased along with progress of exploratory work during the last two decades, reaching 4 billion BBL in 1985 and 4.7 billion BBL as of January 1993 which is about 1.5 times as much as the reserves in 1980 of only 2.5 billion BBL. Table 5-1 shows annual changes of the proven oil reserves in PDO's concession areas.

Yearly changes in the number of oil production wells and oil production are shown in Table 5-2. As seen in the table, oil production significantly increased with extensive development of new oil fields and various reinforced recovery operations in recent years. Annual production reached 250 million BBL (685,000 BBLD; barrel per day) in 1990, 37% increase over that in 1985; and 271 million BBL (742,000 BBLD) in 1992, a 49% increase over the same period. In 1993, the oil production recorded approximately 800,000 BBLD.

Oil reserves in Oman are not so large compared to the reserves in neighboring oil producing countries. The Ministry of Petroleum and Minerals which is responsible for oil development in the country has a long-term policy calling for the sustenance in the life of this scarce resource in the light of extensive exploration and stable production of oil, to maintain the current production of 700,000 - 800,000 BBLD.

5.2 Oil Consumption and Transportation System for Oil

Oman has an 80,000 BBLD refinery which produces gasoline and other petroleum products mainly for local consumption. However, this refinery processes only 7–8% of crude oil produced in the country, the overwhelming majority of the produced crude oil are exported directly. Table 5–3 shows the local consumption and export of crude oil produced in Oman. Oil fields developed to this date are all scattered in wide areas of interior regions.

A storage and export terminal for crude oil is located in Mina Al– Fahal, Muscat. The refinery is located adjacent to that terminal. From oil fields, the crude oil produced is transported through pipeline networks to the storage terminal having a total storage capacity of 4,250,000 BBL, then, these are supplied to the refinery, or are loaded to tankers through the loading facility for exports.

5.3 Production of Petroleum Products

The only existing refinery located at Mina Al–Fahal, Muscat has been running since 1982. It is operated and managed by Oman Refinery Company (ORC). Its refining capacity was expanded from 50,000 BBLD at the initial stage, to 80,000 BBLD with revamping in 1987.

This refinery consists of the main process units enumerated below:

	Production capacity (BBL/day)
Topper	80,000
Naphtha hydrotreater	21,000
Reformer	6,000
Kerosene merox	1,000

Note: At present, a continuous catalytic regeneration (CCR) system of 20,000 BBLD is under construction and scheduled to start commercial operation in 1994. The gasoline production capacity will increase after completion of this unit.

Table 5–4 gives the production of petroleum products at the ORC's refinery. As shown in the table, gasoline production, combining premium and regular grades accounts only for 18% – 19% of total production, while long residues capturing 50% share. In addition, dual purpose kerosene, gas oil, and butane/LPG represent 8% – 9%, 20%, and 2% respectively. At present lead gasoline is produced for local supply. There is a plan to replace it with nonlead gasoline, starting in 1998.

5.4 Consumption of Petroleum Products and Future Supply and Demand Outlook

Recent sales of gasoline and other major petroleum products in Oman, and exports and imports of petroleum products are tabulated in Tables 5-5 and 5-6. From those figures, the present consumption of petroleum products in Oman is estimated as summarized below.

(1) Gasoline

The gasoline consumption has been steadily increasing year after year. The consumption of gasoline combining premium and regular grades (of which premium gasoline accounts for 77%) is estimated to be 4.8 million BBL in 1992. Since domestic production is slightly below demand, imported gasoline is used to fill the gap.

(2) Kerosene (for jet fuel and domestic uses)

The consumption of kerosene totaled 1.3 million BBL in 1992, 97% of which were used for jet fuel, with the remaining 3% mainly for domestic uses. While some of the kerosene consumed in the country are largely imported, still some of kerosene produced remains to be exported, with total supply and demand being more-or-less in balance.

(3) Gas oil

The consumption of gas oil in the country recorded a steady growth, reaching 3.9 million BBL in 1992. As in the case of kerosene, gas oil is partially exported and imported. Overall, domestic production exceeds domestic demand by around 20%, with the surplus being exported.

(4) LPG

Butane produced at the ORC refinery is sold as LPG for domestic use. As the present production of LPG is limited in small quantities, the supply is confined to the Muscat area.

(5) Long residue (fuel oil)

The domestic consumption of fuel oil was approximately 140,000 BBL in 1992. It was consumed at around 750,000 BBL a year up to 1986, then decreased sharply due to conversion of fuel at power plants from fuel oil to natural gas.

As shown in Table 5-4, the production of long residue (fuel oil) amounts to 10-11

million BBL, and a surplus of 9–10 million BBL over domestic consumption (140,000 BBL) is exported.

5.5 Future Supply and Demand Outlook for Petroleum Products

According to the Shell's forecast, the future demand for gasoline, kerosene and gas oil in Oman are estimated as follows:

(Unit: Million BBL)

	1996	2000
1. Gasoline		
Premium	3.6 – 3.9	4.3 – 5.5
Regular	2.0 – 2.1	2.3 – 2.9
Total	5.6 – 6.0	6.6 – 8.4
2. D.P. kerosene	1.6 – 1.7	1.7 – 1.9
3. Gas oil	4.7 – 4.9	4.7 – 5.4

As mentioned earlier, the ORC refinery will add the 20,000 BBLD CCR system to increase gasoline production. Nevertheless, the increased supply will not be able to satisfy increased demand.

ORC is examining a plan to produce gasoline from long residue by the residual fluid cast cracking (RFCC) or the hydrocracking process, but it is uncertain yet whether this plan will be implemented since there is difficulty in building those units at the existing refinery due to its environmental impact on surrounding residential areas. Nor is there any plan for expansion of the existing refinery or construction of a new refinery.

Under these circumstances, gasoline demand in excess of supply capacity will remain to be met by imports for years to come. Similarly, imports of kerosene are expected to increase along with increased demand. Meanwhile, gas oil demand can be met by domestic supply for the time being with some more surplus capacity. For future increase in demand, however, ORC is now planning to increase the gas oil production to 5.9 million BBL starting in 1998.

The long residue (fuel oil) production will continue to far exceed domestic demand, and a surplus will have to be exported in future.

5.6 Development and Production of Natural Gas

Development of natural gas fields has progressed along with exploration of oil

deposits. As a result, recoverable reserves of non-associated gas increased from 7.13 trillion cu.ft. in January 1990, to 14 trillion cu.ft. in January 1993. The figure does not include a major gas reservoir discovered in 1991, on which appraisal work is underway to prove the presence of a reserve. Once this newly-discovered reserve is proven, the total reserve is expected to go over 20 trillion cu.ft..

Table 5-7 gives the production and consumption of natural gas in Oman. Natural gas produced in the past has mostly been associated gas, whose production steadily increases correspondingly with oil production. In 1992, natural gas production reached 163 billion cu.ft., and 93% of which was accounted by gas.

Some of the produced associated gas are consumed at oil fields for re-injection to boost oil production, as well as fuel. The government constructed a gas pipeline system in 1978 to use natural gas for power generation and industrial uses, followed by series of expansion of pipeline networks. The gas pipeline system, called Government Gas System (GGS), transports associated gas not consumed at oil fields, as well as non-associated gas produced separately, to consumers as fuels for power generation and industrial operation. There are some oil fields that are not connected to the GGS, and associated gas produced from these fields is flared out. Gas condensate contained in natural gas is separated and recovered at a gas processing plant, and then spiked into crude oil.

The current consumption of natural gas supplied through the GGS is shown in Table 5-8. As seen in the table, the gas consumption has been growing steadfastly, reaching 70 billion cu.ft. in 1992 (190 million cu.ft./day), 75% of which was non-associated gas. Around 89% of gas supplied through the GGS are consumed at power plants. Other major customers are Oman Cement Co. and Oman Mining Co., which consume around 6% of the total.

5.7 Future Plans for Natural Gas Utilization

The production of associated gas depends on crude oil production. As mentioned earlier, crude oil production will remain at the present level in the foreseeable future, thus the production of associated gas will also remain at the current level.

Under this setting, the gas industry in Oman will continue to grow with reliance on the development of non-associated gas. Based on the development of the large non-associated gas reserves discovered in the interior regions, as well as the level of present gas supply,

the Ministry of Petroleum and Minerals and the Ministry of Commerce and Industry are examining several gas utilization projects, which include those enumerated below:

1) LNG project for exportation: 6 million tons/year
2) Natural gas-based petrochemical projects
   a) Ammonia/urea fertilizer
   b) Methanol
   c) Polyolefin
3) LPG production from natural gas

The LNG project as well as the ammonia/urea and methanol projects based on natural gas are currently at the pre-feasibility study stage. As soon as adequate gas suppliability is affirmed, a detailed feasibility study will be conducted for each project, and an integrated gas supply plan that will secure stable supply for all the projects will be established to implement each.

The polyolefin project aims to produce polyethylene and polypropylene from ethane, propane and butane which can be extracted from natural gas currently supplied through the GGS. The feasibility study has been conducted and is currently reviewed by the Ministry of Commerce and Industry and the Ministry of Petroleum and Minerals. Lean gas comprising mainly of methane, available in large quantities after extraction of ethane, propane and butane, will continue to be supplied as fuel to power plants, cement mills and copper smelting plant, and other facilities. If a shortage of supply to gas consumers occurs in the future, it can be filled by increased production of non-associated gas, thus the project is not expected to affect existing gas consumers.

LPG is used as a household fuel, and consumption was around 60,000 tons in 1993. It is forecasted to increase to 100,000 tons by the year 2000. At present, the ORC refinery is the source for domestic supply of LPG. To meet increased demand for LPG, PDO is currently building a plant to separate butane from natural gas at Yibal, which will become an additional LPG supply source. However, as it will not be capable of meeting continuously increasing demand, a further expansion of LPG production units may be needed in the future.

There is a plan to produce LPG at Ras Al-Khaimah in the UAE by sending natural gas produced from off-shore Bukuha gas field, but it will be entirely geared for exports.

5.8 Issue for Major Industrial Development Opportunities Related to Oil and Natural Gas Industry

As presented earlier, while crude oil production remains at the present level in the foreseeable future, most of crude oil produced will continue to be exported since there is no plan to add or build a new refining capacity. Thus, industrial development through the utilization of crude oil is not likely to occur for the time being.

As mentioned in the previous section, there may be possibilities to develop industrial projects based on natural gas, which include the following project opportunities:

1) A LNG project for exports, including the development of the major non--associated gas fields and construction of a trunk gas pipeline system;
2) The development of hydrocarbon industry using part of natural gas supplied to the above LNG project i.e., possible production of ammonia/urea fertilizer and methanol for export in particular; and,
3) The development of a petrochemical complex to produce petrochemical products based on ethane, propane and butane which can be extracted from natural gas supplied through the GGS. It is important to examine the feasibility of a gas supply system (supply of C2–C4 in particular) by taking into account relevant factors including, the interface with the Butane extracting project currently under construction.

In addition, since continuous drilling of new production wells and maintenance of existing wells become important to maintain the current level of crude oil production, demand for drilling and maintenance equipment and materials will increase in the years to come, thereby creating a major opportunity for industrial development in the process of meeting such demand.

The increased use of LPG in households will spur demand for gas cylinders and equipment, which will provide another new market opportunity.

Table 5-1 Estimates of Oil Reserves in PDO Area

Date	Million Barrels	% Increase
Jan. 1, 1980	2,480	63.8
Jan. 1, 1985	3,844	8.7
Jan. 1, 1986	4,001	4.1
Jan. 1, 1987	3,958	- 1.1
Jan. 1, 1988	4,075	3.0
Jan. 1, 1989	4,109	0.8
Jan. 1, 1990	4,162	1.3
Jan. 1, 1991	4,250	2.1
Jan. 1, 1992	4,349	2.4
Jan. 1, 1993	4,604	5.9

Source: PDO, Annual Reports.

Table 5-2 Production of Crude Oil in Oman

Years	No. of Production Wells	Production of Crude Oil	
		Daily Average ('000 BBL)	Annual Production (Million BBL)
1985	676	498	182
1990	1,363	685	250
1991	1,445	708	259
1992	1,861	742	271

Source: Statistical Year Book, 1992;
Development Council, Sultanate of Oman

Table 5-3 Domestic Consumption and Export of Crude Oil

(Unit: Million BBL)

Years	Domestic Consumption*	Export	Total
1985	18	165	183
1990	19	229	248
1991	21	235	256
1992	19	252	271

Note: * Supply to Petroleum Refinery
Source: Statistical Year Book, 1992;
Development Council, Sultanate of Oman

Table 5-4 Production of Petroleum Products by ORC

(Unit: '000 BBL)

	1990		1991		1992	
	Quantity	Structure (%)	Quantity	Structure (%)	Quantity	Structure (%)
Input						
Crude oil	23,325.3		24,599.2		21,581.2	
Output						
Gasoline						
- Super 97	2,778.0	12.3	3,064.9	13.0	2,779.8	13.3
- Regular 90	1,277.5	5.6	1,162.4	4.9	1,121.1	5.4
D.P. Kerosene	2,254.9	10.0	2,325.9	9.8	1,537.0	7.4
Gas Oil	4,565.2	20.2	4,582.1	19.3	4,549.5	21.8
Butane	405.8	1.8	506.7	2.1	453.2	2.2
Long Residue	11,316.8	50.1	12,070.1	50.9	10,394.6	49.9
Total Products	22,598.2	100.0	23,712.1	100.0	20,835.2	100.0
- Change in inter-mediate products	- 20.1		30.7		- 53.6	
- Fuel uses by ORC	747.2		856.4		799.6	
Total Output	23,325.3		24,599.2		21,581.2	

Source: Statistical Year Book, 1992;
Development Council, Sultanate of Oman

Table 5-5 Total Sales of Petroleum Products

(Unit: '000 BBL)

Type of Products	1990	1991	1992
Gasoline			
- Super 97	3,007	3,352	3,660
- Regular 90	1,070	1,088	1,118
Gas Oil	3,227	3,423	3,926
Jet A.I.	2,347	2,031	1,296
Kerosene	33	39	38
Marine Bunker Fuel Oil	135	139	145
Avgas	0.2	0.1	0.4
Total	9,819.2	10,072.1	10,183.4

Source: Statistical Year Book, 1992;
Development Council, Sultanate of Oman

Table 5-6 Import/Export of Petroleum Products

(Unit: '000 BBL)

	Petroleum Products	1989	1990	1991	1992
Imports	- Premium Gasoline	212	461	367	796
		(8)	(15)	(11)	(22)
	- Regular Gasoline	78	61	-	69
		(7)	(6)		(6)
	- Kerosene/Jet Fuel	-	576	216	69
			(24)	(10)	(5)
	- Gas Oil	247	59	41	265
		(9)	(8)	(1)	(7)
Exports	- Premium Gasoline	-	-	-	17
					(0)
	- Regular Gasoline	-	-	-	17
					(2)
	- Kerosene/Jet Fuel	177	-	205	65
		(21)		(10)	(5)
	- Gas Oil	1,088	630	570	427
		(39)	(20)	(17)	(11)

Note: The figures in parenthesis denote the ratio of the imports or exports to the sales in Oman.

Source: Oman Refinery Company

Statistical Year Book of 1989 - 1992, Development Council

Table 5-7 Production of Natural Gas and Supply to Government Gas System

Items	Unit	Years		
		1990	1991	1992
Production	MMSCF	186,880	187,610	163,347
Associated	MMSCF	133,590	127,020	151,775
Non-Associated	MMSCF	53,290	60,590	11,572
Uses				
a) Government Gas System	MMSCF	61,780	64,151	70,194
b) Oil Fields:	MMSCF	85,410	83,950	93,464
1) Fuel		29,930	28,835	31,447
2) Re-injection		55,480	55,115	62,017
Flared	MMSCF	25,185	22,630	21,903

Source: Statistical Year Book, 1992;
Development Council, Sultanate of Oman

Table 5-8 Supply of Natural Gas (Government Gas System)

(Unit: MMSCF)

	1990	1991	1992
Received Gas Volume			
Non-Associated	47,593.7	50,168.7	53,814.0
Associated	14,555.3	14,584.2	17,449.0
Daily Average	170.2	177.4	195.2
Gas Volume Supplied to End Users			
Power Station	47,709.1	49,671.8	62,588.0
Oman Mining Co.	8,740.7 *	9,142.1 *	1,914.0 *
Oman Cement Co.	2,294.8	2,303.7	2,352.0
Other	3,032.2	3,033.7	3,340.0
Daily Average	169.2	175.8	192.3
Waste	372.2	601.1	1,069.0

Note: * This includes gas consumption for power generation to Sohar Region.
Source: Statistical Year Book, 1992

6 Industrial Development Plan

6.1 Future Vision of Economic Development and Role of the Industrial Development in Oman

The Fourth Five-Year Plan has drawn the future vision for the economic development. It addresses the key issues as follows:

(1) Diversification of the economic structure

The economic development policy will focus on widening the base of the Omani economy and diversifying its activities to meet changes from one or two-sector economy to a composite economy, interconnected and enmeshed at numerous sectoral and geographic levels.

(2) Reduction of dependence on oil

The source of government revenue is still heavily dependent on oil , despite relative decline in the contribution of oil sector to GDP. Hence, revenue is greatly affected by external factors beyond the control of national economy. In view of this situation, emphasis will be placed on the following two issues:

1) Reduce dependence on oil revenues by widening the economic infrastructure and diversifying sources of income.
2) Develop mechanisms and instruments by which precautions may be taken against fluctuations in oil prices to cushion their shocks.

(3) Conservation and efficient utilization of natural resources

More attention will be paid to the conservation of natural resources. In this context emphasis will be placed on, the importance of developing potentialities taking into consideration the preservation and efficient use of natural resources, and the balance between area and population in a manner which is appropriate to the regional distribution ; and the availability of natural resource with due regard to the realization of higher rates of self-sufficiency in basic products and the preservation of non-renewable resources.

(4) Development of human resources to expand the participation of Omani labor force in economic activities by the private sector

The demand for labor forces has expanded along with the rapid development, and it resulted in increased dependence on expatriate labor with lesser increases in the

employment of Omani labor force.

Employment of qualified Omani nationals in the government sector has been promoted with setting up of an incentive structure designed to increase national participation which meets the increasing role of the government sector in production and service activities. But on the other hand, this poses an obstacle to the development of the private sector whose increased participation in economic activities is likewise encouraged.

Currently, however, the government sector has unable to absorb new workers from the increasing number of graduates. Under this situation, attention will be given in finding the necessary mechanisms to deal with the deficiencies of the labor market by increasing the participation of the national labor force, with an integral manpower planning framework that would match the graduates of the various educational and training institutions with the needs of the labor market.

(5) Expanding the participation of the private sector in the economic development

During the previous phases of development, government expenditure played an important role either by way of investment in the various sectors, or through current expenditure that paves the way for private investment and provision of an appropriate climate for economic activity such as by means of setting up adequate infrastructure. These government activities have resulted to the participation of the private sector confining interest to certain areas in trade, banking and manufacturing industries.

For future development, emphasis will be placed on encouraging the role of the private sector and increasing its participation in future development programs, and concentrating government's efforts in defining policies and organization.

(6) Control on increasing current expenditure by the government

Despite the decline in the relative proportion of government investment (in terms of capital formation) from 20.3% and 23.3% of GDP in 1985 and 1986, to 12.8% and 8.9% in 1988 and 1989 respectively due to the measures taken which cushioned the impact of the collapse in oil prices, government expenditure remained at a high level accounting for one-third of GDP. Emphasis will be placed on contemplating suitable means by which citizens can incur part of the expenses on certain services, as government commits itself in providing basic services in gratis to the citizenry.

(7) Resources and uses balance

The level of public expenditure will be maintained within appropriate limits as long as increase in government revenues from various sources permits it, without necessarily resorting to large withdrawals of reserves, or dependence on excessive borrowing.

To achieve the foregoing development goal, the economic development policy calls for increased contribution to GDP of the non-oil income generating sectors, particularly agriculture, fisheries, manufacturing, tourism and service sectors through increased investment as well as through the expansion of industrial infrastructure, while extending the recoverable life of oil reserves, thereby pursuing the restructure of the economy..

Industrial development will play an important role in the generation of national income from non-oil sources as it increases non-oil domestic production, thereby contributing towards the diversification of economic structure and widening of the economic base. This will occur since the manufacturing industry being the most vigorously growing sector, substantially surpasses that of agriculture and fisheries and services sectors in terms of national income generation.

At the same time, future economic development will focus on increased investment by the private sector, and greater participation of Omani nationals in the industrial sector. Thus, industrial development will have a vital importance towards this direction. Figure 6-1 illustrates a conceptual flow of the economic effect derived from the industrial development.

The Fifth Five-Year Plan has not been drawn yet. However, it will follow the fundamental direction of the development as enumerated above.

6.2 Comparative Advantages and Constraints for Industrial Development in Oman

There are several factors which encourage or discourage the promotion of industrial development, among the most decisive factors for formulating the industrial development plan are those enumerated below.

(1) Political and macro-economic conditions and geographic characteristics of the state
(2) Endowment of natural resources available for industrial development
(3) Existence of markets for manufactured products
(4) Capital and human resources available for industrial development

(5) Infrastructure and institutional support facilitating efficient operation of industries

In the subsequent sections, these factors existing in Oman are assessed as basis for examining the efficient and effective direction of industrial development in the country.

6.2.1 Political and macro-economic conditions and geographic characteristics

The political and macro-economic stability of the Sultanate of Oman has established conducive environment for industrial investments, and this is one of Oman's fundamental advantages in promoting both domestic and foreign investment to foster industrial development. The country risk ratings conducted by an authorized financial research institute in Japan ranked Oman as well as other GCC countries (Saudi Arabia, Kuwait, and the UAE) as a less risk country next to NIES. It is a general perception that Oman is located in an area which is less susceptible to potential conflicts in the Middle East.

Further, Oman's geographic location has advantages for external trade, particularly as a strategic point connecting South-west Asian countries especially India and African countries on the east coast, in movement of people and goods.

However, industries in industrialized countries have little knowledge about Oman. Generally, they show less interest in industrial investment in GCC countries except for oil and gas related industries because of limited regional markets. For the promotion of foreign investment, it would be essential to conduct intensive promotion activities in attracting interest of potential foreign investors from target countries.

6.2.2 Endowment of natural resources available for industrial development

Oman is endowed with various natural resources including oil and natural gas, minerals, agricultural and marine resources, land and water resources.

The oil and natural gas resources have given an impetus for steady growth of Oman's economy up to the present. The efficient utilization of these resources is a critical ingredient for future economic development..

Since Oman's reserves of these resources are limited unlike in other GCC oil-producing countries, the development of non-oil industries is a vital task for the state to sustain economic growth. This is clearly indicated as a major economic development

policy.

There are various mineral resources found in Oman, but those available for commercial exploitation are limited. Further, the commercial exploitation of those minerals requires the development of additional infrastructure since most of the deposits are located in remote areas.

The country has water resources, but its potential supply capacity is also scarce.

Agricultural production in Oman is very limited in variety and so is the capacity to develop agro-based industries using indigenous agricultural products, with the exception of dates. Oman has potentials for commercialization of marine resources, but the fishery industry is yet to be developed to ensure adequate supply of marine products which serve as stable inputs for the marine processing industry.

6.2.3 Markets for manufactured products

The limited size of the domestic market owing to a small population is an inherent constraint in the promotion of industrial development, specifically on the development of import-substituting industries in Oman. This implies the importance of industrial development based on export-oriented industries.

Traditional export markets for Oman, as shown in Table 6-1, dominantly comprise the GCC countries with a 57% share, particularly the UAE accounting for 50% of total, followed by Tanzania (3.1%), the US (2.9%), the UK (2.4%), Singapore (1.9%) and India (1.7%)[1].

Some products may be common for both Oman and other GCC countries and for such products, the production could be embarked for supply not only for the domestic market but for other GCC markets as well. Nevertheless, as the size of these markets is relatively small, even if all GCC markets are combined, efforts should be exerted to penetrate other export markets.

In future, India and east coast countries in Africa are expected to emerge as new trade

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1) The export statistics in 1992 shows that following GCC countries Iran and Hong Kong were the major export destinations from Oman, accounting for 12% and 10% of total respectively.
However, it is uncertain whether the exports to these two countries will account for similar shares in the future.

partners.

India has shifted itself away from the traditional self-reliance-based industrialization policy to a new industrial policy based on open market economy, upon which the government pursues selective industrial promotion confined only to industries that can undertake economic production in competition with imports, while pursuing the liberalization of imports.

Along this policy, the Eighth Five-Year Development Plan adopted in India clearly indicates the promotion policy for major industries as follows:

(1) The plan defines negative industries for the promotion of domestic production in the future, which include (a) aluminum smelting due to the shortage of bauxite and electricity; (b) copper smelting because of availability of only low-grade copper ores in India and also inadequacy of the supply to ensure the production in an international economic scale; and (c) paper, carton board, and newspaper printing paper due to the lack of forestry resources.
(2) The demand for nitrogen fertilizer cannot be sustained by the domestic production even after the proposed projects come on stream. Therefore the plan recognizes that any increased demand will be met by imports.
(3) The existing industries engaged in the manufacturing of capital goods, except those for machine tools, transportation equipment, electrical equipment and controls, and instrumentation, require substantial improvement and upgrading of technologies, quality, productivity and costs in order to compete with imports, although immediate improvement appears to be difficult. The electronic industry, except consumer electronics has also faced similar difficulties.
(4) The petrochemical industry in India stands to be on an inferior position in terms of international competitiveness due to high feedstock costs and also, high rates of tax and duties imposed even if plants are based on modern technologies and up-to-date equipment.
(5) The shipbuilding industry lacks competitiveness due to low productivity, long delivery and high costs, whereas the ship repairing industry possesses international competitiveness exhibiting promising growth.

In view of the new industrial policy of the Indian Government and the current conditions of the major industries in the country as cited above, the Indian market could provide prospective opportunities for Oman's exports given its advantage of proximity,

and should Oman be able to produce the products that meet their requirements. As large number of Indian workers working in Oman remit their earnings to India, Oman's exports to the Indian market will not adversely affect the balance of external payments between the two countries.

Exports from Oman to east coast countries in Africa are shown in Table 6-1. Table 6-2 shows exports from India to these countries. Although African countries on the east coast do not offer appreciable market opportunities at present due to relatively low income levels, this market has potential to grow into one of the major markets for Oman, based on their geographical and historical relations with Oman. Likewise, India's industrial policy has also been directed towards strengthening of relations with the African countries.

Most of the products manufactured in Oman, like the locally fabricated automotive radiators, are targeted to middle and low-end consumers both in Oman and the GCC countries. Some factories produce high-class consumers' goods such as high-class furniture. However, the markets for such high-class goods are very limited, and furthermore competition with imports is also present.

Recently, many factories have embarked on exporting their products. However, as such exports are customary goods, they face serious competition with exports from other countries, especially those using low labor cost. For expansion of manufactured exports, a vital task is the diversification of products towards higher value-added items, as well as enhancement of marketing including entry into new markets.

6.2.4 Capital, technology and human resources available for industrial development

6.2.4.1 Present stage of industrialization

The existing manufacturing industries in Oman are dominated by light processing industries which undertake the production of final products such as food and beverages, general consumer goods, building materials and metal products or appliances for domestic use which are small to medium in scale. These industries, except the garment industry have been established entirely for exports, and were originally intended for the production of supplies to domestic markets, some manufacturers of which have started to export at least part of their products in recent years.

The large-scale heavy and chemical industry existing in Oman is limited to only a few.

These are the oil refinery, copper smelting plant and cement plants which belong to the public sector.

In general, the size of the existing industries is still small in terms of the number of establishments, production capacities as well as the extent of industrial branches, and they are concentrated in downstream industries. Majority of the industries use raw materials and industrial inputs imported from abroad, except for a few industries processing indigenous resources because upstream or supporting industries which manufacture industrial inputs have not been established yet in Oman. There are some factories which undertake the production of ancillary components, but these are produced in small units only for their self-uses. Further, Oman's industries are based on conventional technologies, and high-tech industries do not exist yet in Oman.

This situation implies that Oman is still at an early stage of industrialization and has not yet reached a stage that can encourage the development of linkage industries or upstream industries towards diversification and deepening of industrial structure.

6.2.4.2 Technological accumulation and management capabilities

Most of the Oman's industries have not been long since their establishment, which operate manufacturing units acquired from abroad while using expatriate supervisors and operators. This situation limits the accumulation of technologies as well as upgrading of management capabilities in individual manufacturing enterprises.

Most of manufacturers, at present, undertake the production of customary products employing conventional types of established process technologies transferred from abroad or based on product designs provided by foreign partners or buyers. The present level of production can be sustained even without accumulation and upgrading of technologies. However, the accumulation and upgrading of technologies as well as the enhancement of R&D activities would be of vital importance for the existing industries to raise productivity and quality and also to diversify the product lines.

Similarly, most of the manufacturing enterprises depend on expatriate managers employed for factory management. The national entrepreneurs and managers who have experiences in industrial management are still limited. Enterprises however, cannot entrust expatriate managers with entire management no matter how they are capable. Morcover, because expatriate managers provide their services only during a contract period, those enterprises hardly build up confident management systems and skills and marketing

know-how based on expertise. Hence most of the existing industries, particularly small- and medium-scale enterprises, are vulnerable to any changes in markets and business climates as well as to competition with foreign competitors.

The accumulation of technologies, management capabilities and marketing know-how are crucial for industrial development, and to this end, it is a vital task to develop the national human resources which can participate in the operation and management of manufacturing units so as to absorb transferred technologies, management techniques and marketing know-how. In fact, self-undertaking by employees away from the existing enterprises have been serving as an impetus for development of industries in industrializing countries. In particular, peripheral industries have often emerged through these undertakings.

6.2.4.3 Productivity

The industry is broadly classified into three types. These are:

(1) Process-plant-based industry;
(2) Metal fabrication and assemble industry; and
(3) Light processing industry.

The process-plant-based industry existing in Oman includes the oil refinery, copper smelting plant, cement plants and some types of food processing plants. In this type of industry, productivity largely depends on the existence of captive markets that can ensure steady plant operation with high capacity utilization. In Oman, most of the existing process plants except the oil refinery have fallen in low capacity utilization due to small domestic markets and keen competition in the GCC markets which have been the major markets for Omani exports.

The metal fabrication and assemble industry in Oman is still at an early stage of development. Most of the existing metal fabrication and assemble works use raw materials, intermediates and major components imported from abroad, since upstream industries as well as linkage industries are not developed yet. These works are equipped with small units of machinery and undertake a variety of metal fabrication works requiring low level of precision, on the basis of job orders in small scale. Hence, their productivity is poor. Captive markets for these industries are related to the oil and gas exploitation work and oil refinery, and there exists no assembly industry represented by electric, electronics and automobile industries which require a high level of quality and production control.

The light processing industries dominantly existing in Oman include those engaged in the manufacturing of various consumers' goods. Most of these industries undertake labor-intensive operation based on conventional technologies and expatriate labor, and using imported raw materials. Though labor costs paid for expatriate labor are much higher than those in South West Asian countries, productivity is relatively high because of efficient operation performed by skilled expatriate labor employed.

6.2.4.4 Capital resources available

The oil revenues have generated adequate capital resources to finance the public and private investments in all sectors up to the present. The government has provided private investors with interest-free government loans and also soft-term loans through the Oman Development Bank (ODB) to promote private investments in the manufacturing industry. A substantial portion of the manufacturing industries has been established through private domestic investment, except for oil refinery, copper smelting plant and cement plants in the public sector.

The Omani private sector has ample financial capacities with relatively high financial savings enough to realize the investments needed for expanding the manufacturing industries, provided that these are small to medium in scale. Nevertheless, for the development of export-oriented industries, foreign investment will also play important roles like transfer of technologies, as well as enhancement of management and marketing. Towards this end however, intensive activities for foreign investment promotion would be needed.

The interest-free government loans and ODB's soft-term loans facilitate the development of small and medium industries in Oman. However, this industrial financing system is not capable of arranging project finance with syndication of foreign credits for huge industrial projects such as petrochemical and gas-based fertilizer projects. In order to promote such giant projects, the enhancement of the industrial financing institutions would be essential. Apart from this issue, the function of the existing financing system should be enhanced for efficient allocation of financial resources for industrial investments in the private sector.

6.2.4.5 Human resources

The manufacturing industry did not contribute much to the employment of Omani labor force despite rapid growth of the labor demand to date. This is due to the scarcity of

Omani labor force available to industries, since the number of Omani labor force is limited not to mention that majority of these labor force has no industrial training and discipline. It is predicted that the number of workable Omani labor force will substantially increase in the next ten years, so that an adequate number of national labor force will become available for the industries if appropriate education and vocational training are provided. It would be important to take appropriate measures for the development of human resources while establishing the system for encouraging the employment of these labor force by the industries.

6.2.5 Infrastructure and institutional support relevant to the industry

Oman has well developed internal road systems connecting major cities and industrial centers. A potential bottleneck lies in port facilities. The existing ports are small to accommodate large international commercial vessels, and therefore most of exports and imports are transported through Dubai, causing extra freight charges.

The strategic location of Oman allows the country to serve as a regional distribution center for the Gulf area allowing it to share this present role of Dubai in the future. To this end, location advantages must be maximized by upgrading the port facilities to meet increasing transport demand while establishing air routes to link the country with neighboring countries in the Middle East, Europe and Asia.

Electricity supply meets increasing demand with the set up of additional power plants being under construction or planning[2]. However, electricity cost charged in Oman is much higher than that offered in other GCC countries, although it is still lower than that charged in other regions.

Although the water supply is adequate to meet the requirements of the existing industries and their foreseen expansion, it would hardly cater to any new industry that will consume large quantity of water.

The government has facilitated the entry of industrial investments with the provision of fiscal incentives including exemption from import duties and income tax, while protecting the local industries with imposition of import duties on the competing imported items. In addition, the government has simplified or deregulated several administrative

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2) In 1992 the volume of power generated in a peak month was less than 80% of the estimated power generation capacity.

procedures and licenses to facilitate the establishment and operation of industrial units.

These institutional support as well as incentive systems can attract domestic and foreign investors to enhance industrial investments in Oman.

6.3 Industrial Development Strategy Adaptable to Oman and Long-term Development Scenario

6.3.1 Industrial development strategy adopted in other industrializing countries

With a view of seeking an industrialization process and strategy adaptable to Oman, reference is made to the lessons of other industrializing countries, particularly NIES and ASEAN countries.

There are two typical patterns of industrialization process adopted in these countries. These are:

(1) Light industry-oriented industrialization; and
(2) Heavy industry-oriented industrialization.

The former is the process of industrialization can be initiated with the establishment of small and medium light industries by the private sector to produce consumer goods as import substitutes or for exports, and then gradually expanding into upstream or basic industries that produce intermediates or raw materials, capital goods and other bulk products requiring large-scale mass-production or sophisticated technology.

In this process, the initial step of industrialization promotes the nurturing of industrial entrepreneurs and industrial human resources with the transfer and assimilation of technology, and the formation of industrial capital in the private sector. It also creates the domestic markets and help attain economic scale of production towards more skill and technology-intensive industries that drove the development of heavy industries and linkage industries through horizontal and vertical integration and diversification of industrial structure. Singapore and Taiwan are typical examples of countries which have achieved successful industrialization taking this type of industrial development strategy. Similarly, Thailand and Hong Kong also strongly promoted the light industry at an early stage of industrial development.

In contrast to the former, the latter is industrialization-driven with the government

initiatives concentrating on the establishment of heavy industries that achieve self-dependent production of basic industrial products, such as iron and steel, cement, fertilizer and other basic chemicals. In South Korea, India and Indonesia, the governments pushed this type of industrial development, since to some extent, there existed domestic markets for those products. However, such established industries often require the provision of heavy protective measures by the governments because they are less competitive in nature, and results to high cost economy.

In recognition of this economic distortion resulting from the intensive development of heavy industry, governments have changed their strategy towards more market-oriented industrial development by encouraging small and medium light industries especially those geared for exports during the last decade. Malaysian government once concentrated on the development of heavy industry, but they changed its strategy to promote export-oriented light industries. It has brought about significant growth of industry in the last decade. India is currently promoting to establish international linkages in industry under its new liberalized trade and industrial policy.

Nowadays, technology innovation has made possible the enlargement of production scale for heavy and chemical industries which produce the basic industrial products, and it is situated in hardly establishing international economic scale of heavy industry for domestic markets. Thus, the light industry-oriented industrialization would be a way commonly applicable for successful industrial development in the countries which have no prominent advantage in terms of resources, captive markets, geographic location or any other factors conducive to successful development of the heavy and chemical industry. Hence, many of industrializing countries have currently been pursuing industrialization based on the export-oriented industry.

6.3.2 Conceptual frame of the development strategy adaptable to Oman, and its development scenario

6.3.2.1 Basic elements and conceptual frame for drawing the industrial development strategy in Oman

Figure 6-2 shows the general model of industrial development process derived from the lessons learned in other countries. However, in the case of Oman, some other factors affecting the industrialization are necessary to be taken into account.

The small size of domestic market is a major factor among them. If the industrialization is carried out on the basis of available domestic demand, the industries

thus established will be too small to be competitive internationally, and further, they may have to rely on outdated technologies sometimes. If such is the case, industries require protection to some extent in order for them to become viable, lessening the chances of renovation.

The small market size also adversely affects industrial deepening, or the development of up-stream industry and supporting industry. Generally, industrialization in many countries started with development of light industries which are much easier to be established compared to heavy and basic material industries, because of smaller effects of scale of economies. Accordingly with the development of light industries, the demand for up-stream industries has increased, the needs of establishing supporting industries also increased, and technological and managerial experience accumulated. Thus, the base for industrial deepening has been created. These have been the usual process of industrialization observed in many countries. One of Oman's promotional thrusts is the development of downstream light industry to catalyze the development of its domestic market. While this process will create the demand for up-stream industry and supporting industry to some extent, it will not be large enough to support the establishment of linkage industries.

The small size of the domestic market is inherent to Oman. Therefore, the industrialization in Oman must be based not only on the domestic market but, also on overseas markets. In ensuring the demand from abroad on a sustainable basis, making the most of the potential advantage of Oman is important. The basis of such potential advantages may be found in,

1) Geographical advantage against the Mid-eastern region in terms of international disputes.
2) Past and present human relationship in international trade particularly with India, GCC and East coast countries of African continent.
3) Political stability of Oman.
4) Advantageous location for marine transport by container. Favorable ocean freight rates are offered for outgoing container due to cargo inflow volume far exceeding outflow volume, particularly those bound for South-east Asia and East Asia[3].
5) Sincere attitude of Omani people in their business performance which is particularly

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[3] Whereas the container freight from Muscat is offered at US$300/20ft (US$600/40ft) for the west coast in India, it is US$400/20ft (US$800/40ft) for Singapore and US$500/20ft (US$900/40ft) for Far-east. It is by far cheaper than that even for the east coast in India charged at US$600/20ft (US$1,100/40ft). The freight rate is offered at US$2,400/20ft (US$3,750/40ft) for USA, US$800/20ft (US$1,500/40ft) for Rotterdam, and US$1,800/20ft (US$3,500/40ft) for Australia. As Dubai is the hub port for most of container lines in the Mid-East, all container cargoes shipped from Muscat is required to transship at Dubai at present. If container lines stop on Muscat, it will be greatly conducive to save shipping time and feed costs for exports from Oman.

seen in quality control.

Further, availability of fund for investment is another important advantage for industrialization promotion. At present, most of potential advantages observed for Oman, however, remains to be actualized yet although these may already be found in other neighboring countries. Oman has to develop and make decisive steps to explore its advantage over neighboring countries through long term efforts.

Natural resources can provide a momentum for industrial development. The natural resources available in Oman may be a valuable clue in initiating the development of industry. However, these resources may not necessarily be sufficient to develop a sustainable base. The petrochemical and hydrocarbon industries based on natural gas have the greatest prospects for development. However, these industries require the production at large plants in international economic scale to sustain competitive costs in international markets or in certain export markets, since all the produced products should anyway be exported. Thus, those projects must be launched for implementation after feasibility has been justified through careful studies and investigations. Other resources are either too small to be operated on an international scale, or are found popularly endowed in many other countries, thus, subject to keen competition in the market requiring continuous product development among products utilizing these resources to distinguish from those generally found in the market.

The industrial development strategy adaptable to Oman must be drawn with due consideration of the basic elements and conceptual frame as discussed above.

6.3.2.2 Industrial development scenario

The industrial development scenario is discussed in three angles of "Future Vision", "Mid-and Long-term Target", and "Immediate Task". "Future Vision" is a possible vision which supports the sustainable growth of the industry, while the "Mid-and Long-term Target" is the target with which the country will establish industrial infrastructure to make the most out of Oman's geographical advantage and further attaining the succeeding sustainable growth of the industry. The "Immediate Task" are the proposed actions to be taken immediately in preparing the basis of further development. This scenario is illustrated in Figure 6-3.

(1) Future vision

Given the limited size of domestic demand and lack of resources necessary to

support the long-term sustainable growth of economy, it is crucial to develop both resource and non-resource based industries. Sustainable growth of these industries should be based not only on domestic market but also on overseas markets. There are two possible ways of developing the industry based on overseas market. One is via the promotion of export-oriented industries, and another is through infusion of foreign industries to Oman as a relocation site for production base for exports. As the domestic market oriented industry require the existence of domestic demand sufficient to support stable production, an industry based on the overseas market seems to be more appropriate in Oman where domestic demand is limited. This also holds true given the geographical advantage of Oman. This benefit can be materialized through various types of development measures including, the encouragement of multi-national companies to set up their regional operation centers, technical service centers and distribution centers covering the Mid-eastern region, and the establishment of export processing zone for transit trade. It may be conceived for Oman to function as an "International Industrial and Trade Center in the Mid-East Region" in the future. The centers and export processing zones will create demand for industrial products and industrial services not only from the domestic market but from the overseas market as well.

However, Oman lacks technological and managerial basis which is indispensable in exploring the full potential of its geographical advantages. In order to accomplish the above future vision of industrialization and making the most out of its geographical advantages , Oman should make every effort to develop and establish industrial infrastructure which is scarcely available at present.

Dubai in UAE is situated in an advanced position in terms of industrialization as well as economic development based on above-mentioned considerations, especially because its industrial infrastructure including the Free Zone have been developed. There are a number of foreign investments in the Free Zone, including a regional center set-up by multi-national companies, and production bases by foreign operators for their export or re-export business. Further, Dubai is the hub of ocean container lines whereas the Muscat port and other ports in the Gulf are feeder ports. In recognition of this situation Oman should primarily undertake port development which can supplement Dubai's function so that it can play the role as a sub-center which will share with Dubai in satisfying the increasing demands in the region. With this development step, Oman can establish its position as the regional center standing side by side with Dubai in the future.

For materializing the above development concept the fundamental requirements are those enumerated below.

1) Strategic location
2) Strategic system for efficient distribution
3) Infrastructure for information technology
4) Skilled and professional human resources
5) Relevant services for supporting efficient performance of industry
6) Technological capabilities
7) Marketing capabilities
8) Well-established financing system
9) Effective taxation

These requirements may be fulfilled through the development of the following functions:

1) Distribution functions: ocean transport lines, ocean container lines, bulk transport system, general cargo ocean transport system, freight forwarders, bulk storage, cold storage, common warehouses, etc.
2) Precision engineering functions: manufacturing of machine tool and machinery components, metal working, etc.
3) International communication functions: computer networking, printing, packaging, advertising, warehousing and distribution, and legislation for the protection of intelligent property, etc.
4) General supporting functions: industrial design, automation, packaging, metal stamping, plastic processing, tool and die manufacturing, etc.
5) Research and testing functions: standards-related tests, applied research on manufacturing technologies, standard development, etc.

(2) Immediate task

The existing functions in Oman are only a few among the foregoing functional industries. However, this situation is similar in neighboring countries in this region. Oman can establish these industries if appropriate actions are taken for the immediate task and continuous efforts to achieve the mid- and long-term target.

The immediate task indicates the initial step in the development process which Oman has to pursue towards the achievement of its future vision. Given the present situation of the industry standing on limited fields and number of establishments, however, Oman should not be impatient over development by contemplating the

establishment of those functional industries within a short period of time, since it may adversely affect sound growth of the industry. Such functional industries require the existence of an industry that can bear their costs to some extent.. Thus, the immediate task for the industrial development is to expand the scale and fields of the industry by fully utilizing the available yet limited resources and markets. With this objective, the immediate step for development should focus on upgrading and strengthening the existing industries for sustainable growth, as well as the promotion of industrial investment (mainly private investment)to establish new industries that will cater to both the domestic and export markets.

In expanding the industry, the use of foreign firms' capabilities is also important particularly in ensuring market, obtaining efficient management and advanced technical know-how.

Another immediate task is to take appropriate preparatory actions in developing the foregoing functional industries, as well as in deepening of industrial structure, and providing the technological basis upon which long-term development process will revolve

The direction of industrial development to meet the immediate tasks will be discussed in more details in Section 6.4.

(3) Mid- and long-term target

The immediate development step as discussed above will entail the creation of markets for industrial inputs including raw materials, intermediates, and supporting services required by the established industries. This will generate the demand that can support the development of upstream industries and supporting industries in economic scale in the future. Thus, along with this evolution, the future tasks will be directed to the development of upstream industries and supporting industries, while continuing the expansion of established industries.

Through the aforementioned development steps, Oman's manufacturing industries will be built up with competitiveness and efficiency towards diversification of industrial structure and deepening of the industrial base in the future.

However, in Oman, as discussed earlier, the demand actually generated from such industry will not be sufficient for development of up-stream industry and supporting industries due to limited scale of downstream industries. Unlike other countries, the development of up-stream industries and supporting industries should also depend

partly (often mostly) on the demand from abroad, including export to overseas markets. Thus, in Oman the deepening of industry should be pursued on a selective basis, focusing on the sub-sectors essential for realizing the future vision of industrial development.

6.3.2.3 Basic strategy for the pursuance of industrialization

The basic strategy for the pursuance of industrialization, which guides industrial development based on the foregoing basic elements and scenario for the development, can be highlighted as follows:

1. Industrialization with close linkage to industrial capitals in foreign countries and prospects in overseas markets

   Up to the present, Oman has been pursuing industrialization mainly for import substitution in the domestic market. The overwhelming majority of the existing industry stands on the domestic market, except for the garment industry which has been oriented entirely for exports.

   Smallness of the Oman's market, however, poses as a barrier to industrialization based on the domestic markets.

   Thus, it is crucial to promote industrial investments, including those that would upgrade and diversify existing industries, as well as the establishment of new industries with close linkage to industrial capitals of foreign countries while standing on overseas markets, which include the following two directions:

   (1) Promotion of export industries based on resources available in Oman, and industries that are based on geographical advantages and favorable business environments existing in Oman.
   (2) Promotion of industries which can serve as production bases for foreign industries for the purpose of transit trade including re-export, fully utilizing the Oman's geographical advantages.

2. Selective promotion of local supply industries led by the development of market and usage for selected products

   The existing industry covers almost all of the product lines for import substitution, except those unfeasible under the present conditions of markets and localities in Oman. Nevertheless, there are some fields of industries which can be developed for local supply if intensive efforts are devoted to the development of local markets,

particularly new products (including final consumer goods and also industrial inputs such as packaging containers and component parts to be used by other industries) which have not penetrated yet in Oman or those in which domestic demand is likely to increase. Some existing industries based on indigenous resources have possibilities for product diversification for more efficient use of resources, while there are still some resources which have not been used yet as industrial inputs because the downstream products utilizing such resources have not penetrated yet the local market. For these fields of industries, it is important to undertake intensive development of markets and product usage , thereby promoting the development of industries which can supply locally.

3. Simultaneous promotion of the large-scale resource-based export industries, and small- and medium-scale light industries (particularly manpower-saving with mechanization and for which diversification towards higher value added product lines is possible)

As large-scale resource-based industries such as, natural gas-based petrochemical and hydrocarbon industries including ammonia/urea fertilizer and chemical methanol; and large-scale mining of gypsum for exports give impetus to the industrialization according to the strategy enumerated in Section 1 above, it is important to promote those projects for realization.

However, these projects, once developed, will hardly induce subsequent development of other projects because of their individually self-dependent nature and also of limited availability of resources used. Hence, sustainable growth of industry cannot be achieved only with the development of large-scale resource based export industries.

Thus, it is crucial to promote simultaneously the development of a wide variety of small- and medium-scale light industries based on foregoing strategy 1. In Oman, as industries should be dependent on expatriate labor which is relatively costly, labor-intensive light industries become inferior in terms of cost competitiveness to other countries where abundant labor are available at low cost. In order to cope with this constraint, emphasis should be placed on the development of modern light industries including, the rationalization and diversification of the existing industries, to achieve manpower saving with mechanization and diversification towards higher value added product lines.

4. Undertaking by the government of overall support for promoting industrial

development

In promoting the industrial development on the basis of the foregoing strategy, government should not only take the initiative to promote the development of large projects which seem hard to be promoted by the private sector, but it should also undertake overall support for promoting the development of other industries which will be established mainly through private investment. This will stimulate industrial development, and build-up a balanced industrial structure towards realization of the future vision. These supports involve the investment promotion measures particularly for foreign investment, enhancement of industrial finance system, human resource development, the establishment of technological basis, and the upgrading of industrial infrastructure.

6.4. Industrial Development Plan

6.4.1 General

This section discusses the development plan for pursuing the industrial development based on the industrial development strategy and scenario as discussed in the previous section.

The industrial development plan comprises the following three components:

(1) Set-up of macroscopic target for the industrial development
(2) Basic direction for the development of prospective industrial projects
(3) Requirement for the government support programs for promoting industrial development

The "set-up of the macroscopic target for the industrial development" attempts to set up the macroscopic target (growth target of investment and sectoral value added) as an indicator for the achievement of the industrial development discussed in the subsequent sections. Such target basically should be set as the economic development target by the government. However, the economic growth target is not officially set for the year of 1996 onwards, since the Fifth Five Year Plan starting in 1996 is still under preliminary preparation by the government authorities. The target given in 6.4.2 was estimated by the Study Team taking hypothetical assumptions for the purpose of defining a basis of examining the scale of industrial development. Thus, the given target is intended to indicate a framework for the proposed industrial development plan and not to project the official target for the national economic development.

The "basic direction of prospective industrial projects" describes the basic direction

for the development of major industrial projects/sectors which may play a leading role in pursuing industrial development, in line with the "industrial development strategy" presented in the previous section which is based on the "present situation of the existing industry and task for the development" (Chapter 3), the "overview of non-oil mineral resources" (Chapter 4), the "overview of oil and natural gas resources" (Chapter 5) and "pre-feasibility studies of prospective projects" (Annex 4). Those projects have been identified by preliminary studies, in which detailed feasibility studies must be carried out by interested entities for their investment decision making. Assuming the industrial development in Oman will be promoted mainly thorough private investment involving both domestic and foreign capitals, the presented basic direction is recommended to be taken by the government for the promotion of industrial investment.

For promoting the industrial development through private investment, the important role of the government is to provide overall supports for the promotion.

The "requirement for the government support programs for promoting the industrial development" discusses the required supporting measures which the government should take in promoting industrial investment by the private sector.

6.4.2 Macroscopic target for the industrial development

Table 6-3 gives the macroscopic target (growth target of investment and sectoral value added in the manufacturing sector) as an indicator for the proposed industrial development plan.

The oil sector still has a great impact on the economic growth of the state in the future, since it accounts for about 42% of GDP in 1992 and this relative share will be maintained by 1995 when the Fourth Five-Year Plan ends. If oil production remains at the present level of around 700,000 BBLD in the future, the sectoral value-added in the oil sector will virtually be affected by international oil prices. The Fourth Five-Year Plan projects the growth of the oil sector at 4.9% per annum on the average and reaching RO.2,021 million by 1995. Whereas the international oil prices are unlikely to rise in conspicuous upward trend, it is likely that the production of natural gas will substantially increase with the development of new gas fields, supplementing the sectoral value-added to some extent. Thus, it is assumed that the oil sector will continue to grow to some extent, although the growth rate will be lower than the projections in the Fourth Five-Year Plan.

The long-term economic development policy targets to sustain the economic growth at an average of not less than 5% per annum in real terms. In order to achieve this goal, assuming an average annual rate of economic growth of 6% in nominal terms in the future, the manufacturing industry as well as other non-oil sectors should grow at rates higher than those set for the Fourth Five-Year Plan, making the manufacturing industry the most important sector since it has the most vigorously growing potential surpassing agriculture, fisheries and services sectors. Assuming that the growth of the oil sector at 4% per annum during the Fifth Five-Year Plan period and 3% per annum during the Sixth Five-Year Plan period, the manufacturing industries should grow at 13% per annum, and at least 13.5% per annum respectively, during these two Five-Year Plan periods.

The existing manufacturing industries perform far below the scale to achieve the targeted increases in output and value-added. Hence to achieve this goal, the primary task should be focused on identifying investment opportunities in a wider scope of industries to promote and encourage industrial investments, particularly by the private sector. It is estimated that the targeted growth of the manufacturing industries will require investments in the order of RO.420 million (US$1.09 billion) during the Fifth Five-Year Plan period and RO.860 million (US$2.23 billion) during the Sixth Five-Year Plan period.

In view of the past investment trend in the manufacturing sector, it is assumed that the investment in that sector will continue in the order of RO. 25 to 30 million annually (RO. 250 to 300 million in aggregation for the aforesaid 10 years). In addition, industrial investment will be realized in the order of RO. 500 to 600 million if the development of the gas-based petrochemical and hydrocarbon industries materializes, while additional investment in the order of another RO. 300 to 400 million will be realized with the promotion of other proposed projects during the 10-year period. In view of this prospect, the foregoing target is expected to be attained with the proposed development.

6.4.3 Basic direction for the development of prospective industrial projects

6.4.3.1 Introduction

Prospective types of industrial projects for development in Oman were identified by means of broadly assessing sample projects selected based on a variety of industrial development possibilities in the country.

In the course of this assessment the following candidate projects were studied from the viewpoint of utilizing various resources, particularly in respect with: 1) natural resources availability; 2) domestic market; 3) technology, and; 4) geographical conditions in international location of industries. It also includes the study of projects which need to be promoted in pursuing balanced industrial development. Table 6-4 tabulates a list of those projects studied.

(1) Projects for utilization of available resources
 1) Projects for promoting new exports from available resources or vigorous expansion of current exports
 2) Project for developing new markets in Oman and abroad with production of new products utilizing available resources
(2) Project for satisfying the domestic demand
 1) Project for expanding possible substitution for final products presently met by imports
 2) Project for promoting possible substitution for imports of raw materials, component parts and intermediates used by other industries
(3) Projects for utilization of traditional technologies
(4) Project making the most of comparative advantages
 1) Project based on Oman's advantages on access to export markets
 2) Project based on Oman's advantages on conditions for production
(5) Project required to be promoted for pursuing balanced industrial development

Sample projects taken up for studies include those to be developed individually in relatively large scale and also those representing a number of similar projects to be developed in small scale, since study cannot be carried out on all possible projects. The study also excludes the upgrading or expansion of projects for existing establishments which are now being pondered by the entities operating those establishments.[4)]

6.4.3.2 Development of export markets for indigenous (non-oil) minerals

Mineral resources excluding oil and natural gas are divided into two categories of metal resources and non-metal mineral resources.

The exploration work conducted until the present did not find any metal resources which have great prospect for commercial production and utilization (refer to Chapter 4). Endowment of a large variety of metal resources has been reported, but their reserves are too small for commercial exploitation. Copper has been mined for smelting in Oman, but

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[4)] The result of the studies is described in "Pre-feasibility Study of Prospective Industrial Projects" (Annex 4).

the mined reserves are currently reaching its depletion. Thus, in order to continue the operation of the existing copper smelting plant, it is crucial to find new reserves with continuous exploration work. Under this situation there is no prospect for developing industry based on metal resources available in Oman.[5)]

In Oman there are a variety of non-metal mineral resources, among which gypsum, lime-stone and stones for aggregates are abundantly available, although these are low value resources available in many countries. Gypsum and aggregates have great prospect to exploit for export to certain countries where the domestic supply is short, as enumerated below.

1) Gypsum: Japan and some countries in South-east Asia import a bulk of gypsum including low grade gypsum due to short supply from local sources. In this region, Thailand is the only exporter of gypsum since other countries are unable to export their indigenous gypsum due to high costs of exploitation and transportation.
2) Aggregates: Quarrying at wadis is the supply source of aggregates in Oman. As there are a number of operating quarries which are no longer permitted to continue operation for quarrying beyond the permitted maximum depth of 1.5m, quarrying at wadis will hardly meet large demand for aggregates in the near future. The GCC countries except Oman and a part of UAE lack stones suitable for aggregates, while there are large demand for aggregates with construction of infrastructures including roads and ports in these countries. This situation implies bright prospect of developing a large-scale stone quarrying at a stone mountain rather than quarrying at wadis in small scale.

Nevertheless development prospect of these projects is dependent greatly on the location of exploitation sites, since costs for transportation up to destined markets are the most critical factor affecting feasibility. Thus, it is crucial for the projects to seek means of operating at least costs for transportation, such as by: 1) selecting the site enabling production and shipment at economic cost, 2) selecting the reserves to be exploited in economic scale, and 3) minimizing the transportation cost by combining the exploitation of other resources or combining with other projects. Investment on these projects must be determined by conducting more detailed studies on the project sites and market. Nevertheless, the preliminary study indicates a positive prospect of exporting those materials, suggesting to carry out a detailed project study for investment decision by project sponsors. At the same time, intensive export promotion on those materials should be launched.

[5)] It does not mean that there is no possibility at all to find any resources for commercial utilization with further exploration work.

6.4.3.3 Production of new products from indigenous resources

For developing projects geared at producing new products from any resources available in Oman, possible markets in general, should be identified not only in the domestic market but also in export markets because of small size of the former. However, except oil and natural gas, there are no other resources available for production in international scale. In view of these constraints, the development of projects for utilizing resources available in small scale should be possible only in the case of :1) taking advantage of exporting products by using return container offered at lower freight, or; 2) producing any high value products which can be sold widely in small quantity.

With the development of the new natural gas fields in which huge gas reserves have been proven with the latest exploration work, a large volume of natural gas will be supplied from the new fields combining the supply from the existing gas fields. In this event, the development of natural gas-based hydrocarbon industry such as ammonia/urea fertilizer and chemical methanol could be possible in addition to the natural gas-based olefin petrochemical complex project which is under final investigation by project sponsors. As these are large projects with all produced products for export, it is required to carry out detailed feasibility studies including detailed studies on export markets to arrive at a decision of implementation. Notwithstanding all these, the current trend and future outlook of the international markets indicate bright prospect for these projects.

There are no other mineral resources which have bright prospect for commercial development, as mentioned earlier, because these are non-rare minerals endowed with relatively small reserves. However, Oman has an advantage in transporting cargoes to the countries in South-east Asia and East Asia at a comparatively low transportation cost by using return container to be transmitted empty, for which shipping companies offer lower freight because cargo inflow volume far exceeds the outgoing volume. It implies possibility to produce any products by utilizing available resources for export to those regions which will expand into large import markets along with the rapid growth of economy. In this regard, the production of gypsum boards and rock wool may be possible projects which are worthy to conduct detailed studies on feasibility. However, as those resources are available in many countries, competition with local products in destined markets is expected, or from exports in other surrounding countries. In such event Oman, will be handicapped caused by long distance transportation despite favorable container freight. These projects should be well conceived to produce high quality products with high efficiency in order to overcome competition.

In Oman, cultivation of agricultural resources are just as limited as its seasons. Small

production units and inherent constraint in expanding agriculture in large scale are due to scarcity of water supply. However, there are a number of existing estates cultivating in relatively large scale. There may be possibility for those farms to undertake cultivation of selected crops for export in moderate scale under subcontracting scheme from buyers, since those farms can produce quality products in adequate quantity with managed farming to meet every shipping requirement. Meanwhile, products can be transported to destination at competitive cost benefiting from well established inland road network and also lower ocean freight for container as mentioned above.

As for the development of marine resource-based projects, it seems difficult to identify any large projects, because there are no survey data showing details of marine resources available and, furthermore, the present legislation strictly controls fishery for preservation of marine resources. However, there is a possibility to develop projects for efficiently utilizing small-size fish resources which are not used efficiently. For instance, there is a possibility to produce higher value-added products such as pet foods from sardines which are being used only as fertilizer at present, but this requires a gathering system since sardines are caught in small quantity by a number of individual fishermen.

In general, apart from large projects based on natural gas, there are several opportunities from which projects may be identified such as producing small items for exports by using mineral resources, agricultural resources and marine resources.

However, for developing such projects, it is important to upgrade the ports in Oman into a port of call for international container lines while intensifying government supports for small export business.

6.4.3.4 Promotion of import substitution projects

The development of import substitution industries has been actively promoted since early 1980's, and the existing industry covers almost all of the fields which can be feasible for import substitution.

Further steps for the encouragement of import substitution could be implemented for, 1) the production of products for which the domestic demand has grown to a scale that supports economic production and also for, 2) the production of raw materials and intermediates for existing industries to substitute from those imported.

A project for the domestic production of glass bottles for beverages are among the possible projects which can be developed for the domestic production to substitute for increasing imports. Another possible import substituting production involves metal products for buildings, plastic components and small electric appliances, but the demands for these products are still not large enough to support the domestic production competitive with imports which are mass-produced in other countries. However, as these

industries function to support the production of other industries, the government should consider promoting them by providing appropriate supporting measures despite their less competitiveness on the basis of production costs.

At present there are no possibilities for the domestic production of raw materials and intermediates that can substitute for imports.

Personnel who are engaged in the existing industry should seek to identify possible projects for expansion or diversification to expand import substitution along with the expansion of the domestic economy. Toward this end, it is important to nurture capable Omani human resources who work as top and middle managers and engineers in the industry.

6.4.3.5 Project for utilizing traditional technologies

In Oman there are a variety of traditional technologies, which have been inherited from indigenous heritage industries. But those technologies are hardly adaptable to the current industrialization. Typical heritage industries existing in Oman are: 1) wood-working (including furniture), 2) dhow-boat building, 3) ceramic, and 4) fabric weaving.

Traditional wood furniture is featured with Arabic patterns shaped by manual carving, but precision of manufactured articles is substandard. Further, there are no more Omani nationals who undertake the furniture making. Instead, expatriate skilled workers who have practiced carving techniques in their home countries are engaged in this manufacturing, but there is no assurance on how long they will continue this job in Oman. Under this situation the traditional furniture technology can be used only for making furniture to meet limited local demand.

Demand for dhow-boats has been decreasing, and manufacturers of dhow-boats are currently seek to diversify their product lines, including the manufacturing of FRP boats. As seen in the traditional wood furniture and wood-working industry, dhow-boat building is currently carried out by expatriate workers.

Traditional ceramics are biscuit ware which cannot be used for holding water.[6] Experiment on glazing is underway based on technology transferred from China, but it will take time for commercialization.

Indigenous cloths are woven by traditional hand looms, and those cloths are traded at high value because of limited supply. Application of mechanized looms is underway with technical assistance from China. However, the cloths woven using traditional technology have no peculiar design and weaving patterns, thus having no merits for preservation.

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[6] In Oman biscuit ware is used to keep contained water cold by utilizing evaporation of water oozing out from the ware.

6.4.3.6 Promotion of export industry based on Oman's advantages for industrial location

Industrial projects which can be promoted based on Oman's advantages for industrial location would be 1) those based on advantage for transit in international or regional distribution, 2) those for exporting by using return containers at favorable ocean transportation cost, destined to South-east Asia and East Asia to which the return containers are transmitted as mentioned earlier, and 3) those promoting to relocate some fields of production base from India by Indian investors due to high production costs resulting from highly complicated procedures for import and export, high import duties, and restriction on import of production equipment and raw materials. Among these three categories of projects, the first category of projects stands to compete with Dubai because prevailing conditions in Oman do not indicate prospects while the other two categories of projects have bright prospect for promotion in Oman. For instance, prospective projects include those 1) manufacturing high-value knitwear for exports using cotton or blended yarns imported from India and other countries, 2) producing snack foods and other processed foods for exports by using agricultural products imported in bulk from neighboring countries, and 3) undertaking the re-packing of medicines and agricultural products imported for re-export. However, the said produced products are transported to export markets far from Oman, making it important to focus on high value products. At the same time, in order to support those industries, the government should take intensive efforts to upgrade the port facilities and be able to attain a position of a hub port in ocean container transport, so that the industry can benefit from favorable container freight while promoting the development of relevant industries which can supply the export industries at economic cost with required inputs such as high quality packaging containers and printing.

6.4.3.7 Project requisite for pursuing balanced industrial development

Development of supporting industries as well as industrial infrastructure including transportation, telecommunication and utility supply are essential in pursuing industrial development. In particular, the development of high-tech industries requires high level metal-working and precision machinery engineering industry and plastic processing industry. The existing metal-working industry provides supporting services to the oil development and petroleum refining industry. However, this industry is not capable to undertake ancillary parts manufacturing or provide ancillary services for electric/electronic appliances/machinery and related component manufacturing industry and automobile component manufacturing industry which may be developed in the future. The existing plastic processing industry also limits the growth of manufacturers in undertaking ancillary components of the high-tech industry.

Under this situation, it is of vital importance for the government to promote the development of these supporting industries, as well as the development of industrial infrastructure. However, as the existing demand is nearly nil, the government should have to provide large amount of subsidy in order to foster such infant industry with national interest. From the industrial strategy context of pursuing sound growth of the industry, it would be more effective for the government to take indirect measures for promotion, particularly, 1) by promoting the development of mainstream industry which creates demand for supporting industry, and also 2) by intensifying human resource development and the establishment of technological basis which serve to build up technical capabilities of the supporting industry.

6.4.4 Government support programs for promoting proposed development plan

6.4.4.1 Thrusts of government support

The proposed industrial development plan, as described earlier, requires large amount of investments, which will be realized mainly by domestic and foreign private investment. Oman is still in its early stage of industrialization and thus, the existing industry has not reached a scale enough to support the development of upstream and supporting industries which provide industrial inputs and supporting services widely to other industries.

The country also has not built up technological basis, particularly human resources and research institutes for R&D. For promoting the development of industry without adequate technological basis in the country, it is effective to accelerate the development of industry in close tie-up with foreign enterprises thereby promoting transfer of their technical and management know-how to the domestic enterprises in Oman. Also, as described in the basic strategy for industrial development, industrial development should be intensively pursued by promoting export industries and also the concept of relocation in Oman of production base for exports and transit processing/trade base for re-export by foreign manufacturers or business enterprises.

In the course of this promotion, the government should have the initiative in project formulation and promotion, including identification and infusion of foreign partners, for the development of large projects. And at the same time, it should also launch the implementation of overall measures and activities for the promotion of foreign investment and export. Enhancement of industrial financing system is also important in order to cater to large industrial investment and facilitate exports by export industry especially by small- and medium enterprises. Further, the government should pursue overall measures in building up technological basis, human resources and industrial infrastructure which

form the base of sustainable growth of industry. Details of these government support programs are presented in Chapter 7.

Described below are the main issues to which importance should be attached in the implementation of the government support programs.

(1) Efficient use of resources available

Oman has potential, to some extent, to develop resource-based industries, particularly oil and gas and other minerals. Possible mineral resource-based industries broadly consist of two areas; (a) oil and gas based industries including petroleum refining, petrochemicals and hydrocarbon industries (viz. ammonia and nitrogen fertilizer, and methanol) and (b) mineral-based industries.

As for oil and gas-based industries, several projects have already been identified, in which feasibility studies have been carried out or are underway. Although the final decision should have to be made on the basis of the results of thorough investigation in those feasibility studies, a preliminary evaluation in this study implies possibility of developing those gas-based industries which will give an impetus to the industrial development under a certain condition. However, the near absence of domestic demand will be one of the limiting factor on this type of project, and ensuring a stable market will be essential for its successful implementation.

For commercial production of non-oil minerals, the existing mining and quarrying industries have already covered almost all of the prospective mineral resources available in Oman. Various studies conducted to date indicate pessimistic view on potential for large scale commercial exploitation of any minerals left unexploited , except for the development of new deposits of minerals which have already been placed in commercial production in Oman. Hence, for the development of mineral- based industries, a focus should be placed on the following areas:

1) Development of projects producing new products, associated with penetration of those products into markets, by using (i) the minerals commercially available, or (ii) any other minerals that can be obtained with small scale mining, or (iii) those disposed and left unused.
2) Development of any downstream projects related to the existing mineral-based industries.
3) Development of any other down-stream projects conducive to the increased supply of the minerals commercially available.

Under such situation of utilizing these resources, development of new export market and new application of the resources for use in domestic and export markets will be necessary to be pursued.

(2) Development of domestic demand

There are some areas of domestic demand, which now relies on supply of imports, though very limited, among which there is some possibility to seek domestic production for import substitution, even if most product lines seem small to justify establishment of new undertakings. This development promotion should be focused on construction and housing materials, and also materials to be used in the oil and gas industry which are the leading sectors in Oman. However, as the demand for those materials appear to be small, the production should be based on the supply to not only the domestic users but also users abroad.

Although the demand is still small, there is a need to develop the metal engineering and plastic processing industries to some extent, since these fields of industries function as fundamental industries for supporting efficient operation of the manufacturing industries in Oman and possibly for those in other GCC countries. It also serves as the basis for developing precision engineering and machinery industries in Oman as expected in the future industrialization vision.

(3) Tapping export demand

In general, Oman has no endowment of non-mineral resources which have comparative advantages for use as raw materials. Furthermore, industries have to pay comparatively higher labor costs since a large number of expatriate labor should be employed due to scarce national labor. In order to overcome these disadvantages, competitive product lines and appropriate technologies should be selected with thorough examination, particularly as regards to the benefit of producing higher value goods and employing mechanized technologies rather than simply labor-intensive technologies.

Other considerations are identification of industries which can enjoy the benefit from Oman's strategic location for external trades, and other favorable investment and business conditions in Oman, which include fiscal incentives, low cost credit facilities, infrastructure, simplified and deregulated administrative procedures and licenses, and other institutional supports.

India is the immediate target for potential demand development in this context,

followed by GCC markets, Southwest Asian countries' markets, and markets of east coast countries of African continent in the future.

(4) Nurturing industries which form the basis for developing supporting/linkage industries in the future

It is important to undertake selective promotion of industries which can serve as the basis for developing supporting/linkage industries in the future. Metal engineering industries would be one of those industries. However, product lines and the level of technologies to be used should be carefully selected so that those industries can be embarked on a sound basis for future growth as well as for the purpose of technology accumulation.

(5) Establishment of basis for research and development and absorption of transferred technologies

The overwhelming majority of the existing industries have no urgent need for R&D since they adopt technologies transferred from foreign countries without modification for application. Further, there is no organization responsible for technology transfer to Omani engineers and laborers because the industries rely on technologies and skills of expatriate engineers and laborers employed. However, R&D function and technology application/transfer function are among the essential requirements, in providing the basis for technical services which will play an important role in pursuing the industrial development, as these closely link with overseas industries and markets in line with the future vision of developing Oman as the industrial center in the Mid-east region.

As an immediate and mid-term requirement , the R&D is essential for the development of application technology and industrial standards which suit the specific local condition in the Mid-east region. In addition, for the development of ceramic industry there is a need for R&D in the research and development of appropriate technologies for the utilization of locally available resources. As the upgrading of knitwear industry requires application of computerized knitting machines, the set-up of technical assistance function is essential for supporting the efficient operation with such sophisticated machines. In the future, the diversification from general grade products to higher value-added industrial products derived from natural gas and mineral resources, necessitates the development of technological basis. These efforts are also conducive to the build-up of technological basis and human resources in the future.

6.4.4.2 Fundamental Issues in the Industrial development policy

Industrial policy is the overall policy environment that shapes the evolution of industry.

The specific components of industrial policy include policies toward trade, industrial finance, fiscal incentives, and development of human, physical, and technological resources. The challenge of industrial policy is to design a coherent policy framework that encourages rapid and efficient industrial growth.

Industrial policy does not mean the selective targeting of industrial subsectors. The histories of successful industrializing economies provide evidence that industrial growth is facilitated by relatively open markets and neutral incentives.

Lessons from the industrial development policies adopted in the countries which have successfully achieved industrialization can be highlighted as follows (refer to Figure 6-4):[7)]

1) Building up "fundamentals" is the most important step for the economic development of developing countries, without which no successful economic development is achieved.
2) Given that fundamentals have been built up, moderate government intervention should be exercised within a certain scope in relation to explicit and implicit costs; and the government intervention should be rectified or stopped immediately if it causes deterioration of the fundamentals.
3) For the build-up of the fundamentals and appropriate implementation of selective government intervention, it is essential to set up confident institutions which are capable of managing these measures.

The foregoing "fundamentals" include the following elements:

1) Stable macro-economy
2) High human capital
3) Effective and secure financial systems
4) Limiting price distortions
5) Openness to foreign technology
6) Agricultural development policies

The lessons also indicate that the industrial development policy should be designed to prepare environments in which market mechanism can function effectively. In general setting of neutral incentives, industrial policy must nevertheless, address externalities and market failures that may arise in early stages of industrial development. The most

7) Reference is made particularly to "The East Asian Miracle: Economic Growth and Public Policy"; the World Bank (A World Bank Policy Research Report - 1993, Oxford University Press)

important of these fall into three categories:

1) Firms may be unable to capture fully the benefits of learning a new technology or developing a new market, and will be reluctant to enter new and socially profitable lines of activity.
2) Undeveloped financial markets may restrict the supply of capital for industrial development, either to small firms, due to lack of financial information and high handling costs, and/or to large firms, due to insufficient possibilities for the diversification of risk.
3) Infrastructure, information, and coordination may be inadequately provided by private markets because of well-known problems associated with public goods (e.g., ports, databases, and planning.)

In these and other cases, government intervention is justified, provided that the underlying market problem is addressed directly and at commensurate cost.

6.4.4.3 Basic considerations on the industrial development policy in Oman

The guideline adopted for the Fourth Five Year Plan basically incorporates the foregoing basic issues.[8)]

Oman has exerted great efforts to build up the foregoing fundamentals up to the present, and these efforts have partly brought about successful effects. More efforts nevertheless are required in order to pursue the development vision for sustainable growth of industry. However, it is not dependent only on efforts by the private sector, since private enterprises face various constraints themselves caused by market constraint and backwardness of the industrial advancement relative to the international level. In order to overcome these constraints, government support would be indispensable in some areas.

Figure 6-2 illustrates recommendable implementation programs for the government supports which must be provided in pursuing the industrial development in line with the foregoing development strategy and scenario.

Discussed below are the special issues in which particular attention must be paid in implementing the government supports.

(1) Appropriateness of selective promotion of industry

Under a neutral regime, profits in alternative sectors and projects depend on world

8) Refer to 2.3.3 in Chapter 2; "Policy Framework and Target for the Fourth Five-Year Development Plan".

prices and not on the peculiarities of trade restrictions or subsidies. Resources flow into areas of comparative advantage and the negative side-effects of intense political competition for protection are minimized. Moreover, exposure to world market prices improves the dynamic performance of domestic firms, as they intensify their search for and acquisition of foreign technology. Hence, all industrial sectors should be activated equally as much as applicable, then it will lead to the advancement of industries which have comparative advantages. In practice, however, since the private sector has various constraints as mentioned earlier, the government supports are required in order to encourage some areas of activities by private enterprises, provided that any government support be provided equally to all industrial sectors since those constraints are common to all industries in Oman except, in the case where protective measures are given by the government to protect specific industries for a certain period of years. Nor are there sectors comprising clusters of small- and medium-scale industry and cottage industry requiring special supports to those industries unlike the structure seen in many developing countries. This condition would basically not require taking any measures for encouraging selected sectors.

In this context, ideally, market aberrations should be remedied with functional interventions that are closely directed at the source of each imperfection, and match its scope. The remedy for market failure should be equally available to all firms that participate in the imperfect markets so that no new and unnecessary distortions are introduced in favor of one economic activity or another (e.g., generally applied tax privileges such as those widely granted to R&D). In practice, however, some market problems are most easily attacked with selective, sectorally-oriented policies (e.g., sector-specific research institutes). Even in these cases, however, the economies of market failure suggest that equal support should be considered or offered for all industries facing a similar failure.

(2) Requirement for setting special policy for small and medium enterprises (SMEs)

Given that SMEs are forced to operate in unfavorable conditions compared to large enterprises due to imperfection of market stemmed from deficiency in policy, the policy for SMEs aims to improve such unfavorable conditions for SMEs so that SMEs can operate equally with large enterprises under the market mechanism.

Unfavorable conditions dominant for SMEs are generalized as follows:

1) Labor market: Large enterprises provide internal training to employees with assurance of long-term employment, and it resulted in closing labor market.
2) Finance: SMEs have limits on funding, since they are unable to raise funds by issuing public shares and bonds. Financing institutes prefer financing to large

enterprises and generally higher interest rates are charged to loans for SMEs.

3) Market conditions: SMEs have a handicap in merchandising in markets which are used to be dominated by large enterprises.

4) Information: SMEs have difficulty in access to market information and other required information, especially obtaining complete information, whereas large enterprises can collect required information by mobilizing all resources internally available.

In Oman, however, SMEs[9] engaged in industry do not face any unfavorable conditions in market mechanism in comparison with large enterprises. It is because the government support to large enterprises have not created any market distortions since the industry is still new in Oman, and also SMEs have not emerged in business relation with large enterprises and exist only with difference in the scale of investment or in production scale depending on market scale. In this situation, the problems of the industry are common for both SMEs and large enterprises which equally face difficulty in competition with foreign manufacturers in import or export due to smallness of markets and existing industry in Oman. Problems caused by competition in market are similar to both SMEs and large enterprises. Further, in Oman all industries lack necessary information, and SMEs are not confronted with such unfavorable conditions compared to large enterprises with regard to employment and funding. In view of this, SMEs do not need special measures.

(3) Treatment of expatriates

Expatriates play an important role in management and technical aspects in Oman's industries. Although efforts of replacing expatriates with Omani nationals should be an important task in the future. Excessive enforcement of Omanization would hinder the successful advancement of the industrial development as well as the promotion of foreign investment. It should be more effective to seek the best way of utilizing the capabilities of expatriates efficiently for the development of industry, particularly giving attention to the treatment of qualified expatriates who are key personnel for transfer of technical and management know-how, while exerting every effort to upgrade the technical and management capabilities of Omani personnel.

(4) Government support

There are a variety of measures taken for encouraging industrialization in other

9) There is no clear definition on SMEs, but in practice enterprises established with investment less than RO. 100,000 are categorized as SMEs for financing. In judging from the scale of manufacturing facilities and markets, those established with investment less than RO. 25,000 seem to have the nature of SMEs or petty enterprises. Hence this study deems this scale of enterprises as SMEs. However, it excludes Omani small family enterprises engaged in retail trading to which the government intensifies its support.

developing countries. For application to Oman, however those measures should be carefully selected taking cost effectiveness into account, since there may be cases where excessive government support is not justified given cost considerations and limited industry scale, even if certain effect can be expected.

Table 6-1 Export by Countries of Destination

Area	Countries	1988 ('000 R.O.)	% of Total (%)	1992 ('000 R.O.)	% of Total (%)
Total		154,966	100.0	350,174	100.0
GCC	Bahrain	1,801	1.2	2,645	0.8
	Kuwait	3,047	2.0	3,694	1.1
	Qatar	1,731	1.1	2,268	0.6
	Saudi Arabia	7,230	4.7	14,718	4.2
	U.A.E.	71,941	46.4	176,408	50.4
Sub-total		85,750	55.3	199,733	57.0
Other Middle East	Egypt	379	0.2	325	0.1
	Iraq	1,857	1.2		
	Iran	735	0.5	42,266	12.1
	Jordan	407	0.3	359	0.1
	Lebanon	289	0.2	606	0.2
	Syria	11	0.0	1,036	0.3
	Yemen	282	0.2	834	0.2
Sub-total		3,960	2.6	45,426	13.0
West Asia	Bangladesh	19	0.0	17	0.0
	India	2,238	1.4	6,040	1.7
	Pakistan	3,343	2.2	477	0.1
	Sri Lanka	417	0.3	256	0.1
Sub-total		6,017	3.9	6,790	1.9
Eastern Africa	Ethiopia			32	0.0
	Somalia	28	0.0	7	0.0
	Tanzania	875	0.6	10,700	3.1
	Uganda	46	0.0	1	0.0
	Kenya	53	0.0	5,542	1.6
	Sudan	915	0.6	358	0.1
	Zambia		0.0	5,026	1.4
Sub-total		1,917	1.2	21,634	6.2
South East Asia	Malaysia	74	0.0	283	0.1
	Philippines	774	0.5	51	0.0
	Thailand	118	0.1	194	0.1
Sub-total		966	0.6	528	0.2
NIES	Hong Kong	299	0.2	36,201	10.3
	Korea South	4,595	3.0	3,957	1.1
	Singapore	4,255	2.7	6,810	1.9
	Taiwan	11,983	7.7	66	0.0
Sub-total		21,132	13.6	47,034	13.4
North America	Canada	99	0.1	110	0.0
	U.S.A.	7,145	4.6	10,160	2.9
Sub-total		7,244	4.7	10,270	2.9
Europe	Belgium	342	0.2	172	0.0
	Denmark	394	0.3	8	0.0
	France	2,218	1.4	1,337	0.4
	Germany	884	0.6	714	0.2
	Holland	2,440	1.6	1,133	0.3
	Ireland	29	0.0	33	0.0
	Italy	2,125	1.4	772	0.2
	Spain	190	0.1	94	0.0
	Sweden	1,534	1.0	39	0.0
	U.K.	8,960	5.8	8,226	2.3
Sub-total		19,116	12.3	12,528	3.6
Other Asia	Japan	1,437	0.9	2,505	0.7
	China	4	0.0	532	0.2
Other Countries		7,423	4.8	3,178	0.9

Source: Foreign Trade Statistics 1992

Table 6-2 India Export to Eastern Africa

	Items	Unit	Quantity	Value (Mil. RS)	Value ('000 R.O.)
Ethiopia	Submersible Pump	no.	163	11.9	161
	Parts of Machinery & Appliance	ton	292	16.5	223
	Total			109.7	1,482
Kenya	Natural Steatite Crushed	ton	5,160	12	162
	Aluminium Hydroxide	ton	163	12.6	170
	Other Medicine			20.7	173
	Imitation Leather Cloth	sqm.		12.8	173
	Tea-Leaf Cutting Machinery	no.	110	13.3	180
	Parts of Machinery & Appliance	ton	145	17.2	232
	Other Parts of Machinery	ton	274	14	189
	Bicycle Hubs	ton	613	20	270
	Total			1029	13,905
Somalia	Others Millmade, Handprint	'000sqm.	103	1.9	26
	Total			13.5	182
Sudan	Wheat	ton	48,417	84.9	1,147
	Leaf Spring for Motor Vehicles	ton	540	10.4	141
	Other Parts of Spark-Ignition Engines	ton	983	31.9	431
	Parts of Diesel Engines	ton	418	11.5	155
	Other Parts of Vehicle	ton	550	20.8	281
	Total			389.6	5,265
Tanzania	Rice Except Parboil	ton	18,041	104.3	1,409
	Other Tobacco	ton	33	10.8	146
	Common Salt	ton	30,550	11.4	154
	Total Medicine			36.4	492
	New Pnmtc Tyres Used on Buses	no.	17,445	38.3	518
	New Pnmtc Tyres Used on Bicycle	no.	672,776	24.3	328
	All Other Powerloom Fabrics	'000sqm.	2,543	43.3	585
	Other Printed Woven Fabric	'000sqm.	650	10.1	136
	Odhani,Cotton,Hand Printed	no.	5,132,090	120.3	1,626
	Odhani,Cotton,Nes	no.	390,001	12.4	168
	Special Transport Vehicle	no.	80	26.4	357
	Lorries & Trucks	no.	38	12.6	170
	Other Parts of Vehicle	ton	301	19.8	268
	Bicycle	no.	91,031	77.6	1,049
	Total			1184.1	16,001
Uganda	New Pnmtc Tyres Used on Buses	no.	6,700	12.9	174
	Lorries & Trucks	no.	66	29.5	399
	Bicycle	no.	82,635	73	986
	Bicycle Hubs	ton	1,010	32.4	438
	Total			311.1	4,204
Zambia	Other Medicine			49.1	664
	Black / White TV	no.	7,270	15	203
	Motor Vehicle With Internal Engine	no.	21	13.4	181
	Total			671.8	9,078

Note: 1 R.O.=74 R.S.

Source: Statistics of the Foreign Trade of India by Countries

Table 6-3 Indicative Target for Growth of Manufacturing Industries

	1995*	2000	2005
1. Growth Target (R.O. ml.)			
GDP (at factor costs)	4,875	6,524	8,730
- Oil Sector	2,021	2,459	2,851
- Manufacturing Sector	275	507	955
2. % to GDP			
- Oil Sector	41.5%	37.7%	32.7%
- Manufacturing Sector	5.6%	7.8%	10.9%
Growth Rate Assumed			
(% p.a.)	(1995-2000)	(2000-2005)	
GDP	6%	6%	
- Oil Sector	4%	3%	
- Manufacturing	13%	13.5%	
Investment Requirement for Manufacturing Industries (Aggregated for 5 years) (R.O. ml.)	(1996-2000) 420	(2001-2005) 860	

Note: * Target figures in Fourth Five-Year Plan

Source: Estimated by JICA Team

Table 6-4 Summary of the Selection Process of Potential Projects

Criteria for identifying projects	Identified potential projects for development			Factors considered in the project screening
	Existing industry with expansion prospective	Prospective projects identified for further study	Projects not prospective at the current stage of industrial development	
1 Making use of endowed natural resources				
1.1 Development of new resources not utilized yet				
– Metal resources				No prospective resource available
– Non-metal mineral resources			Kaolin	R&D work required for industrial processing
– Fishery resources		Pet food		Further studyrequired on availability of resources
– Agricultural resources		Small scale, contract-based projects		No prospective resource available for industrial processing in large scale.
1.2 Development of export market for the potential resources				
– Non-metal mineral resources	Cement	Gypsum Marble Aggregates		
– Agricultural resources			Dates	R&D work including market research required
1.3 Development of new application of available resources				
– Non-metal mineral based		Gypsum board		Should be an export oriented project
		Rock wool		Should be an export oriented project
			Refractory bricks	Demand size limitation w/diversified demand
– Natural gas based		Ammonia and urea Methanol C_2 downstream		
– Metal based			Basic copper products	Demand size limitation
2 Making use of potentiality of domestic market				Not propective yet due to demand size limitation
2.1 Supply to the existing large scale industries for deepening of import substitution				
– Oil & NG sector				
– Copper refining sector				
– Cement sector				
– Basic food sector				
– Government services				
2.2 Furtherance of import substitution				
– Food & beverage				
– Consumer products			Assembly of passenger cars	Small size due to diversified demand
		Glass bottles		
– Construction/housing materials				
			Metal products used for construction	Demand size /supporting function limitation due to immatured accumulation of industry
			Small electric appliances	Demand size /supporting function limitation due to immatured accumulation of industry
3 Development of traditional technology				No firm technology basis for export oriented commercial operation
4.1 Pottery				
4.2 Textile				
4.3 Wooden furniture				
4.4 Fishing boat				
4 Capitalized on locational advantage of Oman in the international business				
4.1 Locational advantage on access to export markets				
		Snack food		
		Printing		
			Wooden furniture	Prospective hard wood resource is not available
		Pharmaceuticals formulation/ repacking		
4.2 Advantage on production condition				
		Knitted wear		
5 Formulation of the basis for balanced industrial development				
5.1 Industries related to metal working			Metal engineering	Demand size /supporting function limitation due to immatured accumulation of industry
5.2 Industries related to plastic processing			Small electric appliances	Demand size /supporting function limitation due to immatured accumulation of industry

Figure 6-1 Economic Effect of Industrial Development

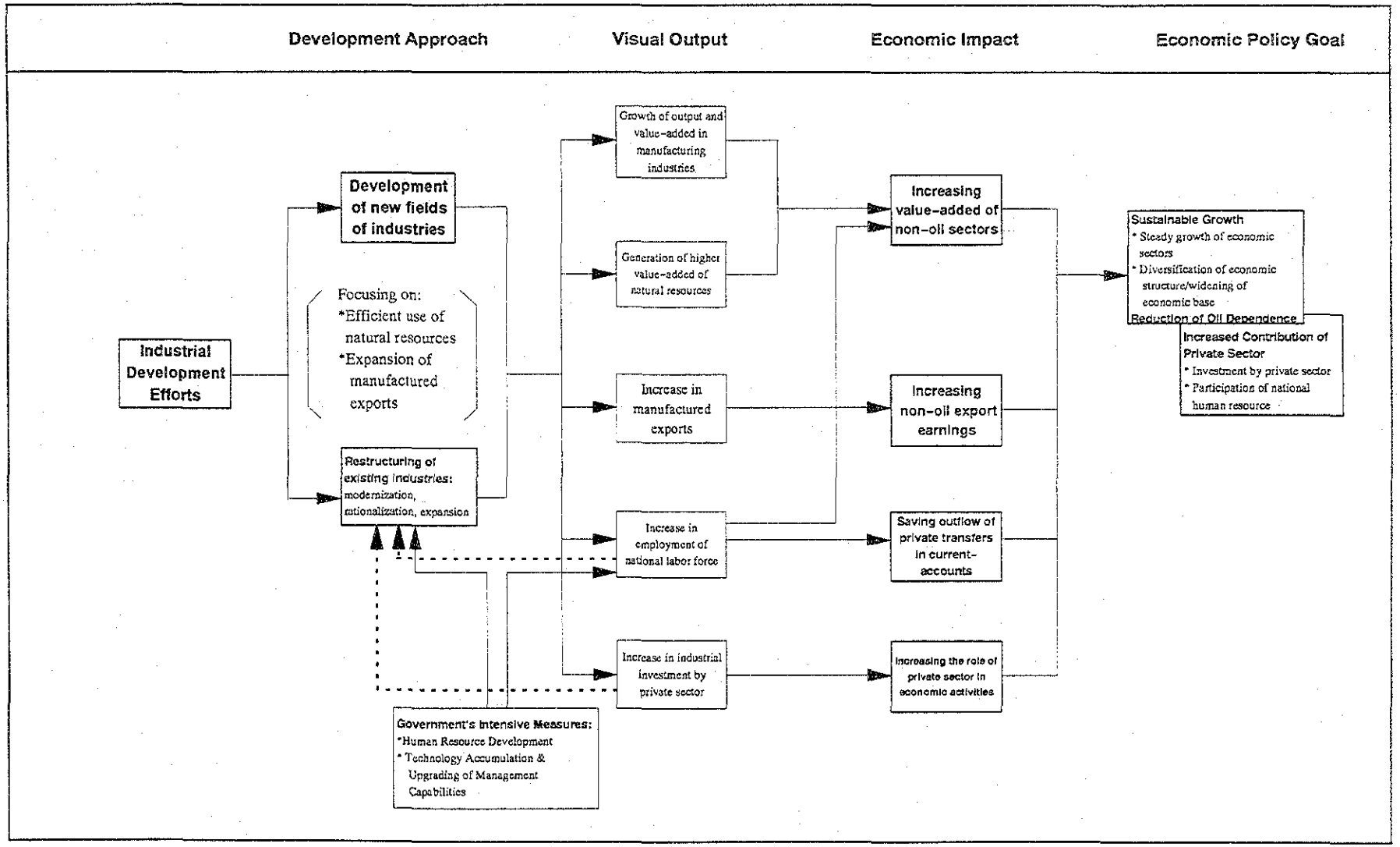


Figure 6-2 Industrial Development Model

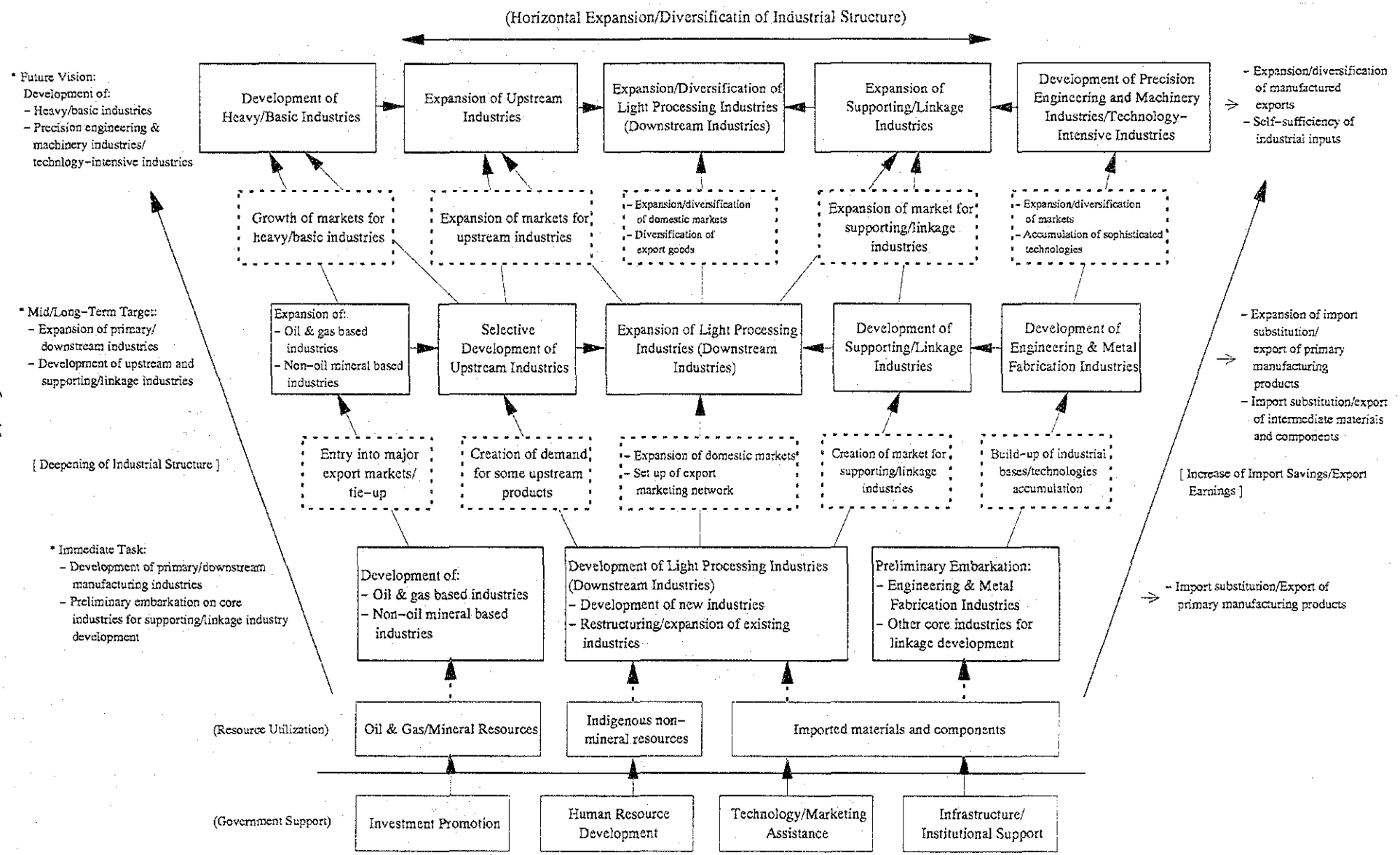


Figure 6-3 Industrial Development Scenario

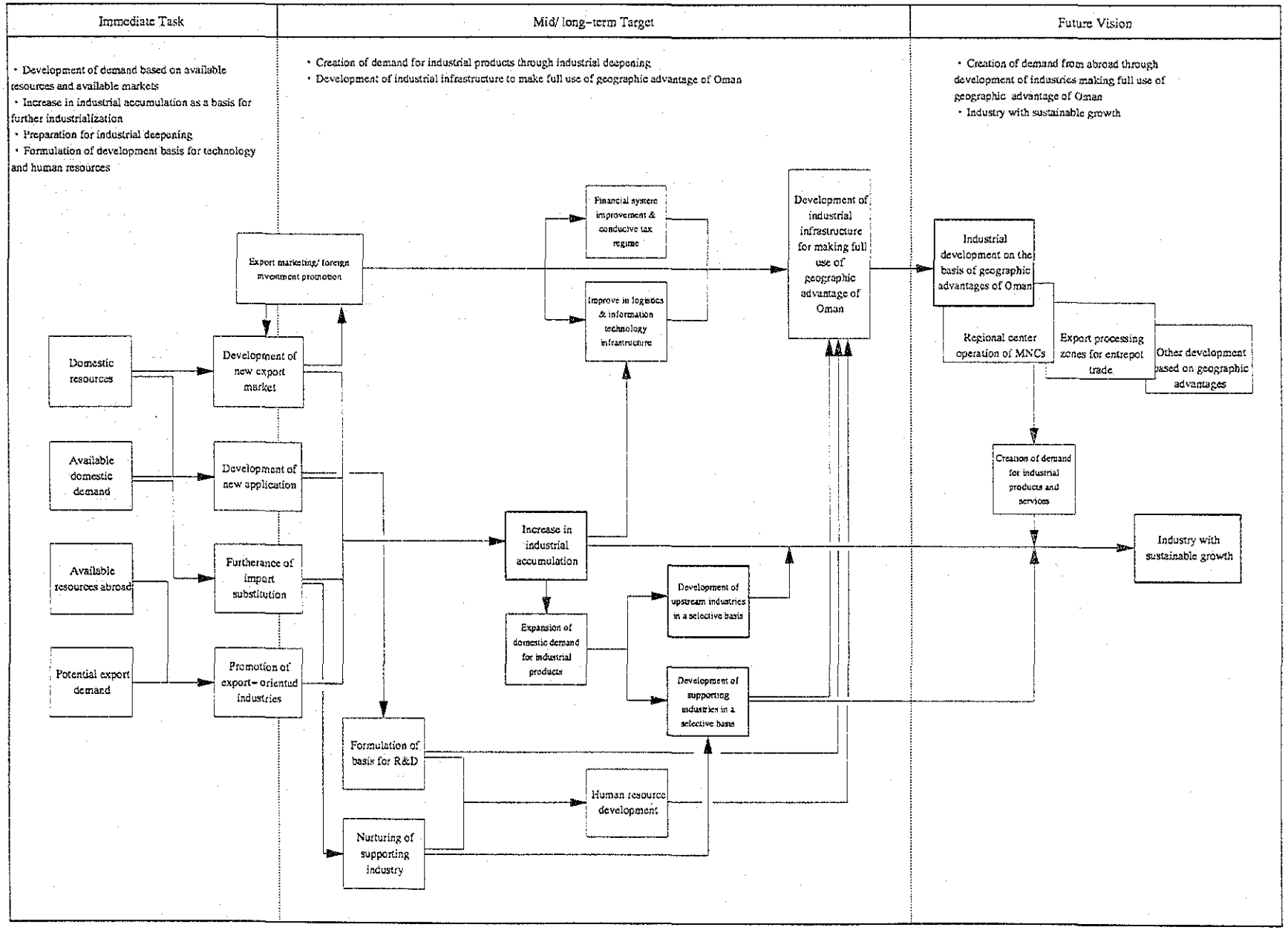
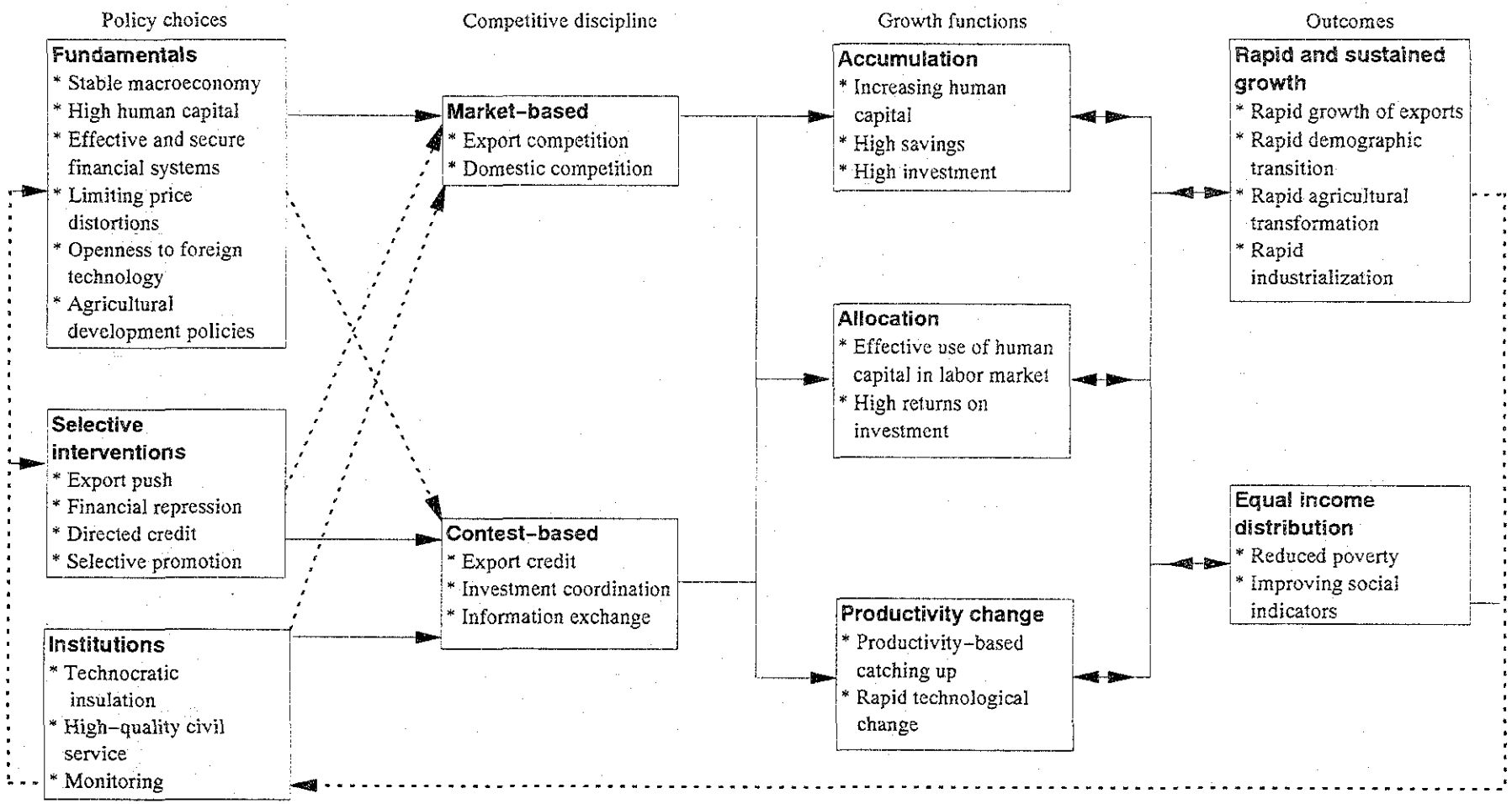


Figure 6–4 A Functional Approach to Growth



Source: The World Bank, "The East Asian Miracle," (New York: Oxford University Press, Inc., 1993)

7 Government Support Programs for Industrial Development

General

As discussed in the previous chapter, the industrial development strategy calls for the implementation of the government support programs which gear the promotion of the contemplated industrial development. This chapter presents the description of the government support programs.

Figure 7-1 illustrates conceptually the industrial growth scenario drawn by focusing on major industrial projects and sectors which will be promoted to achieve the industrial development goal as discussed in the previous section.

The industrial development scenario put emphasis on the growth of existing industries as an initial step for development in light of its possible contribution to immediate growth of the industrial sector as well as forming the industrial base for strides. It is primarily based on (1) industrial growth spurred by public investment and its multiple effect, particularly in cement, aggregate and other construction-related industries, (2) increase in production of export products by existing industries, such as oil, cement, and foodstuff for other GCC countries, and (3) growth of the domestic market-oriented industries producing foodstuff and other consumers' goods which resulted from increases in domestic demand along with a rise in people's income level induced by growth of these existing industries.

At the same time, the existing export industries could possibly grow within a few years if efforts are made to strengthen these industries, including diversification towards higher value-added exports in the garment industry, and upgrading of marble products for export drive in the marble industry. Also, the natural gas-based chemical industries can greatly contribute to industrial growth as well as increases in exports by around 1998, if contemplated projects in these fields are launched with the implementation of plant construction by 1995.

On the other hand, projects that need to be further studied, such as the export of gypsum, and the production and export of gypsum boards, will take more time for realization so that these projects can contribute to increases in industrial output only after 2000.

Some industries can be developed with the improvement or development of relevant infrastructure such as the establishment of a container port functioning as a regional hub, the improvement of port facilities, and the set-up of a free zone. However, since the development of these infrastructures needs further study and plan, such industries will bring their effect on industrial growth in 2005 or later.

The intensification of foreign investment promotion including the set-up of the free

zone will accelerate industrialization, and it will induce the development of linkage industries for sustainable growth. However, this subsequent effect will come later than the above.

In order to achieve successful industrial development along this scenario, a variety of government supports have to be implemented. Presented in the subsequent sections are details of the proposed government support programs which are related to the following issues:

1. Ensuring export market
2. Encouraging foreign investment
3. Intensifying financing programs/schemes for industrial development
4. Human resource development
5. Establishment of technological basis
6. Further grading up of infrastructure

Figure 7-2 illustrates the conceptual implementation timing of the government support programs and their possible effects, indicating function development process for attaining the "Future Vision" given in time sequence.

7.1 Ensuring Export Market

Introduction

The main ingredients of a successful export promotion policy involve direct and indirect exporters with ready access to inputs at world market prices and working capital for export production. Assuring access to inputs at world market prices and export financing at an interest rate that covers the actual financing costs is nothing but to provide a sound policy environment in which private firms can produce and export products based on the country's comparative advantage and competitive market mechanisms. Overseas marketing and export product development are ultimate tasks of private firms, because private initiatives and creativity are key to the success, and marketing information is useless unless it is absorbed and responded by commodity producers.

In the early stages of export development and exposure to world markets, however, some form of government assistance in export product development and marketing abroad may be justified due to the lack of information by many firms on export products, technology, and overseas markets, as well as the scale economies and externalities in such information collection and dissemination. It is particularly important that small and infant exporters, on one hand, and indirect exporters, on the other, are drawn into the export promotion system.

This situation is applicable to the manufacturing sector in Oman, particularly those who are interested in starting business in export industries. There are many opportunities to start export manufacturing, and there are some examples of success; for example export of dates as raw materials for seasoning source for special purpose, export of vegetables to Japan by air cargo, etc. However, much of the seeds of export manufacturing have been hampered by lack of knowledge about the needs of markets, difficulty of access to the export market, lack of knowledge on packaging, and/or poor performance at the initial contact with potential buyers.

Government support in marketing intelligence services, product development support, and trading company development can be helpful in this context, in identifying and entering new markets and developing specialized marketing capabilities.

Further, the Government needs to develop a strong capacity to deal with bilateral and multilateral trade negotiations so as to maintain and improve market access, as well as develop appropriate mechanisms to ensure that the available opportunities are utilized most effectively.

The current programs for export promotion in the Sultanate includes, 1) export promotion and assistance for development and marketing of potential export products, and 2) regional cooperation with GCC countries. Details are as follows:

(1) Export promotion activity

Direct export promotion efforts have not been taken in a concerted or planned manner. At present, the establishment of an organization specialized in export promotion is considered, but it is still at the conceptual design stage and will take some more time before an actual plan is produced.

There are several organizations in Oman which provide service related to export promotion, ODB and RIEA. In particular, RIEA's promotional activity is conducted as part of support for RIE tenant industries and focuses on support and assistance in exhibition, i.e., RIEA coordinates participation of tenant industries (at their own cost) in a variety of overseas exhibitions as well as those sponsored by various ministries and other government organizations. RIEA also places advertisements on international magazines and hold exhibitions at RIE's exhibition center. (Note: most of foreign businessmen visit the RIE) Most recently, RIEA has participated in exhibitions in Taiwan and other places and is planning to hold an exhibition in Japan under the support of JETRO. Nevertheless, these activities are conducted on a spot basis.

(2) Development of regional cooperation for cultivating markets

Oman has consistently been active in cooperative activities among GCC countries:

The Gulf Co-operation Council (GCC) was formed in 1981, aimed at promoting economic and industrial co-operation among member countries. Following are the major contents of the agreement:

1) Citizens of GCC countries may move freely among the six countries without visas,
2) No custom duties have been imposed within the GCC on certain Gulf produced materials:
   a) Basic requirements for GCC products (certified products as originated in GCC countries) are defined as follows:
      1. The ratio of (total cost – foreign cost) to total cost must be 40% or over.
      2. 51% or more of the company's share must be owned by GCC nationals.
   b) Certification must be obtained by submitting an application form. Once certification is obtained for a certain product, it is automatically renewed for subsequent exports undergoing a one-day procedure. If a manufacturer or product name is changed, however, a new certification must be applied and obtained. The initial application procedure takes much time as the application is reviewed and processed by MCI, the GCC Secretariat in Riyadh, and other GCC countries (in this order). Most problematic is cost calculation since various countries adopt somewhat different methods. Saudi Arabia demands annual review of certified products.

3) Professionals who are nationals of GCC state may work in another, and
4) Cross-boarder ownership of shares is permitted.
5) Development of joint industrial projects and/or complementary projects among GCC countries

   Gulf Organization for Industrial Consulting (GOIC) serves as a secretariat responsible for technical coordination. GCC countries have contemplated a joint initiative to restrict license for industries with excess capacity, such as cement, but no agreement has been reached, yet. As a formal organ of joint investment, GCC countries maintain Investment Cooperation Committee for GCC which is participated by the MCI minister.
6) Comprehensive GCC industry and market information is not available, while there are some related to individual projects.

There is no immediate task related to cooperation with other GCC countries. It is desirable to strengthen ongoing activities further and upgrade joint activities in the region. Outside the GCC region, cooperation of India will become important from the viewpoint of target marketing.

Major activities which need particular focus in relation to export promotion are presented below, which consists of the support for market intelligence and marketing activities through an export promotion center and government-supported trading house, and designation of a special marketing task force within the center to undertake market research, and formulate the strategic plan for overall promotion actions.

Program 1-1: Institutional setup for export promotion

Program Description

(1) Objectives

It is proposed to establish an Export Promotion Center which carries out export promotion activities. The expected functions of this institution include undertaking of general supporting activities for local (and foreign in the future when the foreign investment is encouraged in the Sultanate) manufacturers and traders established in the Sultanate. These include:

1. Trade information: build up and facilitate local manufacturers with data on overseas buyers, overseas market research companies/organizations, and foreign trade regulations
2. Assistance for trading procedures: assist companies to electronically declare and

clear their goods, obtain information on shipping schedules, trade codes, foreign exchange data, trade statistics, Port Authority's berth and ship schedule, etc. through on/off-line service

3. Product design and packaging consultancy services: organize design consultancy for the various industries by bringing in overseas experts to advise local manufacturers on new developments in design and marketing. Design seminars and workshops by leading designers will be also useful.
4. International marketing assistance: organize trade missions and participation in international trade fairs for local (and foreign in the future) companies to promote their products and services in both established and new markets.
5. A special marketing task force: form a special task force within the center to undertake market research of strategic products of the country, monitor the export trend and formulate the strategic plan for promotion actions to be undertaken either by the center or by the government-supported trading house proposed in Program 1-2 (provisionally called "National Trading House").

At the same time, the center will play a role to maintain or improve the reputation of Omani export business to be efficient and reliable in international trading, by assisting small-scale Omani trading houses through extension of consultancy services in close collaboration with the National Trading House.

(2) Target sub-sectors

All the sub-sectors require export promotion assistance, except for those giant projects. Emphasis on activities should be set on the basis of the research work to be undertaken by the strategic task force for market research. The promotion of specific products, however, should be undertaken by individual manufacturers/traders, unless it involves a large number of small establishments. The assistance for it, if necessary, should be provided on semi-commercial basis by the National Trading House.

(3) Target markets

Basically, the institution's activities will cover all the potential markets regardless of the manufacturing subsectors. The emphasis of activities, however, need to be placed on a certain markets, due partly to a limited budget and manpower. The focal markets should be decided on the basis of research and analysis carried out by the special task force for the market research. There are two approaches.

The first approach is from the standpoint of promoting some specific project products like those identified in the industrial projects pre-feasibility study. There are

two types of products included in these projects. One is a product which will be produced by one project (under the operation of one establishment), such as gypsum. The promotion of this type of products require marketing activities specific to the target markets. Another includes such products as snack food to be produced by a number of establishments. The former type of products is necessary to be promoted by the projects themselves, or with assistance from the National Trading House. For the latter types of products, the Center can support the potential manufacturers/exporters providing them with market information and assisting in the organization of exhibitions or by sending trade missions, etc.

The second approach is from the standpoint of promoting some specific potential markets. According to the provisional analysis, there are five potential markets essential to Oman in general. One is the GCC market, which has similarity in consumers' trend, and therefore, it is the most accessible export market, but at the same time, competition is very keen because of proximity of manufacturing sector in these countries. Second is the EC market. Promotion to this market requires more research for efficient access.. Third is Indian market, where under its new economic development policy, it is expected to move towards importing various products instead of producing everything domestically as in the past. We expect the marketing capability of Indian capital to be poured as investment in Oman. Fourth, is the market in Southeast and East Asian countries. This market will be one of the potential markets in the near future because of advantage on ocean going container freight rates. The fifth is the market on the Eastern coast of African continent. The purchasing power in this market, however, is still limited.

Emphasis of promotion activities will vary by market as well as timing of promotion activities. The following table shows the matrix of general tendency of needs of promotion activities by market.

Target market:	GCC	EC	Indian	S.E./ E.Asia	E.Africa
1. Provision of trade information	A	B	A	B	C
2. Assistance for trading procedures	B	A	A	A	C
3. Product design and packaging consultancy services	B	A	B	A	C
4. International marketing assistance	B	A	B	A	C
5. Special market research task force	A	C	A	A	C

A: Urgent needs, B: Moderate needs, C: Future needs

Key Success Factor

1. The organization of international marketing assistance (trade missions and exhibitions, etc.) should be carried out in the selected strategic markets on the basis of

results of study by the special task force. In undertaking such activities, a careful study should be made in advance, regarding; 1) what products/industries should be promoted, 2) who are the potential buyers, 3) whether the event is set correctly to the targeted buyers/users or not, and 4) what in-advance actions will be effective to attract the target buyers/users to the missions/exhibitions.

2. Since the Task Force plays a critical role in successful operation of the center, the experienced foreign experts are recommended to be engaged directly in the task force (as a member(s), and not as an advisor(s) or a technical staff(s)).

Alternatives

1. Direct assistance by the MCI, OCCI and RIEA as currently being undertaken:
   As the present practice reveals, the strategic action is hard to be undertaken. Forming of the special task force is the key for efficient export promotion activities.
2. Combined activities with the proposed activities for "Investment Promotion", and "Technological Development Support":
   Since required liaison offices and branch distribution, and some actions required are duplicated with that of these functions, integrated/combined action could save manpower and costs.

Suggestion for Implementation

(1) Organizational set-up

1. Lead agency: MCI
2. Support roles: RIEA, OCCI, Embassies abroad
3. The Center is recommended to be established as an independent body under the government sector (like Rusayl Industrial Estates Authority) to be able to mobilize their revenue from the services for their activities.
4. As for the liaison offices abroad, the center is recommended to be set up only in the strategic markets including UAE, India, Singapore/Taiwan, EC, while other markets are covered in collaboration with commercial attache of embassies, and OCCI offices.

(2) Implementation steps

1. Form a "Special Marketing Task Force" to carry out the implementation planning on the basis of study on; 1) available data and data sources for continuous updating, 2) procedures to build up a system for trade procedure assistance, and 3) manpower requirement
2. Establish the Center in Muscat area starting with the functions of; 1) trade information service, 2) assistance for trading procedures, and 3) international

marketing assistance. The functions of "trade information services" and "assistance for trading procedures" should be extended to the major Wilyats through the branch offices of OCCI.

3. Through the above services, the task force should grasp the local demand for export promotion.
4. The task force will undertake intensive market research, with engaging experienced consultants, if necessary, particularly in the strategic markets to buildup basis for market information services, and for the products identified for strategic promotion.

Program 1-2: Trading company development

Program Description

Establishment of a trading house to be operated under the intensive government support. The trading house will take the lead in promoting and exporting Omani products. It provides foreign buyers with assistance in product sourcing, quality assurance, and logical services, and offers Omani manufacturers product development, technical and marketing assistance utilizing its worldwide marketing network.

In Oman, many seeds of developing small-scale export industries and potential investors in such ventures are available, but their realization fails in actuality.. Hence, support seems to be effective in bringing such business opportunities into reality. While MCI has been providing support through IDU and other organizations, efforts should be made on a commercial basis. By doing so, initiatives will be taken with recognition of risks involved in new ventures, and feasible projects can be launched quickly and individually. Also, the increase in foreign investment will prompt growth of support industries by increasing demand for locally available raw materials and intermediate products.

In the process, it is of critical importance for the trading house to expand its network and enable itself to handle small-lot sales. The trading house is to be operated as a semi-government body, but on commercial basis, with some assistance from the government as part of the development efforts for SMIs.

Key Success Factor

1. The trading house should be operated basically on a commercial basis. In other words, selection of products for export must be made with risk by the trading house. The subsidy from the government should be provided only for, as assistance to export product development (the same subsidy, if made available, should be also made

available for those who are non-users of the trading house).

2. The trading house may handle any product as other trading houses do, but the percentage of products handled on a full commercial basis should be limited to a certain percentage of total value handled by the company to avoid squeezing the operation of other private traders.
3. The objective of the trading house is not to relieve products not acceptable in the international market under Government subsidy, but to promote top quality and innovatively designed Omani products with assistance for their product development. Thus, the experience in the global trade is essential. In order to supplement the business experience of local people, the involvement of foreign experts with global trade experiences are recommended. Each strategic market needs respective expert(s). The collaboration with trading houses in the respective strategic markets is an alternative for soliciting the services of experts, but it should be kept in mind that these trading houses are operated on commercial basis and therefore, might be reluctant to pursue the transactions not showing clear promise for profits, this being an obstacle of promoting new products.
4. The products handled will be mostly small-scale transaction. It will result in loss operation at the initial stage because of costs for communication and manpower. However, this type of operation should be promoted even with the assistance from the government.

Alternatives

1. Assistance by a government organization, which will be established for supporting export product development, through consultancy services

   The consultancy services extended by the government organization will be one of alternative ways to assist the SMEs if the organization decides to engage experienced experts, but this will not be sufficient to assist the marketing of products; instead, actual marketing activities themselves will be more efficient with the investor and trading house sharing the risks.2. Creation of government-operated company for trading

a) Disadvantage: Full support from the government will tend to result in neglecting cost effectiveness and business risks.

b) Advantage: Easy for the trading house to control its operation and to avoid causing damages to private trading houses by squeezing their operation.

Suggestion for Implementation

(1) Organizational set-up

1. Lead agency: MCI
2. The trading house is recommended ideally to be established as a private company with a certain percentage of equity participation from the Government. However, since it will take time to raise the capital from private sector, the company could be a government establishment at the initial stage of operation. The gradual privatization should be pursued, however, to make the operation on a commercial basis.

(2) Implementation steps

On the basis of the research results from the Task Force, start the operation with a certain products identified as potentials. The size of operation should be limited to that of the trading of these products, initially, and increase the staff and develop the overseas branch offices accordingly with increase in products to be handled.

Other Recommendations:

It is not conceivable to take further initiatives in relationship with other GCC countries. Nevertheless, active participation in GCC cooperative efforts, whenever an opportunity arises, is undoubtedly beneficial for Oman, and such opportunity should be identified and pursued in an aggressive manner.