

PART 2: INDUSTRIAL DEVELOPMENT MASTER PLAN **FOR THE SOUTHERN DISTRICTS**

VI. INDUSTRIAL DEVELOPMENT SCENARIO

6-1 Development Scenario for Jordan

6-1-1 Objectives of the Socio-Economic Development for Jordan

The objectives of the socio-economic development for Jordan are stipulated in the New Third Economic and Social Development Five-Year Plan (1993 - 1997) which has been formulated by the Government of Jordan in due consideration for the Medium-Term Economic Program (1989 - 1993) and Medium-Term Economic Structured Adjustment Plan (1992 - 1998) prepared with International Monetary Fund (IMF) and International Bank for Reconstruction and Development (IBRD) as follows.

- Economic liberalization, improved investment environment
- Development of natural resources, particularly water and energy
- Development of new export/sales routes, expansion of traditional markets, development of export sectors
- Balance between human resources and economic resources
- Expanded production sector employment

In addition, it may be proposed that the followings be included among the objectives.

- Enhancement of income level and eradication/alleviation of poverty
- Narrowing the development gap among the regions, in particular between the Northern/Central and the Southern Districts
- Decreasing the trade deficit, in particular in terms of manufactured goods

6-1-2 Development Scenarios for Jordan

(1) Key factors to be considered

Future development scenario for Jordan is affected by various factors, the followings being the most significant ones.

- Development policy alternatives for Jordan
- Scenarios or possible outcomes of the peace process and activation of the Middle East region

Development scenario or future perspective of Jordan will be determined by the interaction between the two.

(2) Development policy alternatives for Jordan

1) Analysis of the present socio-economic conditions of Jordan

The past and current Jordan's economy is characterized by its dependence in various aspects both domestically and internationally as follows, though degree of the dependability fluctuates by time. The numbers or percentage shown below are based on the discussion in the Section 2-2-2.

International dependability

(a) Dependability on imported goods

In consequence, huge amount of trade deficit which was equivalent to about 50 to 60 % of GDP, which was mainly attributable to the deficits resulting from the trade with Europe and USA.

(b) Dependability on the earnings by Jordanian migrant workers

Big number of Jordanian migrant workers, usually medium-to-high level labor, mainly to the Gulf countries, in particular Saudi Arabia, and Iraq. The number of which is presumed to range 250 thousand to 350 thousand, earning big foreign exchange equivalent to about 20 % to 30 % of GDP.

(c) Dependability on ODA from Gulf countries, USA, Japan, etc. amount of which was equivalent to about 20 to 30 % of GDP.

(d) Dominance of the mineral ores in the exports

(e) Big number of foreign workers in Jordan mainly engaged in agriculture and service sectors, mainly from Egypt and some from Syria and other countries, which presumably amounts to about 200 thousand to 250 thousand.

Domestic Dependability

(a) Regional concentration of population and economic activities accounting for about 90 % of the total population in the Central and Northern Districts, the land of which accounts for less than half of the country.

(b) Dependability on the Government sector which accounts for about 20 % of GDP, 40 % of employments, only about 90 % of the Government expenditure being met by the domestic revenue including taxes, the balance being supplemented by ODA.

Owing to the peculiarities of the Jordan's economy characterized by the above-mentioned two kinds of the dependability, Jordan has been suffering chronic illness in its economy including:

- Big trade deficit due largely to the import of manufactured goods,
- Vulnerability to the fluctuation of the economies of the foreign countries where Jordanian migrant labors are working and to the change of political environment in the Middle East,
- Low labor productivity resulting in small domestic products and weak competitiveness on the world market, and
- Demerits of over-concentration of population and economy in the capital region, in particular the severe water shortage which is already prevalent in the region at the present moment.

2) Policy alternatives

Two options can be conceived as policy alternative:

- Dependent policy
- Self-reliant policy

(a) Dependent policy

The dependent policy is a continuation of the policy adopted in the past.

Externally, the policy counts on foreign economies for the management and growth of Jordan's economy. Namely, overseas remittance from Jordan's migrant workers and ODA are counted on.

Domestically, the Central and Northern Districts play the dominant role in the development of the national economy. The principal development objective of the Southern Districts, in this case, should be to contribute as much as possible to the economic development of these regions either by functioning as gateway and physical distribution center as well as supplying water resources. Public/Government sector continue to play the leading role both in terms of the value-added and gross output value and employment with the private sector as sub-component of the economy.

Merits of this alternative are;

- Economic management of the economy is an extension of that in the past and no sizeable change is expected. Smooth and efficient handling of the economy can be expected.

- Under ideal situation, regional cooperation in the international perspective including the establishment of free trade and investment areas in the Middle East region with the similar agreement with EU and others can be expected. Jordan can develop the economy fully utilizing its comparative advantages including its strategic location with expanded market for its products.

Weak point of this policy is the inability of curing the chronic economic illness, namely:

- Jordan's economy continues to be vulnerable to the fluctuation of business conditions of external economies, either prosperity or recession as well as political and economic ties with other countries.
- Being dependent on the public sector economy with lower labor productivity, GDP growth rate ought to remain at low level and competitiveness of Jordanian products on the world market remain weak.
- By continuing to be dependent on the economy of the capital region, the regional economic gap between the capital region and the others is likely to be further widened which is against the basic government policy.

(b) Self-reliant policy

In order to reinforce the constitution of the domestic economy of the country, various policy measures should be taken. From the viewpoint of foreign economic relations, the following policy measures should be adopted.

- The Jordanian working population with relatively high educational background should be attracted to move back from foreign countries and settle in the Jordan's economy and the domestic labor force should be reinforced both in terms for quality and quantity.
- The share of workers' remittance from abroad and ODA in the total foreign exchange earnings should sharply be reduced.
- Considering the low domestic savings which have been in red figures these years as well as expected reduction of workers' remittance, foreign direct investment into Jordan should vigorously be promoted.

- Export of manufactured goods as well as import substitution depending on the categories of products considering the comparative advantages / disadvantages of Jordan should be expanded in order to reduce the deficit in international trade.
- Industrial cooperation with neighboring countries, in particular Saudi Arabia, Egypt, Iraq and Israel, should be reinforced, introducing and utilizing its high-level technology, financial capacity and marketing channels.

Domestically, the following policy measures should be adopted.

- Basic industrial infrastructures for improving technology and training manpower for manufacturing industries should substantially be strengthened.
- Private enterprises which should assume the leading role in the development of the manufacturing sector of the country should be fostered with higher productivity. Privatization of the public enterprises should be accelerated.
- Investment environment for foreign direct investment should further be enhanced in order to compete with other countries in Asia and Middle East.
- Preferential treatment in favour of the regions other than the Central and Northern including the Southern Districts should be strengthened specially in terms of the investment incentives, aiming at avoiding the over-concentration of industries in the capital region. Similarly, priority for the infrastructure development should also be placed on these regions.
- Higher value-added should be sought. In the mining sector, mineral production should be diversified and mineral ores should be processed further to produce high value-added derivatives.
- Non-durable goods which are currently imported should partly be substituted by domestic products, specially these fallen under the following categories.
 - Medium-tech type
 - Assembling and simple processing type
 - These for which certain level of technology has already been developed.

Merits of this policy alternative are:

- Stable economic management can be expected with the domestic economy less vulnerable to the prosperity and recession of the external economies and external political environment.

- In the long-term perspective, high economic growth can be achieved.

Weak points are:

- Before attaining self-reliance, approach run or preparation and transition period will be needed. The growth rate in the short-run, therefore, might be lower than that under dependent policy.
- In order to change the system, high adaptability and vigorous efforts would be required for the public and private sector entities.

(c) Adopted policy

Though quantitative comparison between the two alternatives with regard to the effects on the enhancement of the socio-economy of Jordan in the future is not possible, it is recommended that self-reliant policy be adopted because:

- Long-time economic illness of Jordan could be cured by materializing this policy.
- Being endowed with able manpower and relatively well-established educational system as well as located at the strategic location in the Middle East region, Jordan has adequate potential to reinforce its manufacturing and export sectors which are strong enough to support the self-reliant economy of Jordan.
- Though it would take time to realize self-reliant economy and would require continued vigorous efforts of all the entities and people in Jordan, sound and stable economy can be finally realized through the adoption of this policy and accomplishing the targets of the policy.

Since it takes time to materialize the recommendations of the self-reliant policy into the reality, it is recommended that this policy be adopted by the Jordanian Government at the earliest opportunity.

Converting the current dependent economy into the self-reliant one should be progressed in stages as follows:

Time frame	Progress
Short-term	Preparation stage
Middle-term	Transition stage
Long-term	Realization of the self-reliant economy

(3) Possible scenarios for the Middle East peace process and activation of the Middle East region

1) Components of the Middle East peace process and activation of the Middle East region

Due mainly to its strategic location in the midst of the Arab countries, neighboring Israel, being the cross point between the western and eastern civilization and economies, Jordan has been affected either positively or adversely by the external economies, in particular Middle East economies.

In recent years, various incidents happened, development or aftermath/settlement of which would affect the Jordan's economy substantially. First is the incidents happened as a result of the Gulf War, namely UN sanction imposed on Iraq and deterioration of economic relationship between Jordan and Gulf countries. Second is the Middle East peace process among the Arab countries including Jordan, Palestinian National Authority (PNA) and Israel. Third is the possibility of accelerated regional development in the Middle East and Mediterranean countries including setting-up of a regional development bank and free trade and investment area/agreement.

The deteriorated relationship between Jordan and the Gulf countries recently is getting improved but full recovery is yet to be attained.

The Middle East peace process has three components or aspects:

- Giving autonomy to PNA or creation of the Palestinian independent nation
- Restoration of the Golan Heights to Syria and conclusion of peace agreement between Syria and Israel
- Achieving comprehensive peace between the Arab countries and Israel

2) Expected impacts on Jordan's economy

Restoration of economic ties with the Gulf countries would mean the resumption of the reception of Jordan's workers by the countries. Their direct investment into Jordan, particularly the neighboring Saudi Arabia might be expected.

Iraq has been a big trading partner of Jordan both in terms of exports and imports. Having only a port in the Gulf, the Aqaba Port is strategically important for international trading for Iraq. Consequently, re-exports from Jordan to Iraq accounted for about 20% of the total exports from Jordan to Iraq.

The lift of UN sanction against Iraq and resulting recovery of Iraq economy with oil export as driving force would, therefore, give significant positive impact on Jordan's economy both in terms of export from Jordan and revived physical distribution to Iraq through the Aqaba port.

Establishment of autonomous Palestine or independent nation means another trading partner for Jordan. Industrial and physical distribution linkage between the two can also be expected.

Though peace agreement between Syria and Israel would not affect Jordan's economy directly by noticeable degree, it is an essential condition for the comprehensive peace agreement in the Middle East region.

Achievement of the comprehensive peace in the Middle East region would upgrade the locational conditions of the country as well as enlarge sharply the business opportunities of Jordan which would include:

- Jordan could afford direct access to the Mediterranean countries including Turkey, Eastern Europe and Western Europe which could be markets for Jordan's products.
- Large-scale infrastructures connecting Jordan and neighboring countries would be realized by bi or multi-lateral investment and efforts.
- Augmented and new foreign investment into Jordan can be expected.
- Jordan's role in physical distribution in Mediterranean and Middle East region can be expected.
- Bi or multi-lateral industrial cooperation with Jordan can be expected in the forms of division-of-work, subletting, production at consignment, etc.

If the regional free trade and investment area/agreement is concluded together with the establishment of regional development bank, impacts would further be strengthened beyond the achievements of the comprehensive peace agreement. In addition to the elimination of political, obstacle, barriers of customs and investment restriction would substantially be lowered. Benefits Jordan could gain would be:

- Bigger opportunity for exports
- Bigger role in international physical distribution
- Bigger inflow of foreign direct investment
- Bigger fund availed for the development of infrastructures, etc.

3) Possible scenarios for Middle East region

(a) Possible outcomes

a) Economic relations between Jordan and Gulf countries

Diplomatic as well as economic relations between Jordan and the Gulf countries are recently getting improved quickly. A likely scenario would be the relations will be fully recovered to the level before the Gulf War.

b) Lift of UN sanctions against Iraq

In 1996, UN sanction against Iraq has partially lifted allowing Iraq to export limited amount of oil to purchase basic necessities including food and medicines. Possible scenario would be complete lift of the sanctions resulting in the recovery of Iraqi economy and full resumption of trading with foreign countries including Jordan. There exists a condition, however, that 30% of oil export earnings should be given to the Reparation Fund for the Gulf War. If this condition should strictly be observed, the recovery of Iraqi economy might be rather slow.

c) Establishment of autonomy and independent country for the Palestine

Two scenarios could be conceived for the status of the Palestine after ceasing of occupation:

- Full autonomy is given to the Palestine, namely the West Bank of Jordan River and Gaza.
- Independent country will be created in the Palestine.

It seems likely that the full independence will be achieved after going through the stage of the full autonomy.

d) Conclusion of peace treaty between Syria and Israel

Possible outcome would be the agreement of security measures and subsequent return of the occupied the Golan Heights to Syria, followed by the conclusion of the peace agreement between the two countries.

e) Comprehensive peace agreement for the Middle East region

If the issues of the Palestine and the Golan Heights are settled and necessary actions are taken, the conditions for the comprehensive peace agreement for the

Middle East region seem to be met. It will not be long before the comprehensive peace agreement is reached, once the issues are solved.

f) Regional trade and investment agreement

Once the comprehensive peace agreement is reached, Mediterranean countries will be within easy access of Jordan besides the neighbouring Arab countries. Several outcomes could be conceived for the progress of the regional economic cooperation as given hereunder.

- Jordan will be admitted to EU as associate member.
- Regional development bank for the Middle East will be established with the headquarters at Cairo, Egypt.
- Middle East Free Trade Agreement/Area (MEFTA) will be established with Jordan as full member.
- Between EU and MEFTA, agreement for free trade and investment among the member countries.

(b) Possible scenarios

Although the outcomes of the peace process and activation of the Middle East region would substantially affect the economy of Jordan, it would be a difficult task to make projection. Several cases or alternative scenarios can, however, be conceived based on the time range when the outcomes are realized as follows:

a) Ideal Case (Scenario)

Problems are solved and agreement are concluded within the shortest time span as can be expected.

b) Optimistic Case (Scenario)

Negotiations and talks will be progress quite smoothly and outcomes can be expected in no distant future.

c) Conservative Case (Scenario)

Progress will be gradual.

Under Ideal Case, most of the outcomes are expected to be realized within short-term, i.e., by and in the year 2000 as shown in Table 6-1-1. Optimistic case assumes that most of the outcomes are realized in middle-term, i.e., by and in the

year 2005 as shown in Table 6-1-2. In the Conservative Case, outcomes are assumed to be materialized only after the year 2010, the target year for the Study as shown in Table 6-1-3.

(4) Alternative development scenarios

When a country take off bound for an industrial country, it usually goes through the following stages.

- 1) Export of primary commodities including agricultural and mineral resources: Stage 1
- 2) Import substitution of light industrial goods: Stage 2
- 3) Export of light industrial goods: Stage 3
- 4) Import substitution of heavy/chemical industrial goods: Stage 4
- 5) Export of heavy/chemical industrial goods: Stage 5

Up to date, Jordan's economy has been characterized heavy dependence on imports and trade deficit. As shown in Table 6-1-4, Jordan's dependence on imports is significantly high compared with other countries with per capita GNP ranging from below US\$ 500 up to more than US\$ 20,000 which include developing countries, Arab and Middle East countries, ASEAN, NIES and advanced countries.

Structure of domestic exports and imports of Jordan is shown in Table 6-1-5. As seen in the table, current (non-durable) consumer goods and crude material have big shares in total exports while the shares of capital goods and parts and accessories are quite small. Compared with imports, import figure is bigger than export figure for even current consumer goods and the same goes with durable consumer goods. Import figures are much bigger than the export for other intermediate goods and parts and accessories which clearly indicates that the current manufacturing sector in Jordan comprises mainly processing and assembly industries utilizing the imported intermediate goods and parts and accessories. Manufacturing of parts and material in Jordan seems negligible. The total imports of the capital goods were much smaller than these for consumer goods or about 60 %, with the value of about JD 334 million which may not be adequate for the accelerated industrial development of the country.

According to the above-mentioned figures of exports and imports, it seems that Jordan's economy is in the initial phases of Stage 2 and Stage 3. If the advantages of strategic location and endowment of certain kinds of mineral resource of Jordan are fully exploited together with adequate investment in the manufacturing sector, Jordan might be able to complete Stage 2 and 3 while strengthening the export of chemical products.

The pace of the industrialization will depend on the development policy of the country and international environment surrounding the country including the direction and progress of the Middle East peace process. If the self-reliant policy should be effected fully and the Optimistic Scenario for Peace Movement and Stabilization of the Middle East Region is realized, the industrialization would be implemented quickly within the time range up to 2010. If the scenario should turn out to be the Ideal Scenario, the pace would be even faster.

(5) Macro-economic targets for Jordan

In response to the above-mentioned scenarios (the Ideal Scenario and the Optimistic Scenario) while assuming that self-reliant policy be adopted, two macro economic targets for Jordan are prepared although they are only a plausible guide to the consequence of the future and not an exact forecast.

Targets are presented in value added of the manufacturing sector, number of employees and industrial land area. Value added comes from the projected growth rates in 1994-2010 by the Scenario. From the national targets, regional targets for the Southern Districts are derived. The base year is set in 1994 because of data availability. All prices are shown in 1991 constant terms. Flow of the projections and major results are shown in Figure 6-1-1 and Figure 6-1-2.

1) Setting of the growth rates by the Scenario

The first target is correspondent to the Optimistic Scenario, which is a combination of the case of smooth progress in the peace process and self-reliant policy. It assumes that the country may attain a certain level of self-sufficiency and self-reliance through expanding employment-generating production base, developing a competitive export sector and introducing foreign direct investment, which were adopted in Asian emerging economies.

For this target, the average annual growth rate of manufacturing sector in 1994-2000 is set up at 7.8%. This is derived from the average growth rate of the total productive sectors in the current five year plan (1993-1997) as shown below.

- GDP at producer's prices: 6.0%¹
- Total productive sectors: 7.8%
- Manufacturing sector: 8.9%

¹ World Bank estimated annual growth rate of GDP at 7% in 1993-2003 in "Peace and the Jordanian Economy" in 1994.

The second target is consistent with the Ideal Scenario. This scenario is a combination of the case of progress of the peace process within the shortest time span and achievement of self-reliance of the economy.

The average annual growth rate in 1994-2000 is set at 11.4% for this scenario. This ratio is derived from the following assumptions.

- to reach the level of Thai's per capita GDP of 1994 in 2010 (See Table 6-1-6)
- to increase the share of manufacturing sector in GDP by 2.07 times compared to the current level of Jordan to reach the level of Thailand. (See Table 6-1-6)
- to assume 3.1% annual population growth in 1994-2010

Thailand is one of emerging powers in the East Asian Miracle countries. It has a remarkable record of high and sustained economic growth with NIES and other ASEAN countries. Although Thailand's basic resources such as large population and traditional strong agricultural sector are different from Jordan, it is selected as a target because its export-led policies with introduction of foreign investment will become a good model in Jordan and its level of per capita GDP is fully within reach.

Table 6-1-6 shows the comparison between annual growth rate of GDP, annual growth rate of value added in manufacturing sector and the share of value added of manufacturing sector in GDP in selective countries. In 1980-93, Thailand has been one of the top group members. Figure 6-1-3 also show the relation between annual growth rates of GDP and value added of manufacturing sector in selective countries.

Since it may take time to change the policy and to make positive impacts on Jordan's economy through progress of the peace process and the stability of the Middle East region, the average growth rates for both targets in the second half in 1994-2010 seems to be high compared to that of the first half.

2) Targets in manufacturing sector in 2010

Targets for Jordan in 2010 are shown below. Details are also shown in Table 6-1-7 and Table 6-1-8.

(a) Optimistic Scenario

Value added of manufacturing sector in 2010	: JD 1,482 million
Number of employees	: 226,861 persons
Estimated industrial area	: 2,714 ha

(b) Ideal Scenario

Value added of manufacturing sector in 2010 : JD 2,506 million
Number of employees : 383,727 persons
Estimated industrial area : 4,590 ha

6-2 Development Scenario for the Southern Districts

6-2-1 Comparative Advantages / Disadvantages and Expected Role of the Southern Districts

The Southern Districts are composed of the four governorates, Karak, Tafila, Ma'an and Aqaba in the southern part of the Kingdom and shares borders with Saudi Arabia and Israel. The latest available regional data list the population of the Southern Districts as accounting for 9.5% of the total of Jordan, while the Central Districts accounts for 38.1%, the Northern Districts 23.4%, the Eastern Districts 19.8%, and the Western Districts 9.3%. The population share of the Southern Districts, which occupy nearly half of Jordan's land, is thus quite small. The urban population in the Southern Districts is also low in comparison to the national average. Specifically, the share of the agricultural population is high, with urbanization lagging behind.

The districts are connected to the capital city of Amman by the Desert Highway and Wadi Araba Highway, two trunk roads which link the country from north to south. The distance between Aqaba and the capital is about 360 km that can be reached within about 4.5 hours through these roads. Cities of Aqaba and Ma'an are located along these highways. Most of the eastern part of the Southern Districts is desert (Badia). Ma'an Governorate contains Petra and Wadi Araba, the key focus spots of tourism in Jordan, while Aqaba Governorate at the southern tip is highlighted by the Port of Aqaba, Jordan's only international trading port, open to the Red Sea.

The Port of Aqaba opening out into the Gulf of Aqaba is Jordan's only and the Middle East region's leading harbor for international trade, and it has played a vital role on the distribution front over the years to date. It is also a gateway to the rapidly growing Asia region and the Mediterranean countries via Suez Canal. The Port of Aqaba traffics not only passengers but also cargos, and its annual cargo capacity is 30 million tons, but the present cargo traffic is about the half of the capacity, mainly due to the embargo on Iraq after the Gulf War which uses the Port of Aqaba as the main port for its import and export. There is a plan to expand the port's capacity, which if achieved would boost its distribution capacity to greater heights. As such, it is projected that this port will be utilized to expand the sphere of industry and industrial function in Jordan. Discussion is under way at present, for example, on unloading LNG from Qatar at a terminal in the Port of Aqaba, followed by shipment to Israel and destinations in the further west. In the future, if realized, it is anticipated that LNG might also be able to be used to promote

business enterprises in the freezing, refrigeration, food processing and other related industries.

Aqaba also has Aqaba International Airport (AIA), which is located 9 km north of Aqaba City near Israeli border. AIA has a runway with 3,000 m long and 45 m wide with asphalt concrete, a taxi way with 3,000 m long and 23 m wide and a passenger terminal building with three passenger aprons, which can accommodate Airbus-class airplanes. Its current capacity is 150,000 passengers per year.

In terms of electricity, Aqaba Governorate has the highest capacity to supply electricity in Jordan, because it has Aqaba Thermal Power Station (ATPS) with a current installed capacity of 263 MW, which will be expanded to 650 MW under the ATPS Expansion Project financed by OECF loan.

Aqaba, Ma'an and Tafila are endowed with the relatively abundant ground water resources in Jordan. Aqaba Governorate has Disi Sandstone Aquifer, the largest and the least developed ground water source in Jordan, which is estimated to last about 50 years with an annual consumption of 125 million m³ of water (the current consumption is 75 million m³). Tafila Governorate has relatively large ground water sources along the Desert Highway, for example, in the area of Al Hasa phosphate mines and the neighboring area in the south of it. Ma'an Governorate is also comparatively rich in ground water resources, having two aquifers in Jafer Basin.

The Southern Districts are rich in underground resources and the Dead Sea mineral resources. Specifically, limestone, potash, phosphates, oil shale and other underground sources, besides the Dead Sea mineral resources in Karak Governorate, are found in abundance in three governorates of Karak, Tafila and Ma'an, while Aqaba is noted for its silica sand. These mineral resources are currently utilized in the operation of industrial plants in the cement, fertilizer and other fields, while there is also the possibility that the related business enterprises might emerge in the future, depending on the upcoming changes in the local business environment.

In terms of industrial structure, Governorates of Karak and Tafila possess large enterprises in the phosphorous ore and cement business, while Aqaba has major firms in the potassium chloride (fertilizer) field. Besides, Karak Governorate has industrial enterprises / workshops in non-metal mineral products, metal processing, food processing and other areas, while Tafila Governorate has industrial enterprises in food processing, and Ma'an Governorate in non-metal mineral products, food processing and industrial services, although these are all small-to-subsistence level enterprises and

workshops. As indicated above, mining and manufacturing in the Southern Districts of Jordan are characterized by the bipolar structure of (a) a small number of large-size enterprises and (b) a large number of small-to-subsistence manufacturing firms and workshops.

Tourism is one of the industries in which Jordan holds particularly high hopes over the years to come. The Southern Districts possess valuable tourist resources such as Petra, Wadi Araba and the Gulf of Aqaba. Tourism would not only serve to induce directly related consumption in hotels, dining facilities, transportation and other areas, also it would lead to the promotion of tourist facilities and equipment, souvenirs, tourist-related farming and fishing, telecommunications and other industries linked to the tourism industry.

It is no doubt that the urban agglomeration in the Central and the Northern Districts will continue to attract investment there. A market of 2.5 million people is available right at its foot steps. Necessary services are available to facilitate industrial activities. Living amenities for investors to settle there are well equipped in these districts. Also it would have easy access to the major Mediterranean ports of Haifa and Ashdod in Israel for export to and import from Europe and USA, if cooperation with Israel should be successful. However, it has constraints such as water shortage, increasing traffic congestion, pollution, higher price of land and higher labor costs relative to other districts.

Taking this into account, in the long-run, the Southern Districts might be able to reduce the gap with the Central and the Northern Districts.

6-2-2 Basic Direction of the Development of the Southern Districts

From the viewpoint of the comprehensive or overall development of the Southern Districts including industry, trade, agriculture, services and other sectors, two can be conceivable.

- Strengthening of cooperation with the Central and Northern Districts which have been already well developed with bigger concentration of population and economic activities as well as urban infrastructures and facilities, should be sought from the initial stage.
- Potential of each Governorate should be reinforced. Linkage and cooperation among the Districts should be reinforced subsequently. In the long-run, reinforcement of the economic ties with the Central and Northern Districts should be sought.

Of the two, the latter option is recommendable because of the following reasons.

- The Southern Districts have their own potentiality of development including the resources endowment, strategic location and well developed transport infrastructures.
- Strengthening the linkage between the Central / Northern Districts and the Southern would aggravate the over-concentration in the capital region which goes against the Government policy.

The objectives of the regional development of the Southern Districts should be as follows.

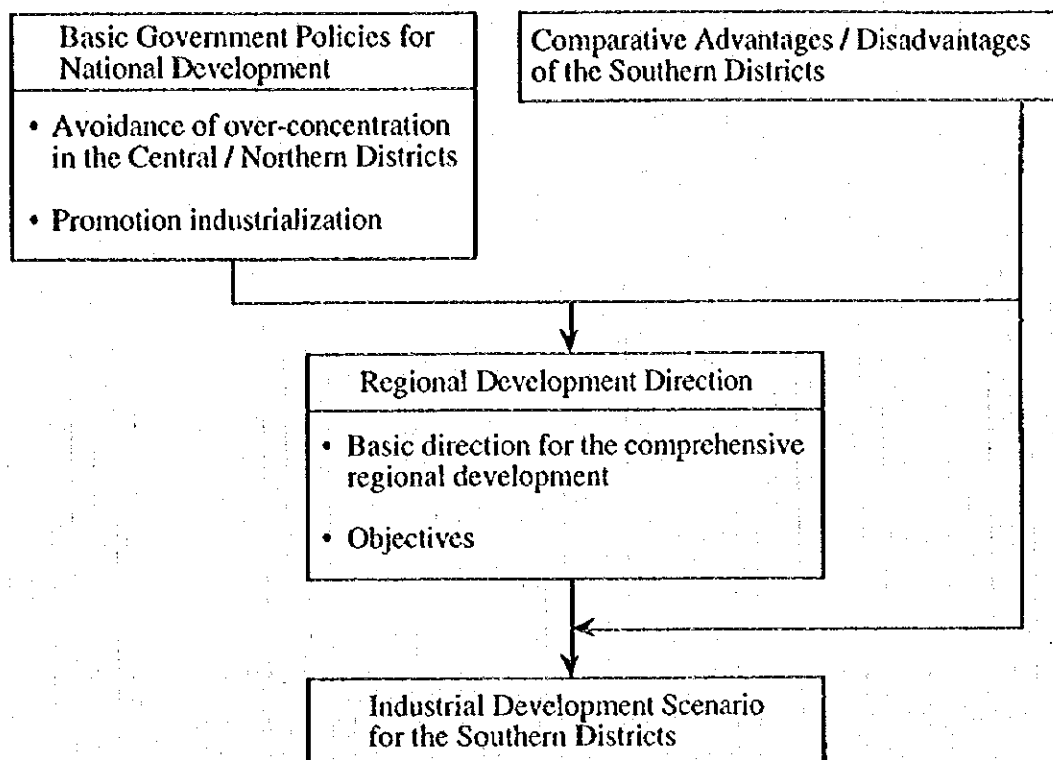
In the National Perspective

- To establish a new growth pole of the country besides the Central / Northern Districts,
- To strengthen the gateway function of the Southern Districts for the country, and
- To form an important core region for the international economic / industrial cooperation, in particular with respect to Saudi Arabia, Egypt and Israel.

In the Regional Perspective

- To increase the GRP (gross regional product) of the Southern Districts,
- To alleviate poverty, both in terms of abject and absolute poverty,
- To narrow the socio-economic development gap with the Central / Northern Districts in terms of the levels of income, education, health care, etc., and
- To keep the development gap among the four Governorates within permissible range.

The relationship between the Government policy and the basic direction and objectives of the regional development of the Southern Districts is expressed below.



6-2-3 Industrial Development Scenario for the Southern Districts

Considering the above-mentioned basic direction of the regional development of the Southern Districts and their comparative advantages/disadvantages, the following scenario is proposed for the industrial development in the Southern Districts toward the year 2010.

(1) Overall scenario for the Southern Districts

The resources endowed in the Southern Districts should fully be utilized. Mineral resources such as phosphate mining at Eshidiya and other mines, limestone quartz should continue to be exploited. Transformation of these minerals into higher value products such as glass and fertilizers should be sought. These mineral-resource-based production should either be located in the vicinity of the mines or near the international trading port for the convenience of importing medium products for the production and exporting the final products.

Though the amount is limited, the agricultural produces produced in the Southern Ghor area and in the high lands along the King's Highway including vegetables, fruits/olives should be processed to make juice, ketchup, wooden furniture and others. Livestock-based-industries should also be developed including leather industry.

Fully utilizing the Aqaba international trading port which has various ocean routes, metal assembly and machinery industries should be developed, importing the components/parts and intermediate goods. The products should be transported to the Central and Northern Districts via the Desert Highway and further to Saudi Arabia, Gulf countries and Iraq by the RN5 and the RN65. They can also be shipped to the Mediterranean countries including Turkey, East Europe and West Europe. Aqaba is a physical distribution center of Jordan and could further be developed to assume the role of regional hub for the physical distribution in the Middle East region. Industries for the packaging materials and parts of transportation equipments of simple structure should be developed.

Jordanian labor force having medium-level technology, high and medium level apparel industry such as men's suits, ladies' dresses and lingerie should be promoted. The Southern Districts are endowed with the world-famous tourism resources of the Aqaba Gulf and cultural asset of Petra. Resort facilities including hotels of international standard and villas should be constructed to attract the tourists and supporting industries including housing materials, interior materials, construction materials as well as printing industry should be strengthened. Besides, housing industry such as brick, tile, concrete blocks, glass, doors, window frame and furnitures should be reinforced to meet the increasing demand by the increased population associated with the development of the various industries in the Southern Districts including mining and manufacturing. Demand for the construction material would sharply be increased due to the implementation of the large-scale infrastructure projects including bi and multi-lateral projects. Accordingly material industry should be strengthened.

Foreign investors in particular from the Arab countries, Israel, Europe and USA as well as the Jordanian investors from the advanced areas including capital region and Irbid will be the main driving force for the industrialization of the Southern Districts. Strategic location together with well-developed transport infrastructures and relatively low wage rates of labor with good academic background as well as the preferential treatments for investment will be major attraction. In order to provide hospitality for these investors, well-equipped industrial estates and export processing zones will be constructed within easy access of the major transport infrastructures and urban facilities. Cooperation among the neighboring countries, in particular Jordan, Saudi Arabia, Egypt and Israel as well as West Bank and Gaza by means of utilizing comparative advantages will be another useful tool for the industrialization in the Southern Districts which share the borders each other.

Aqaba, being equipped with the only international port of the country and international airport, will be the principal growth pole in the Southern Districts and a new growth pole of the country as well. Land available for development in and around Aqaba City is limited, however, with the high lands and mountains located close to the east of the city. On the other hand, spacious land is available around Ma'an City. Once Aqaba-Ma'an section of the Desert Highway is totally expanded to 4 lanes, the two cities will be connected within one hour drive distance and strong economic and industrial linkage will be established, supplementing and utilizing the advantages and weakpoints each other.

In the northern part of the Southern Districts, new industrial corridor will be set up between the two district capitals of Karak and Tafila by means of strengthening the road, link and utilizing the urban and educational/scientific facilities as well as labor force of the two capitals and their suburban areas.

As a result of all the above-mentioned, industrialization in the Southern Districts will make progress faster than the country as a whole.

(2) District-scenario

1) Karak Governorate

From industrial development point of view, Karak Governorate can be divided into three zones:

- (a) Low flat land in the Western part of the Governorate to the south and east of the Dead Sea,
- (b) High lands with the altitude of about 1,000m in the central part of the Governorate along the King's Highway between the two Governorate capitals of Karak and Tafila including Mu'tah University, and
- (c) Low flat land in the eastern part of the Governorate along the Desert Highway .

Industries based on the Dead Sea minerals will be developed centering on the Potash City and Safi. The east coast of the Dead Sea will be developed or a winter resort and tourism-related industries will be developed. In the southern Gohr area, agro-based and food processing industries will be developed with the agricultural products in the southern Gohr as raw material for domestic market including Amman. When the Wadi Araba Highway is connected with the Israeli road network around Safi in the future, cooperative industrial production between the two countries will be realized in this area.

In the high lands area along Kings Highway, the following types of industries will be developed.

- Food processing industry and housing-related industry including furniture will be developed mainly for marketing in the Karak local market.
- Housing-related industry and industry for daily necessities will be developed for the local market of Karak and its suburbs.
- Relatively advanced-technology type industries will be developed in cooperation with the Mu'tah University.
- With the expansion of the RN50 connecting Karak City with the Desert Highway, light industrial products will be marketed to the capital region besides the local market.

In the eastern part of Karak Governorate, no noticeable industrial development is observed at present. Making the most of the relatively easy access to Amman and the flat land along the Desert Highway, industrial zone will be established for producing the light industrial products mainly for marketing to the capital region.

Karak Governorate as a whole has relatively abundant labor force among the four Governorates and medium-tech labor intensive industries will be developed for light industries including the apparel. Cooperation with Israel in this field is conceivable.

2) Tafila Governorate

From the industrial development point of view, Tafila Governorate can be divided into three zones:

- (a) High lands in the central part of the Governorate along the Kings Highway,
- (b) The southern part where cement factories are located, and
- (c) Al Hasa area along the Desert Highway including Al Hasa mine township and Al Hasa City.

In the southern part of Tafila Governorate, large-scale limestone mines and cement factories are located including Rashadiya mine which is one of the biggest in Jordan. In the south, cement industry will continue to be the key industry.

Similar to the central part of Karak Governorate, agro-processing industry will be the major industry along the King's Highway.

Al Hasa mine might cease operation during 2005 - 2010 period due to the expansion of the ore of adequate quality. Under the situation, the accumulation of the housing facilities, social infrastructures including school and clinic and groundwater wells as well as the spacious flat land within easy access to the Desert Highway. Endowment of groundwater resources has been confirmed in the area to the south of Al Hasa mine where the Al Hasa City is located. Besides a new road will be constructed from the Governorate capital to the vicinity of the Al Hasa mine area passing through agricultural area in the Governorate. Utilizing all these, a new industrial zone will be developed in the area between the Al Hasa mine and Al Hasa City. Among the major industries in this zone, ceramic manufacturing, food processing and relatively water-consuming industries will be located.

3) Ma'an Governorate

Ma'an Governorate can be divided into the following four zones from the industrial development viewpoint:

- (a) Governorate capital of Ma'an and its suburbs,
- (b) Eshidiya mining area and its vicinity,
- (c) Mudawara area, and
- (d) Shawbak

Ma'an City is located at the junction of the Desert Highway and the RN50 which runs up to Saudi Arabia via Mudawara area to the south and to Iraq to the north. It is also connected with the King's Highway. In the near future, Ma'an will be connected with the Aqaba City, after the expansion of the Ras an Naqab-Aqaba section, by four-lane high grade highway within one hour drive reach. Utilizing these advantages, new industrial zone will be developed in this area. Due to its strategic location, physical distribution center might also be established. The following types of industries will be located.

- Land intensive types
- Industries with close linkage with these in Aqaba
- Agro-processing types using the agricultural products in Mudawara and these in Tafila Governorate

- Livestock-oriented types
- Mineral-resource-based

To be more specific:

- Metal assembly
- Machinery including transport equipments
- Glass and ceramics
- Leather
- Packing materials

In the Eshidiya zone, phosphoric acid will be produced by processing the phosphate rock. The products will be transported to the Aqaba Port through the El Jafr - Batn El Ghul road to be constructed before 2005.

In the Mudawara zone, the agricultural produce comprising wheat, barley, fruits, etc. grown in the area will be processed for producing food products on the condition that adequate water be provided to the agricultural area from the Disi groundwater.

In the Shawbak zone, high quality apples grown in the zone will be processed for producing jam and juice, etc. for export as well as for the domestic market.

4) Aqaba Governorate

Within the Aqaba Governorate, two major industrial zones will be established, centering on Aqaba City as follows:

- Area extending from the north of Aqaba City up to the north and east of the airport
- Area lying at the border with Saudi Arabia

The northern zone may be further sub-divided into two:

- Area between the city and the airport
- Area to the north of the airport located in the Wadi Araba along the border with Israel

In the area between the city and the airport, following industries will be attracted making the best use of the international trading port of Aqaba.

- Assembly of machinery including transport, electrical and professional machinery, parts/accessories and intermediate products being imported.
- Metal assembly

- Export-oriented industries
- Housing-related industries
- EPZ type industries
- Industries based on the cooperation, division of labor and production at consignment with Israeli enterprises.

Assuming the development will be progressed under either Optimistic or Ideal Scenario, a special economic zone will be constructed to the north of the airport along the border with Israel. This zone will be constructed by joint efforts of Jordan and Israel. The zone may jointly be managed by the two countries. Export-oriented enterprises and these operated in cooperation with Israeli enterprises will be the major investors in the zone.

Heavy industrial zone will be established along the border with Saudi Arabia with total area of 56 km², attracting fertilizer, LNG and other chemical industries. Wharves and jetties will be expanded along the Aqaba Gulf for the exclusive use by the enterprises to be located in the zone. A road will be constructed which branches off from the Desert Highway to provide another access for the zone besides the existing coastal road. In this zone, a free zone also may be constructed.

Queira can be considered as potential agro-industrial zone, which are used as distribution centers for Australian cattle. At Queira, there are four private free zones for trading with and storing livestock, making a meat industry, and re-exporting the products. The open area for those zones is 750,000 m² and the total capital investment amounts to JD 12 million.

6-2-4 Macro-economic Targets for the Industrial Development of the Southern Districts

(1) Setting the share of the Southern Districts along the national targets as a case study

Value added of manufacturing sector in the Southern Districts in 2010 is derived from assuming the holding shares of the region in the national targets that are projected through two Scenarios (the Ideal Scenario and the Optimistic Scenario) for the country as a whole. Two cases for each Scenario are set up for this projection. First case is set at 10% and the second one is at 15%. These ratios are almost two and three fold respectively compared with the current region's share of value added in manufacturing sector in the country which is estimated at 4.1% based on Industrial Census in 1994. The region is expected to be an engine for the industrial development in the country in order to accomplish objectives that are discussed in the preceding section.

(2) Region's targets in manufacturing sector in 2010

Targets in the region in 2010 are shown below. Details and procedures are also shown in Tables 6-1-7 and 6-1-8 and Figures 6-1-1 and 6-1-2.

1) Optimistic Scenario

(Case-1)

Value added of manufacturing sector in 2010	:JD 148 million
Number of employees	: 18,561 persons
Estimated industrial area	: 222 ha

(Case-2)

Value added of manufacturing sector in 2010	:JD 222 million
Number of employees	: 27,841 persons
Estimated industrial area	: 333 ha

2) Ideal Scenario

(Case-1)

Value added of manufacturing sector in 2010	:JD 251 million
Number of employees	: 31,395 persons
Estimated industrial area	: 376 ha

(Case-2)

Value added of manufacturing sector in 2010	:JD 376 million
Number of employees	: 47,092 persons
Estimated industrial area	: 563 ha

6-2-5 Industrial Development Strategies

(1) Spatial development strategies

In consideration of the direction of urban distribution, economic accumulation, road planning and other conditions in the Southern Districts, the mid-term (through year 2005) and long-term (through year 2010) plans with regard to the formation of the effects of the regional development axes are discussed as follows.

Present situation

Under hierarchy of the existing national arterial road in Jordan, running from the capital zone in the Northern/ Central Districts (with population of 2,531 million) to Aqaba

is the Desert Highway on the east side, while proceeding at the west along the Israeli border is the Wadi Araba Highway. In addition, running between these two routes is the King's Highway. Of these routes, the Desert Highway is a comparatively high standard four-lane road midway to Aqaba.

The Northern/ Central Districts represents a considerable degree of urban accumulation as a capital zone. As the economic linkage between this capital zone and the Southern Districts is weak at present, a key theme from here on will be to strengthen this linkage, decentralize the economic accumulation in the capital zone to principal regions, and enhance the economic cooperation in the Southern Districts.

Located along the King's Highway are Karak (with population of 59,007) and Tafila (with population of 37,375). Lying between these two cities are Mu'tah (which contains Mu'tah University on the outskirts of Karak City) and several other smaller scale cities, although the linkage between the cities remains weak.

Located at the far south of Jordan is Aqaba (with population of 63,735), with a seaport and an airport. Aqaba is expected to increase its role and function through activating distribution and economic accumulation and utilizing the seaport and the airport. (refer to Figure 6-2-1)

Mid-Term Plan (Through Year 2005)

Karak and Tafila lie about 50 km apart from north to south, while located along the King's Highway besides Mu'tah there are also Al Mazar (with population of 7,855) and other medium- to small-size cities. It will be important to improve the King's Highway which links up these two cities, as well as heighten the linkage between the cities and otherwise contribute to the formation of a regional development axis.

At the same time, there is a need to improve the separate cross routes which connect to Karak and Tafila to the Desert Highway, respectively. Through these roads, the urban accumulation from the Amman capital zone will move along the Desert Highway in linking up to the regional development axis between Karak and Tafila, with that regional development axis anticipated to expand as a development base.

In Aqaba, the increase in distribution and tourists is expected to lead to the economic accumulation. Proposed by the Study Team is the construction of industrial estate A-2 and an industrial estate the year 2000 zone (A-1). In this connection, it is expected that Aqaba will supply these industrial estates with urban services, labor and other supports. In Ma'an as well, a proposal has been made for industrial estate (M-2), and by the year 2005, it is suggested that industrial estate (M-2) be constructed with consideration for the

anticipated supply of urban services and labor between Ma'an and an industrial estate (M-2).

For both of these cities (which are connected by the Desert Highway) there will be a need to strengthen the mutual linkage between the Desert Highway and the said route. To address this need, it is necessary to expand the Desert Highway from a two-lane to a four-lane road, increasing the economic cooperation between the two cities and promoting the creation of a regional development axis between the two zones in order to formulate a new economic development base. Construction work has already been started.

Future, the road from Fifa to Tafila, which is under construction (to be exact, already opened for traffic, but partly under paving work), will play an important role as a sight-seeing road reaching to Petra from the Dead Sea via Tafila when it is brought to completion. Therefore, early completion of the road is highly anticipated.

With regard to the relations with neighboring countries, it is anticipated that industrial cooperation with Israel will develop along the progress of the Middle East Peace Process, and that the United Nations' sanctions on Iraq will be lifted, as will the economic restoration between Jordan and Saudi Arabia and other countries. It is believed that these changes will result in the opening up of economic cooperation routes from the Northern/ Central Districts to Israel, Syria and Iraq, from Ma'an to Iraq and Saudi Arabia, and from Aqaba to Eilat in Israel.

Hopes are particularly high for the enhanced economic cooperation with Israel on the part of the Northern/ Central Districts. Furthermore, there is a need to improve in the Wadi Araba Highway in order to handle the increased commodity distribution from Potash City to the Port of Aqaba (refer to Figure 6-2-2).

Long-Term Plan (Through Year 2010)

At this point in the development, the industrial estate (T-2) proposed in the Study Team will be formulated with the focus on small cities, fostering urban services, labor and other industrial linkage between Tafila and Ma'an. Envisioned at this stage is the formation of regional development axes between Tafila and the small cities focused on T-2, and between Ma'an and the small cities focused on T-2.

The urban accumulation in the Amman capital zone is still expected to grow, while the linkage with the regional development axis lying between Karak and Tafila should strengthen as an economic development base. Within this process it is anticipated that various types of industry will locate in the axis stretching from the Amman capital zone to

Tafila along the Desert Highway. Qatrana, which is situated as an effective crossroads between the two routes, is expected to be a growth point.

With regard to the relations with the neighboring countries at this stage, based on the progress of the peace process with Israel it is expected that economic cooperation between the Northern/ Central Districts and Israel will grow. As for the Southern Districts, with the industrial strength supported by the regional development axis between Karak and Tafila, economic cooperation with Israel is expected to grow active. Meanwhile anticipated is the new economic route to Egypt from Aqaba via Eilat in Israel.

Also there is a potential for economic cooperation with Israel from the viewpoint of the regional development axis between Aqaba and Ma'an via Fifa on the Wadi Araba Highway. Road improvement on the Wadi Araba Highway and connection road from Fifa to Beer Sheva in Israel will be required to make this possible.

It is expected that the two regional development axes of Karak-Tafila and Aqaba-Ma'an will enhance their industrial accumulation. As a result, the economic accumulation in the Amman capital zone will come to link up with the economic development bases between Aqaba and Ma'an and between the Karak-Tafila.

In this way, utilizing economic potential in the Southern Districts will divert from the excessive economic concentration in the Amman capital zone to the balanced development in the country as a whole and the increase of the roles of the Southern Districts (refer to Figure 6-2-3).

(2) Strategy for sectorial linkage

As stated in 3-3-7, the current industrial activities in the study area are characterized as follows:

- a) A few large local-resource-based industries such as phosphate, potash and cement which are major foreign exchange earners of the commodity exports of the country and at the same time the major employers of industrial workers in the Study Area.
- b) 25 out of the total of 743 establishments in the Study Area produce 94.5% of the value-added.
- c) 650 small-scale establishments having less than 5 employees are mainly engaged in 4 types of activities that are bakery, carpentry, concrete blocks and blacksmith for small local consumptions.

Under these circumstances, it is difficult to draw an encouraging picture of future industrial development of the region through the conventional method of trend projection. Therefore an attempt was made to overview the future outlooks of the other sectors to assess the opportunities for industrial development by a linkage approach among the productive and services sectors of the Southern Districts. Sectors under focus are mining, agriculture and animal husbandry, water, energy, construction and transportation which are briefly discussed as below.

It should be noted that, however, detailed study on the sectors other than industry is beyond the scope of the Study. The analysis of the sectional linkage should, therefore, be deemed to be of preliminary nature.

1) Mining

Phosphate mines are located in Al Abiad, Al Hasa and Eshidiya. The sites are far from the urban centers and their operations are done in self-contained style. The mine has its own power sources and water sources and community facility for their workers. Machining and tooling for maintenance of the mining and transportation equipment are done by their own resources. The Al Abiad and Al Hasa mines are planned to be closed sometime after 2005 and phosphate mining will be concentrated in Eshidiya. Similarly, Safi is the center for Potash, Rashadiya for lime stones for cement. If not all, some portion of engineering works for maintenance of these mining activities could be out sourced. This will enable efficient use of technological resources and reduction of the maintenance costs of the mining company and offer opportunities to broaden the industrial base of the region.

Mining activities require substantial energy for resource extraction, processing and transportation. At present the source of energy is almost imported from the neighboring country. Development of local source of energy, oil shale, a large deposit of which is found in this region as could be a substitute of imported energy if the oil price goes up in the future.

2) Agriculture and Animal husbandry

Due to the constraints in water supply, irrigated farm lands are limited mostly for vegetables. The southern Ghor area could be developed when the proposed Mujib and Tannur dams are built. Palm trees adaptable to saline soil could be widely planted in Wadi Araba. The highland agriculture comprises mix crops of grain, animal husbandry, vegetables and some kinds of fruits like apples and olives along the King's Highway.

Opportunities from this sector are supply of industrial inputs for agro-processing such as vegetables, fruits and animal hides and demand for agricultural implements and inputs including farm chemicals, irrigation pumps and pipes and packing materials.

3) Energy

Aqaba is a large supply source of electricity in the country by the thermal power generation which is based on imported oil. Its capacity will further be expanded by oil-thermal or LNG-based thermal power in the future. This will offer opportunities for engineering industry for construction and maintenance of equipment. If the proposed importation of LNG from Qatar comes into reality, it will provide an opportunity to invite location of the industries which consume intensively the cold potential released by regasification.

Cables and wires and fabricated metals will be demanded for transmission and distribution. Transformers and power meters for end users will need to be replaced from time to time. Also gas cylinders will be demanded for domestic and industrial uses. Natural conditions of the region are suitable to harness such renewable and alternative energy as solar and wind. Development of these devices and equipment might provide another opportunity for industrial development in the Southern Districts, in particular Ma'an and Aqaba including Wadi Araba.

Energy supply, particularly petroleum will become once again a critical issue of the global economy in the coming decades if such mega populated countries as China and India continue to maintain the current growth rate. Though oil has not been found yet, Jordan has the huge deposits of oil shale located mostly in the region under the Study. In the past a number of studies have been made by the bi-lateral assistance and or foreign private sector initiatives. The results of these studies conclude that the feasibility of shale oil recovery of the deposit, such as the one in Lajun will depend primarily on the market factor of crude oil and cost factors of technologies in mining and processing of oil shale, namely the crude oil price should go up to \$20 to \$25 per barrel.

The government of Jordan is currently paying keen attention to the utilization of oil shale for direct combustion to generate electricity which is simpler than shale oil recovery by retort system. It is told that the direct combustion system is already working in Israel as an experiment. The concerned agencies are planning to encourage private sector to venture into power generation as early as possible to substitute imported energy which has the largest share in her national imports.

It may be an idea to start with a single purpose of power generation to give a kind of development impetus to the industry as well as the region. However when we look at a likely path of the global economies and its energy needs in the coming decade, the character of the existing industries and its spatial distribution from a view of the intra regional industrial linkage, and the current technological advancements, another option of the integrated utilization of oil shale will be refocused.

Recovered shale oil could be fed into the existing refinery in Zarka or to new one to be established in Aqaba or elsewhere in the region. Power to be generated in Aqaba by direct burning of oil shale could be used in the southern or middle part of the Southern Districts so that the transmission cost would be reduced. Sulfur by products might be able to replace the current import for production of phosphoric acid and potassium sulfate in Eshidiya and Aqaba. Ammonia to be imported by the NJFC in Aqaba might be replaced by the local production through utilization of associated gas in the retort process of oil shale. Oil shale could be used at the same time as substitute of limestone in the cement industry in Rashadiya. Gypsum byproducts by air pollution control device could be used for cement production.

In this sense the integrated utilization of oil shale might possibly be a strategic core industry of the region and the country as well to meet the needs of the key regional industries of chemicals and cement. It would save a lot of foreign exchange as an import substitute, help create substantial job opportunities, diversify and enhance the regional industrial products, promote transfer of advanced technologies and ripple effect of technical improvement to the regional industries as a whole.

4) Water

Surface and groundwater resources of the Southern Districts are limited but have not been fully utilized. Use of recycled water is needed from the viewpoint of water conservation and environmental protection, which will offer opportunities for the manufacturing industries for supply of pipes of steel, plastic and cement and pumps on top of the conventional demand. In the long-run, fresh water production through desalination in Aqaba might be conceived. Engineering industry will have opportunities to participate in the businesses at various stages.

5) Tourism

Main tourist attractions of the country are found in the Study Area. The resources are diversified and balanced. The archaeological asset of Petra which is designated by the UNESCO as the world heritage is considered the apex of the southern golden

triangle of tourism linked with Wadi Rum of nature wonders and Aqaba of resort attraction of sea, sand and sun. At present there are about 2,000 hotel rooms distributed in Aqaba and Petra. According to the recent tourism study funded by JICA, the projected demand for hotel rooms of the region in the year 2010 is approximately 7,500 rooms to accommodate about 1.5 million non-Arab tourists. This will offer the industry such opportunities as to supply the various types of building materials, furniture for hotel construction and local made traditional handicrafts and some non-conventional items for souvenir.

6) Construction and Transportation

These industries as well as the mining require various types of heavy equipments, truck and ships which are required to be repaired and maintained, regularly. In the Aqaba Free Zone, there is a section to keep these equipment and heavy machinery owned by major international contractors. Engineering and fabricated metal industries as well as transport equipments will be demanded for production of replacement parts and for repair and maintenance services. Taking into consideration the combined markets of such capital intensive industrial plants such as chemicals, cement and power and construction and transportation, the engineering and metal working industries are likely to have good potential to grow in the Southern Districts.

(3) Industrial development strategies

1) Priority development of the infrastructures in the Southern Districts

In parallel with the development of the industrial infrastructures which would directly affect the promotion of the industrial activities, socio-economic infrastructures as a whole in the Southern Districts should be developed, being placed high priority in the infrastructure development in the country. Sector-wise, particular attention should be paid to:

- Water supply
- Transportation
- Electricity and telecommunications

In determining the order of implementation or priority order among the development projects, due attention should be paid to the formulation of the development axes/economic development bases within the Southern region and between the Southern region and the Central as well as the promotion of international cooperation.

2) Introduction / upgrading of basic industrial infrastructures in the Southern Districts

(a) Technology improvement

a) Technical improvement

The existing industrial enterprises in the Southern Districts can be classified into two extremes:

- Large-scale mining and chemical enterprises with more than 1,000 employees, and
- Workshops and household industries with less than 10 employees

Small to medium-scale enterprises, scale of which lies between the above two are also in operation, some of which are engaged in manufacturing parts / components of simple structure, applying the technology developed for repairing works. The number, however, is quite limited. While the big enterprises are developing and introducing their technologies, technologies of the subsistence industries and workshops remain at the level of the household industries. Namely, accumulation of industrial technology in the Southern Districts is quite limited at present except for particular industries.

To achieve the full-scale industrial development of the Southern Districts, full-fledged basic industrial technology should be either developed or introduced for the provision for the investors including these in:

- Manufacturing technology
- Production control
- Quality control
- Performance testing

To attain this objective, an institution should be established in the Southern Districts either in the form of private, academic or public sector organization. Considering the characteristics of this task which seem to be non-profitable at least during the initial stage and require the development / introduction of the provision of wide range of appropriate technologies, it is recommended that a public institution be established to carry out this task.

b) Managerial improvement

In the Jordan's economy, Government and public sector has big share. In the private sector, though accounting for sizable share, industrial sector is not yet

dominating which requires long-term investment compared with the other significant sectors of transport, commerce and other service sectors.

In the Southern Districts, existing enterprises do not possess business management know-how of adequate level except for limited number of large enterprises. At present, their markets are mostly limited to the local markets, mainly major regional cities and their suburbs and partly the capital region. In the future, however, they will be required to open up new markets in the country and overseas for their expanded production. In parallel with the relocation and expansion into the Southern districts of the enterprises currently located in the Central and Northern regions, new investors/enterprises of medium-to-small scale should be reared and established and encouraged to enter into the Southern Districts.

In this context, it is recommended that a public institution be set up aiming at extending supports particularly to the medium-to-small scale enterprises who are interested in investing in the Southern Districts either by establishing new companies or expanding the existing business activities into the Southern Districts. The institution should extend the supportive services in the following fields:

- Business management including long-term investment and corporate accounting,
- Marketing including export,
- Business incubation, and
- Provision of the related information including availability of financial facilities

(b) Manpower development and training

Out of the 12 universities established in the country, only one university is in the Southern Districts, i.e., Mu'tah University near the Karak city. In order to promote the industrialization in the Southern Districts, academic facilities should be enhanced for bringing up required manpower.

In this respect, it is recommended that besides the existing Mutah University, a university be set up in Aqaba which will assume the role of the principal growth center in the Southern Districts in addition to the reinforcement of the proposed Ma'an branch of the Mu'tah University by adding a faculty of engineering.

Considering the expected needs of the industrial society in the coming years, emphases should be place on engineering and business administration fields.

At present, 6 vocational training centers are in operation under the Vocational Training Corporation. As industrialization develops in the Southern Districts, skilled manpower will increasingly be needed and kinds of required skills will be diversified. Vocational training is recommended to be, therefore, reinforced in terms of teaching staff and quota of students as well as quality of curricula. Special attention should be paid to absorb the needs of the industrial society so that appropriate and up-to-date skills be acquired by the Trainees.

(c) Construction of IEs / EPZs

a) Estimation of required land area of IEs / EPZs in the Southern Districts

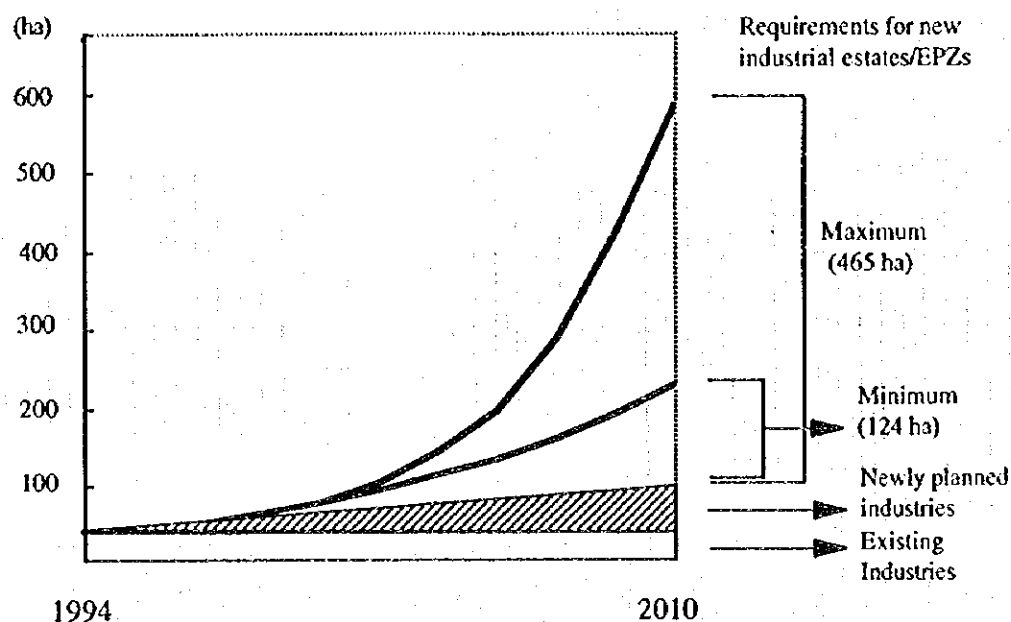
Required new land area of IEs / EPZs are projected as shown in Table 6-1-7 and 6-1-8. As basic assumptions, existing industrial area and planned newly developed industrial area are deducted from the total requirement. The results by the Scenario are summarized as follows.

Optimistic Scenario

Case-1	: 124 ha
Case-2	: 235 ha

Ideal Scenario

Case-1	: 278 ha
Case-2	: 465 ha



Note: This figure is only illustrative. Numbers between 1994 and 2010 do not show the exact values nor time schedule of the land requirement for IEs/EPZs.

As shown above, land requirements for IEs/EPZs in four cases are in the range between 124 ha and 465 ha. Thus, land requirements in terms of macro-economic targets are well balanced with the development area for industrial estates (net development area: 324.5 ha in total), which is proposed on the basis of demanded area, by the potential investors as shown below. Details of development area for each industrial estate are discussed in the Chapters VIII through XI.

Development Area for Industrial Estates

Industrial Estate Site	Net Development Area(ha)	Gross Development Area(ha)
K-3 site	27.6	35.0
T-2 site	67.2	80.0
M-2 site	63.8	80.0
A-2 site	165.9	200.0
Total	324.5	380.0

b) Necessity of IEs / EPZs

In order to the materialize the industrial development in the Southern Districts, tracts of land well-equipped with the utilities of water supply, sewerage, electricity and telecommunication as well as internal and access roads to the

highways should be constructed to accommodate the investors for production. Industrial estates of this standard are in operation, one in Sahab and the other in Irbid but none in the Southern Districts. These industrial estates would be quite effective to receive the medium-to-small scale enterprises as well as foreign investors and their joint ventures with Jordanian enterprises. Their locations should be decided taking into account the access to the transportation and other infrastructures, urban facilities and labor force. Regional development viewpoint should also be taken into account, considering their significant role to be played in the development. For the subsistence enterprises and workshops which require smaller size of factory lots and floor areas, workshop apartments with limited land scale, being provided with adequate utilities facilities should be constructed in the Governorates.

Being deep in deficits in trade balance, export promotion is badly needed for Jordan. With the international trading port which is the gateway of the country for both Asia and Mediterranean countries, Aqaba provides excellent location for export processing zone where processing / assembly type industries both foreign and domestic will be attracted.

Aqaba Governorate shares the long border with Israel. Israel having advanced-technology and investment fund, a tract of land should be availed along the border on the Jordanian side for cooperative industrial production between the two countries.

3) Policy and institutional measures for the investment promotion and productivity improvement

In 1995, investment promotion law was revised so that the preferential treatment applicable to the Arab investors should also be applicable to the non-Arab foreign investors. In order to strengthen the economic activities outside of the capital region, investment zones, A, B, C, have been set up so that stronger incentives are provided for the less-developed areas in the country.

To succeed in attracting the foreign investors to the country in the midst of the keen competition among the countries including Asian emerging economies, the investment environment should be further reinforced with stronger and varied investment incentives. Considering the significant differences in the provision of urban facilities and public services as well as cultural and amenity facilities, differential treatment among the zones should further be widened.

Weak finance being the most serious hindrance against the promotion of industrialization, a subsidiary loan system for promoting of industrialization in the Southern districts should be established with soft loan conditions. The eligible entities for the loan should be:

- The medium-to-small and subsistence enterprises currently in operation in the Southern Districts,
- Relocation and expansion into the Southern Districts from the Central and Northern regions,
- Foreign and joint venture enterprises investing into the Southern Districts, and
- Venture business newly established for investing into the Southern Districts.

The funds through the system will be utilized for:

- Increasing the investment into the Southern Districts, and
- Rationalization of the subsistence enterprises including renovation/renewal and modernization of production facilities/equipments as well as improvement of productivity.

4) Promotion of local-resource-based industries with higher value-added

About 70 % of phosphorus materials are exported in the form of ores and the remaining 30 % in the form of fertilizer. Higher processing of phosphorus ores to produce higher value-added products including phosphoric acid and phosphates should be practiced for reinforcing the manufacturing industries and increasing the value of exports.

Currently, potash (KCl) is exploited from the Dead Sea water. Other minerals and their chemical compounds can be exploited and manufactured including bromine and its compounds, table and industrial salts, etc. These diversification of mineral products and compounds should be promoted.

5) Export promotion

Suffering chronic trade imbalance and current account deficit, export promotion is an urgent necessity together with import substitution of certain categories. For export promotion, special attention should be paid for:

- Higher processed products based on mineral resources including phosphorus and various resources from the Dead Sea, and
- Assembly and processing of imported parts/components for export

Attracting foreign direct investment will be a powerful measure for export promotion utilizing their marketing channels overseas. Establishment of EPZ will be quite effective for export promotion considering the weakness of the domestic industries for basic materials and parts/components. Among the target markets for export, Israel should be added. Aqaba being an international trading port facing the Red Sea, exports to the emerging Asian economies should be strengthened. In the case, Jordan comes to have the direct access to the Mediterranean countries through the land link with Israel, export to these countries should be promoted via the ports of Haifa and Ashdod.

6) International cooperation

The Southern Districts share the border with three countries, i.e., Saudi Arabia to the south and east, Egypt to the southwest via the Aqaba Gulf and Israel to the west. Though not directly adjacent, the West Bank of the Jordan river is within easy access from the Karak Governorate. Jordan has been historically maintaining close relationship with Saudi Arabia and Egypt both in terms of cultural and economic ties. With Israel, Jordan has already established diplomatic relationships in 1994. The industrial cooperation with these countries/area should be one of the principal strategies for the industrial development in the Southern Districts. The comparative advantages of the countries/area can be recognized as:

- Israel : Advanced/high-technology, financial capacity, marketing capacity
- Saudi Arabia : Financial capacity
- Egypt : Big pool of un-skilled and semi-skilled labor
- West Bank : Skilled and semi-skilled labor
- Jordan : Medium-technology and managerial manpower

Among these, bi- or multi-lateral cooperation can be expected in the fields of production, investment, labor supply as well as physical distribution. Being located at the center of these countries/area, Jordan can and should take the initiative in promoting the cooperation.

7) Promotion of foreign direct investment

Although availability of long-term investment fund is a pre-requisite to the full-scale industrial development, domestic savings in Jordan is quite small and long-term financial facilities are also limited. Attraction of the foreign direct investment would give the solution to this problem, bringing in technology and markets together. The

Southern Districts, in particular Aqaba, can offer good location for receiving the foreign investment with well-developed transport infrastructures and long borders with the neighboring countries. The following measures are recommended to be taken:

- To reinforce further the economic infrastructures including roads, railways, port, airport, electricity and telecommunications,
- To develop the basic industrial infrastructures to train the qualified manpower and upgrade the quality of products,
- To enhance the preferential treatment in the investment in favor of the zones outside of the Central regions including the Southern Districts, and
- To prepare adequate area of industrial land well-equipped with the needed utilities acceptable to the foreign investors.

8) Conservation of the natural environment

Future industrial development and related activities such as urbanization may cause undesirable impacts on various environmental resources, as show below.

Possible Impacts on Environmental Resources							
Activities	Resources						
	Air	Ground water	Surface water	Agriculture land	Wildlife reserve	Tourism resource	Urban environment
Mining	Dust	Over-use	Pollution	Decrease	Decrease	Landscape change, dust, noise, water pollution	dust, noise
Manufacturing							Wastes
Agriculture, Animal husbandry		Pollution	Pollution	Over grazing	Destruction		
Energy			Cooling water discharge				
Water Development		Over use	Salinization	Salinization			
Tourism		Over use	Pollution		Over use		
Construction, Transportation				Decrease	Decrease	Possible degradation	
Urbanization		Over use		Decrease	Decrease	Degrade	More wastes
		Pollution					

To avoid and control those potential impacts, conservation strategies should be designed and implemented.

(a) Legal strategies

Enactment of the Environmental Law of Jordan in 1995 was a great step for Jordanian environment. At present the government is preparing an environmental action plan with assistance of the World Bank. The most acute legal action for realization of the concept of the law and the plan is to enact by-laws, regulations and standards for each environmental elements. GCEP, in cooperation with other governmental, non-governmental, and international agencies, should take initiative in the formation of those rules.

(b) Enforcement strategy

The Environmental Law designates GCEP as prime agency for environmental management by giving all powers to set standards, enact environmental laws, and enforce the laws. In present situation, GCEP employs 27 personnel at its headquarters including the General Director and administrative staff. Except the Solid Waste Section that employ two persons, all sections has only one personnel to set policy and administer.

In order to realize the spirit of the Environmental Law and to cope with industrial development, GCEP should increase the number of the staff. Assumed that the existing 18 divisions and sections have at least four personnel each; one chief and three subordinates, GCEP would employ more than 70 personnel in the headquarters. GCEP also should station environmental specialists at least at every twelve governorate, and desirably at every major city in addition.

(c) Public awareness

Most of Jordanians spend relatively nature-friendly way of life today and the population density is very low except several large cities. Environmental awareness among the most of Jordanians is naturally quite low today.

With the industrial development, however, rural population will gather to the cities and many of the migrants will start working in factories. They will migrate with their animals to support their urban life. Wastes will be deposited at the door way, animals will graze in open area that decreases year by year.

A public awareness program should be considered to prevent health hazards caused by urban living condition and work place environment. The Ministry of Health (MOH) should be responsible for designing and implementation of the

program. JIEC, in cooperation with MOH, should also be a strong advocate for better working environment. As proposed in the Priority Industrial Projects section in this report, JIEC should conduct seminars and workshops at their IEs so that the managers of private enterprise become aware of the merit of good working environment and how to achieve it.

After substantial achievement of the health program, it will be possible to extend the interest of majority of the public on conservation of natural environment. In the nature conservation program, GCEP should be responsible for organizing and implementing the program in cooperation with NGOs such as Jordanian Environmental Society and Royal Society for Conservation of Nature. The role of universities as opinion leader and technical advisor is also important. GCEP shall be ready to take the initiative by the long-term time frame when it employs sufficient number of the staff. In the mean time, the two NGOs should be responsible for the awareness program on nature conservation.

Table 6-1-1 Ideal Scenario for Peace Process and Stabilization of the Middle-East Region

	Present Conditions	Short-term (-2000)	Middle-term (2001-2005)	Long-term (2006-2010)	Beyond 2010 (2011-)
Gulf War Related					
- Deteriorated Relations between Jordan and Gulf States	<ul style="list-style-type: none"> Diplomatic and economic relations between Jordan and the Gulf States including Saudi Arabia and Kuwait are gradually getting improved. 	<ul style="list-style-type: none"> Diplomatic and economic relations and cooperation between Jordan and the Gulf States will be fully recovered to the level before the Gulf War in 1990. 			
- UN Sanctions against Iraq	<ul style="list-style-type: none"> UN sanctions have partially been lifted allowing Iraq to export about 700,000 barrels of oil a day. 30% of its earnings being put into the Gulf War Compensation Fund. 	<ul style="list-style-type: none"> UN sanctions against Iraq will completely lifted allowing Iraq to export its crude oil (Before the sanctions, Iraq's quota in OPEC was about 2.88 million barrels.) 			
Middle-East Peace					
- Palestine Issues	<ul style="list-style-type: none"> Partial autonomy are given to the eight cities in the West Bank and Gaza areas. 	<ul style="list-style-type: none"> Palestinian independent country will be established after the agreement among all the concerned nations and parties. 			
- Syrian Golan Heights	<ul style="list-style-type: none"> No noticeable move has been made with regard to the restoration of the Golan Heights. 	<ul style="list-style-type: none"> Security measures will be agreed upon and the Golan Heights will be fully restored to Syria. 			
- Comprehensive Middle-East Peace	<ul style="list-style-type: none"> Only two Arab countries, i.e., Egypt and Jordan have entered into diplomatic relations with Israel as in 1996. 	<ul style="list-style-type: none"> Comprehensive peace agreement will be reached for the Middle-East region and all the Arab nations will enter into diplomatic relations with Israel. 			
Regional Agreements for Free Trade and Investment					
	<ul style="list-style-type: none"> Jordan has applied for the associate membership of EU but it is yet to be approved. 	<ul style="list-style-type: none"> Jordan will be admitted into EU as associate member. 	<ul style="list-style-type: none"> Middle East Free Trade and Investment Agreement/Area (MEFTA) will be established and Jordan will be admitted as full member. 	<ul style="list-style-type: none"> Agreement for free trade and investment will be concluded between EU and MEFTA. 	
		<ul style="list-style-type: none"> "Middle East Regional Development Bank" will be established for extending financial assistance to the member countries for development and reconstruction with its headquarters in Cairo. 			

Table 6-1-2 Optimistic Scenario for Peace Process and Stabilization of the Middle-East Region

	Present Conditions	Short-term (~2000)	Middle-term (2001-2005)	Long-term (2006-2010)	Revised 2010 (2011-)
Gulf War Related					
- Deteriorated Relations between Jordan and Gulf States	<ul style="list-style-type: none"> Diplomatic and economic relations between Jordan and the Gulf States including Saudi Arabia and Kuwait are gradually getting improved. 		<ul style="list-style-type: none"> Diplomatic and economic relations and cooperation between Jordan and the Gulf States will be fully recovered to the level before the Gulf War in 1990. 		
- UN Sanctions against Iraq	<ul style="list-style-type: none"> UN sanctions have partially been lifted allowing Iraq to export about 700,000 barrels of oil a day, 30% of its earnings being put into the Gulf War Compensation Fund. 		<ul style="list-style-type: none"> UN sanctions against Iraq will completely lifted allowing Iraq to export its crude oil (Before the sanctions, Iraq's quota in OPEC was about 2.88 million barrels.) 		
Middle-East Peace					
- Palestine Issues	<ul style="list-style-type: none"> Partial autonomy are given to the eight cities in the West Bank and Gaza areas. 	<ul style="list-style-type: none"> Complete autonomy will be given to the West Bank and Gaza areas. 	<ul style="list-style-type: none"> Palestinian independent country will be established after the agreement among all the concerned nations and parties. 		
- Syrian Golan Heights	<ul style="list-style-type: none"> No noticeable move has been made with regard to the restoration of the Golan Heights. 		<ul style="list-style-type: none"> Security measures will be agreed upon and the Golan Heights will be fully restored to Syria. 		
- Comprehensive Middle-East Peace	<ul style="list-style-type: none"> Only two Arab countries, i.e., Egypt and Jordan have entered into diplomatic relations with Israel as in 1996. 		<ul style="list-style-type: none"> Comprehensive peace agreement will be reached for the Middle-East region and all the Arab nations will enter into diplomatic relations with Israel. 		
Regional Agreements for Free Trade and investment	<ul style="list-style-type: none"> Jordan has applied for the associate membership of EU but it is yet to be approved. 		<ul style="list-style-type: none"> Jordan will be admitted into EU as associate member. 	<ul style="list-style-type: none"> Middle-East Free Trade and Investment Agreement/Area (MEFTA) will be established and Jordan will be admitted as full member. 	<ul style="list-style-type: none"> Agreement for free trade and investment will be concluded between EU and MEFTA.
			<ul style="list-style-type: none"> "Middle-East Regional Development Bank" will be established for extending financial assistance to the member countries for development and reconstruction with its headquarters in Cairo. 		

Table 6-1-3 Conservative Scenario for Peace Process and Stabilization of the Middle-East Region

Present Conditions		Short-term (~2000)	Middle-term (2001-2005)	Long-term (2006-2010)	Beyond 2010 (2011-)
Gulf War Related					
- Deteriorated Relations between Jordan and Gulf States		<ul style="list-style-type: none"> • Diplomatic and economic relations between Jordan and the Gulf States including Saudi Arabia and Kuwait are gradually getting improved. 	<ul style="list-style-type: none"> • Diplomatic and economic relations and cooperation between Jordan and the Gulf States will be fully recovered to the level before the Gulf War in 1990. 		
- UN Sanctions against Iraq		<ul style="list-style-type: none"> • UN sanctions have partially been lifted allowing Iraq to export about 700,000 barrels of oil a day, 30% of its earnings being put into the Gulf War Compensation Fund. 		<ul style="list-style-type: none"> • UN sanctions against Iraq will completely lifted allowing Iraq to export its crude oil (Before the sanctions, Iraq's quota in OPEC was about 2.88 million barrels.) 	
Middle-East Peace					
- Palestine Issues		<ul style="list-style-type: none"> • Partial autonomy are given to the eight cities in the West Bank and Gaza areas. 			<ul style="list-style-type: none"> • Complete autonomy will be given to the West Bank and Gaza areas.
- Syrian Golan Heights		<ul style="list-style-type: none"> • No noticeable move has been made with regard to the restoration of the Golan Heights. 			<ul style="list-style-type: none"> • Security measures will be agreed upon and the Golan Heights will be fully restored to Syria.
- Comprehensive Middle-East Peace		<ul style="list-style-type: none"> • Only two Arab countries, i.e., Egypt and Jordan have entered into diplomatic relations with Israel as in 1996. 			<ul style="list-style-type: none"> • Comprehensive peace agreement will be reached for the Middle-East region and all the Arab nations will enter into diplomatic relations with Israel.
Regional Agreements for Free Trade and Investment					
		<ul style="list-style-type: none"> • Jordan has applied for the associate membership of EU but it is yet to be approved. 			<ul style="list-style-type: none"> • Jordan will be admitted into EU as associate member. • "Middle-East Regional Development Bank" will be established for extending financial assistance to the member countries for development and reconstruction with its headquarters in Cairo.

Table 6-1-4 Indicators of Development of Economy (1993)

Country	GNP per Capita	Ratio of Dependence on Export ^{/1}	Ratio of Dependence on Import ^{/2}
Jordan	1,083	25.5 %	72.3 %
<Less than \$500>			
Bangladesh	220	8.8 %	15.4 %
India	290	8.2 %	8.7 %
Pakistan	430	12.5 %	17.8 %
<\$500 ~ \$1,000>			
Sri Lanka	600	26.2 %	35.0 %
Philippine	830	23.7 %	31.6 %
Egypt	660	6.1 %	22.3 %
<\$1,000 ~ \$2,000>			
Morocco	1,030	12.4 %	25.9 %
Rumania	1,120	17.8 %	22.4 %
Tunisia	1,780	24.8 %	40.5 %
<\$2,000 ~ \$5,000>			
Thailand	2,040	30.9 %	38.3 %
Turkey	2,120	12.2 %	23.0 %
Poland	2,270	16.2 %	21.6 %
<\$5,000 ~ \$10,000>			
Greece	7,390	12.7 % ^{/3}	30.9 % ^{/3}
Korea	7,670	24.3 %	24.8 %
Portugal	7,890	19.8 %	31.3 %
<\$10,000 ~ \$20,000>			
Taiwan	10,826	38.6 %	35.0 %
Israel	13,760	20.3 %	31.3 %
U.K.	17,970	17.4 %	19.8 %
<More than \$20,000>			
Canada	20,670	25.3 %	24.2 %
Germany	23,560	19.2 %	17.3 %
Japan	31,450	9.2 %	6.2 %

Source: World Statistics, 95/96, Tsuneta Yano Memorial Society

Remarks; /1: Ratio of dependence on export : Ratio of export value to GNP

/2: Ratio of dependence on import : Ratio of import value to GNP

/3: 1992 figures.

Table 6-1-5 Structure of Domestic Exports and Imports

Unit: JD1,000

	Domestic Export*		Import	
Consumer goods				
Current consumer goods	293,310	36.9 %	462,074	19.6 %
Durable consumer goods	14,478	1.8 %	89,798	3.8 %
Sub-total	307,788	38.8 %	551,872	23.4 %
Crude material and intermediate goods				
Crude material	192,962	24.3 %		
Fuels			289,043	12.2 %
Construction material	32,395	4.1 %	33,316	1.4 %
Other intermediate goods	209,230	26.4 %	946,927	40.1 %
Sub-total	434,587	54.7 %	1,269,286	53.7 %
Parts and accessories	6,522	0.8 %	116,653	4.9 %
Capital goods	45,022	5.7 %	34,420	1.5 %
Transportation equipment except small motor vehicles			77,046	3.3 %
Other capital goods including machinery and equipment			299,751	12.7 %
Live animals for breeding			1,642	0.1 %
Other goods			11,913	0.5 %
Total Domestic Export	793,919	100.0 %	2,362,583	100.0 %

Source: Monthly Statistical Bulletin, September 1995

Central Bank of Jordan

Remarks: *: Excluding the re-exports of imported goods.

Table 6-1-6 Comparison of Various Indicators in Selected Countries

Countries	Per capita GDP (1993, US\$)	Per capita GDP (1994, US\$)	Annual GDP growth rate		Annual manuf. sector growth rate		Share of manuf. sector in GDP		Unit: percent (%)
			1970-80	1980-93	1970-80	1980-93	1970	1994	
India	250	320	3.4	5.2	4.5	6.2	15	18	
China	360	530	5.5	9.6	8.9	11.5	30	37	
Sri Lanka	520	640	4.1	4.0	3.4	5.0	17	16	
Indonesia	760	880	7.2	5.8	9.6	6.3	10	24	
Jordan	1,120	1,440	-	1.2	-	-	-	14	
Thailand	2,150	2,410	7.1	8.2	9.7	11.0	16	29	
Malaysia	3,390	3,480	7.9	6.2	8.7	8.2	12	32	
Korea	7,500	8,260	10.1	9.1	16.4	12.1	21	29	
Israel	13,410	14,530	4.8	4.1	-	-	-	-	
Singapore	19,700	22,500	8.3	6.9	8.6	6.2	20	27	

Source: World Development Report 1995 and 1996, The World Bank

Notes:

(a) Current five years plan (1993-97) in Jordan : Annual GDP growth rate is projected at 6.0% at producer's prices. productive sectors at 7.8% and manufacturing sector at 8.9%.

(b) World Bank, "Peace and the Jordanian Economy" (1994): Annual growth rate of GDP is projected at 7.0% in 1993-2003 with enhanced policy reform.

Table 6-1-7 Industrial Development Targets with Optimistic Scenario

1991 prices for monetary terms

	1994	2010	Remarks
Jordan as a whole kingdom			
(a) Value added of manufacturing sector (JD1,000)	445,490	1,481,625	7.8% average growth rate per annum in 1994-2010 1)
(b) Value added per employee (JD) 2)	4,648	6,531	1.4% annual growth rate in 1994-2000, 2.6% in 2001-2010 3)
(c) Number of employees (persons)	95,843	226,861	Number in 1994 is derived from Industrial Census 1994
(d) Estimated industrial area (ha) 4)	1,146	2,714	Divided by weighted average number of employees per ha in Sahab and Al Hasan industrial estates 5)
Southern Districts			
<i>Case-1 (Share of 10% in 2010)</i>			
(e) Value added of manufacturing sector (JD1,000)	18,265	148,162	4.1% in 1994 and 10% in 2010 of value added of the manufacturing sector in the country 6)
(f) Value added per employee (JD)	5,681	7,983	see remarks on (b)
(g) Number of employees (persons)	3,215	18,561	Number in 1994 is derived from Industrial Census 1994
(h) Estimated industrial area (ha)	38	222	see remarks on (d)
(i) Estimated area for new industrial estates (ha)	-	124	Deduct estimated exiting industrial area in 1994 (38ha) and planned independent factory area (60ha) in 1994-2010
<i>Case-2 (Share of 15% in 2010)</i>			
(j) Value added of manufacturing sector (JD1,000)	18,265	222,244	4.1% in 1994 and 15% in 2010 of value added of the manufacturing sector in the country
(k) Value added per employee (JD)	5,681	7,983	see remarks on (b)
(l) Number of employees (persons)	3,215	27,841	Number in 1994 is derived from Industrial Census 1994
(m) Estimated industrial area (ha)	38	333	see remarks on (d)
(n) Estimated area for new industrial estates (ha)	-	235	see remarks on (i)

Sources: JICA Study Team, Central Bank of Jordan; Monthly Statistical Bulletin June 1996, Department of Statistics; Industrial Census 1994

Notes:

- 1) 7.8% is derived from the average growth rate of productive sectors in the current 5 year plan (1993-97).
- 2) Labor productivity in 1994 is derived from the value added in manufacturing sector in the Statistical Bulletin of the CBI and number of employees in the Industrial Census 1994.
- 3) The actual annual growth rate in 1992-94 is applied for 1994-2000 estimation. Growth rate in 2001-2010 is derived from the World bank report titled "Jordan - Issues of Employment and Labor Market Imbalances, 1986."
- 4) Industrial area size shown in this table is only factory area. (This is called "net" industrial area.) The area of roads, parks and other common space are not included.
- 5) 82.4 employees per ha in Sahab IE and 95.2 employees per ha in Al-Hasan IE. The weighted average is 83.6 employees per ha.
- 6) Value added in 1994 in the Southern Districts accounted for 4.1% in those of the whole kingdom based on the Industrial Census 1994.

Table 6-1-8 Industrial Development Targets with Ideal Scenario

		1991 prices for monetary terms	
		1994	2010
Jordan as a whole kingdom			
(a) Value added of manufacturing sector (JD1,000)	445,490	2,506,115	11.4% average growth rate per annum in 1994-2010 1)
(b) Value added per employee (JD) 2)	4,648	6,531	1.4% annual growth rate in 1994-2000, 2.6% in 2001-2010 3)
(c) Number of employees (persons)	95,843	383,727	Number in 1994 is derived from Industrial Census 1994
(d) Estimated industrial area (ha) 4)	1,146	4,590	Divided by weighted average number of employees per ha in Sahab and Al Hasan industrial estates 5)
Southern Districts			
Case-1 (Share of 10% in 2010)			
(e) Value added of manufacturing sector (JD1,000)	18,265	250,612	4.1% in 1994 and 10% in 2010 of value added of the manufacturing sector in the country 6)
(f) Value added per employee (JD)	5,681	7,983	see remarks on (b)
(g) Number of employees (persons)	3,215	31,395	Number in 1994 is derived from Industrial Census 1994
(h) Estimated industrial area (ha)	38	376	see remarks on (d)
(i) Estimated area for new industrial estates (ha)	-	278	Deduct estimated exiting industrial area in 1994 (38ha) and planned independent factory area (60ha) in 1994-2010
Case-2 (Share of 15% in 2010)			
(j) Value added of manufacturing sector (JD1,000)	18,265	375,917	4.1% in 1994 and 15% in 2010 of value added of the manufacturing sector in the country
(k) Value added per employee (JD)	5,681	7,983	see remarks on (b)
(l) Number of employees (persons)	3,215	47,092	Number in 1994 is derived from Industrial Census 1994
(m) Estimated industrial area (ha)	38	563	see remarks on (d)
(n) Estimated area for new industrial estates (ha)	-	465	see remarks on (i)

Sources: JICA Study Team, Central Bank of Jordan; Monthly Statistical Bulletin June 1996, Department of Statistics; Industrial Census 1994

Notes:

- 1) 11.4% is calculated as follows:

$$JD\ 445\ million \times US\$2410\ (per\ capita\ GDP\ in\ Thai\ in\ 1994)/1440\ (in\ Jordan) \times 1.031^{16}\ (population\ growth) \times 29\ (share\ of\ value\ added\ of\ manufacturing\ sector\ in\ Thai\ in\ 1994)/14\ (share\ in\ Jordan) = JD\ 2,517\ million. \quad (2517/445) \times (1/16) = 11.4\%$$
- 2) Labor productivity in 1994 is derived from the value added in manufacturing sector in the Statistical Bulletin of the CBI and number of employees in the Industrial Census 1994.
- 3) The actual annual growth rate in 1992-94 is applied for 1993-2000 estimation. Growth rate in 2001-2010 is derived from the World bank report titled "Jordan - Issues of Employment and Labor Market Imbalances, 1986."
- 4) Industrial area size shown in this table is only factory area. (This is called "net" industrial area.) The area of roads, parks and other common space are not included.
- 5) 82.4 employees per ha in Sahab IE and 95.2 employees per ha in Al-Hasan IE. The weighted average is 83.6 employees per ha.
- 6) Value added in 1994 in the Southern Districts accounted for 4.1% in those of the whole kingdom based on the Industrial Census 1994.

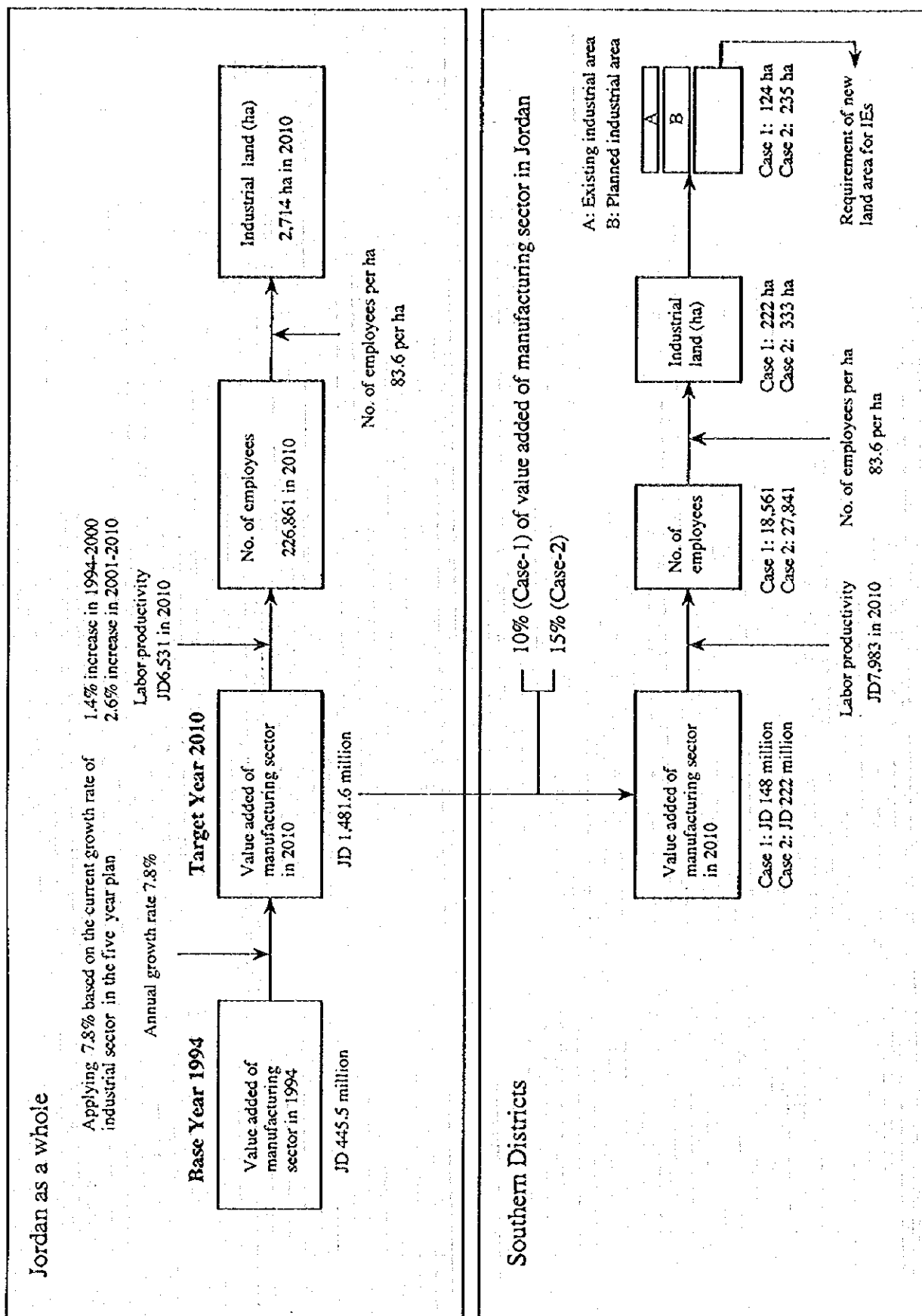


Figure 6-1-1 Targets and Industrial Land Requirements for Jordan and the Southern Districts for the year 2010 (Optimistic Scenario)

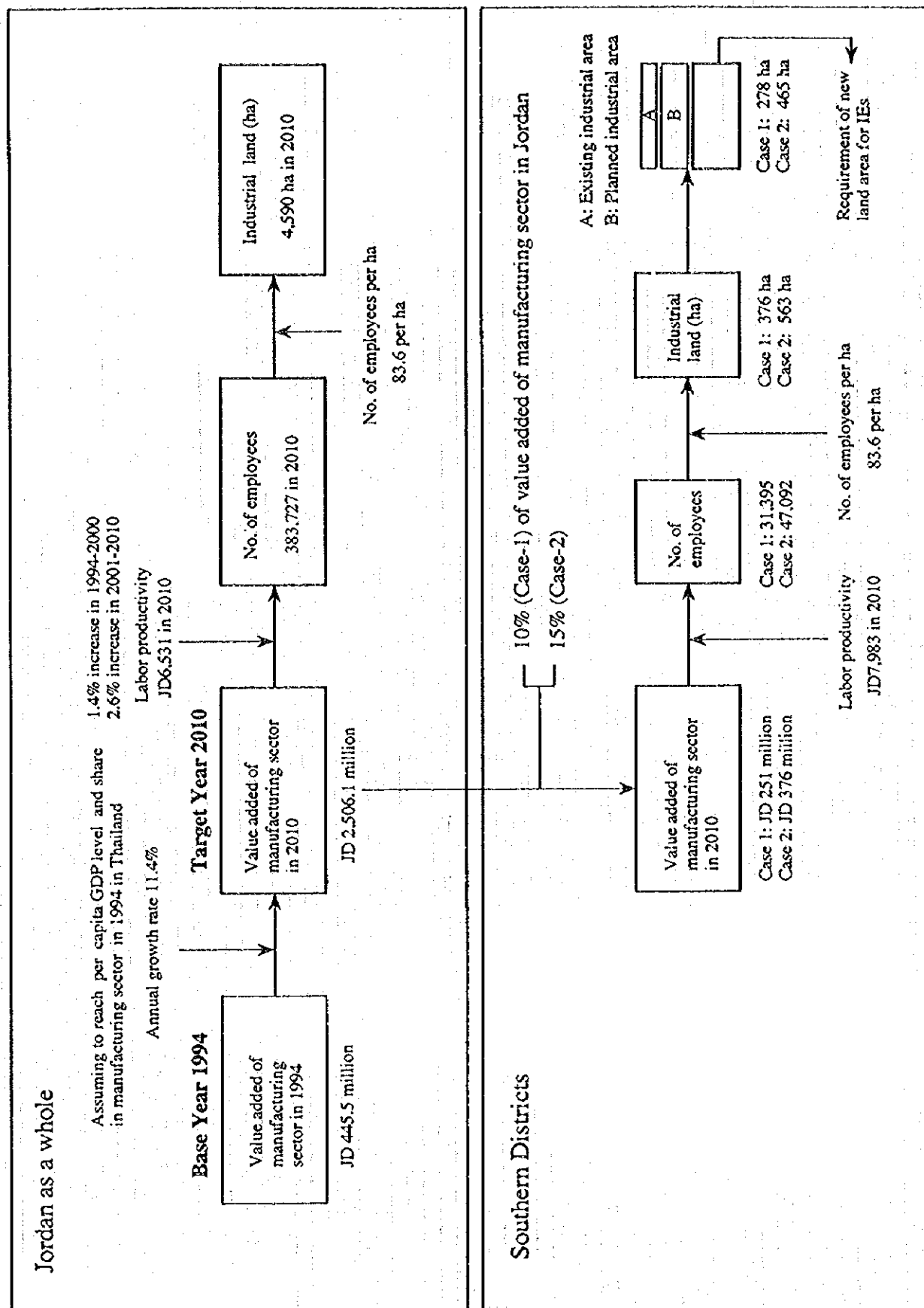
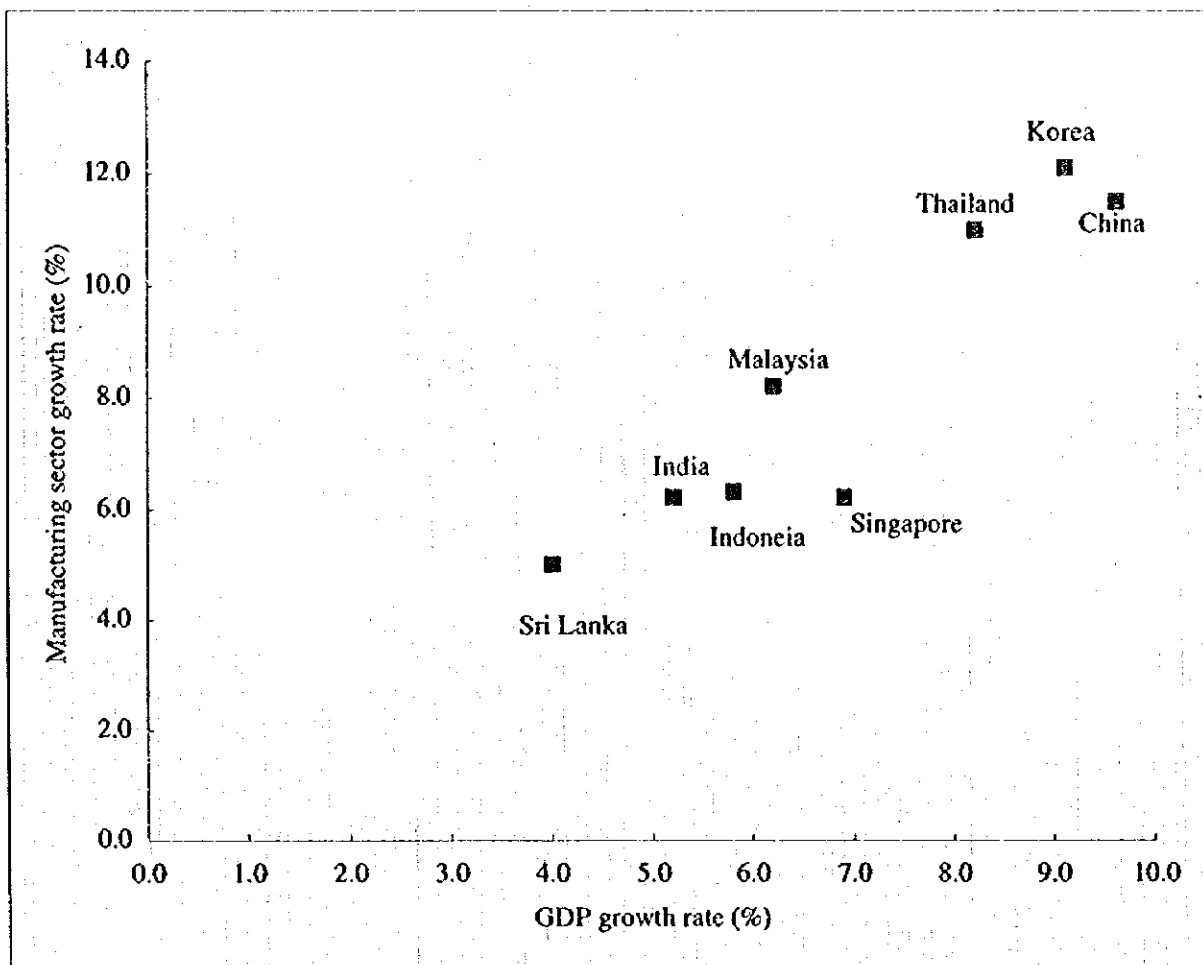
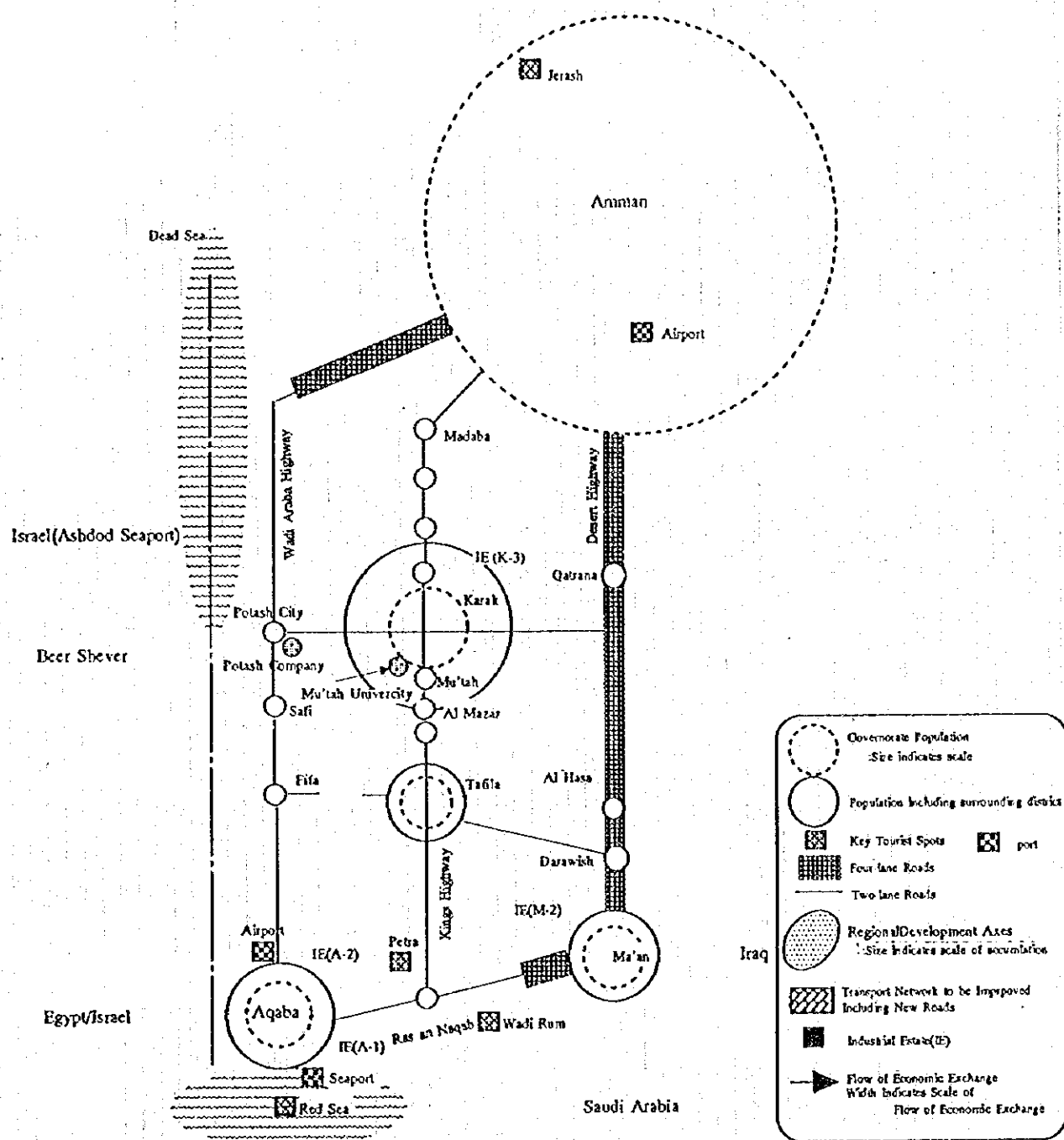


Figure 6-1-2 Targets and Industrial Land Requirements for Jordan and the Southern Districts for the year 2010 (Ideal Scenario)



Source: World Development Report 1995, The World Bank

Figure 6-1-3 Relation between Annual Growth Rate of GDP and Value Added in Manufacturing Sector in 1980-93



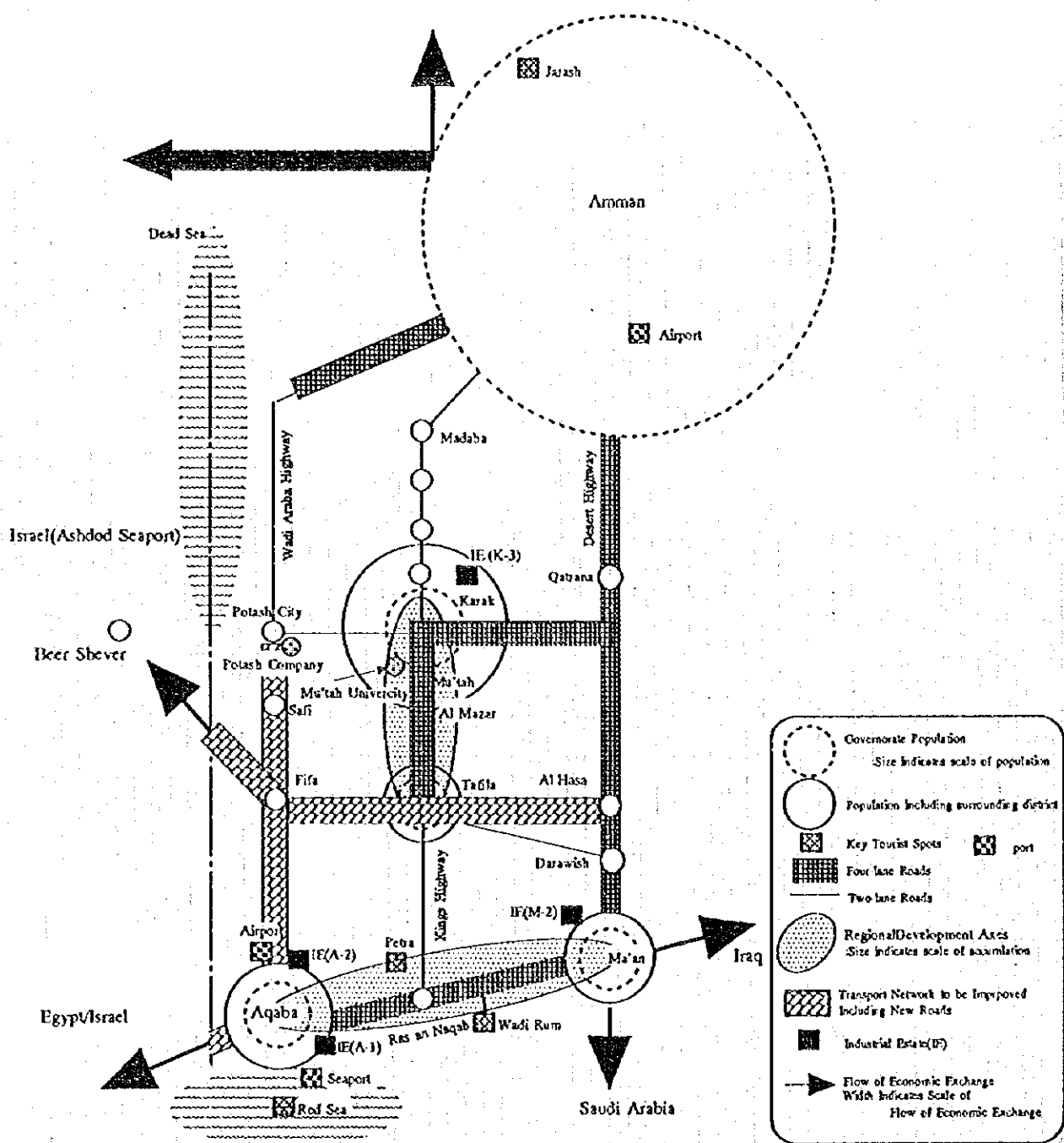
JAPAN INTERNATIONAL COOPERATION AGENCY

JORDAN INDUSTRIAL ESTATES CORPORATION

STUDY ON INDUSTRIAL DEVELOPMENT IN
THE SOUTHERN DISTRICTS OF THE HASHEMITE
KINGDOM OF JORDAN

Figure 6-2-1 Urban Economic Linkage and
Regional Development Axes
(Present Situation)

NIPPON KOEI CO., LTD.
JAPAN INDUSTRIAL LOCATION CENTER
REGIONAL PLANNING INTERNATIONAL CO., LTD.



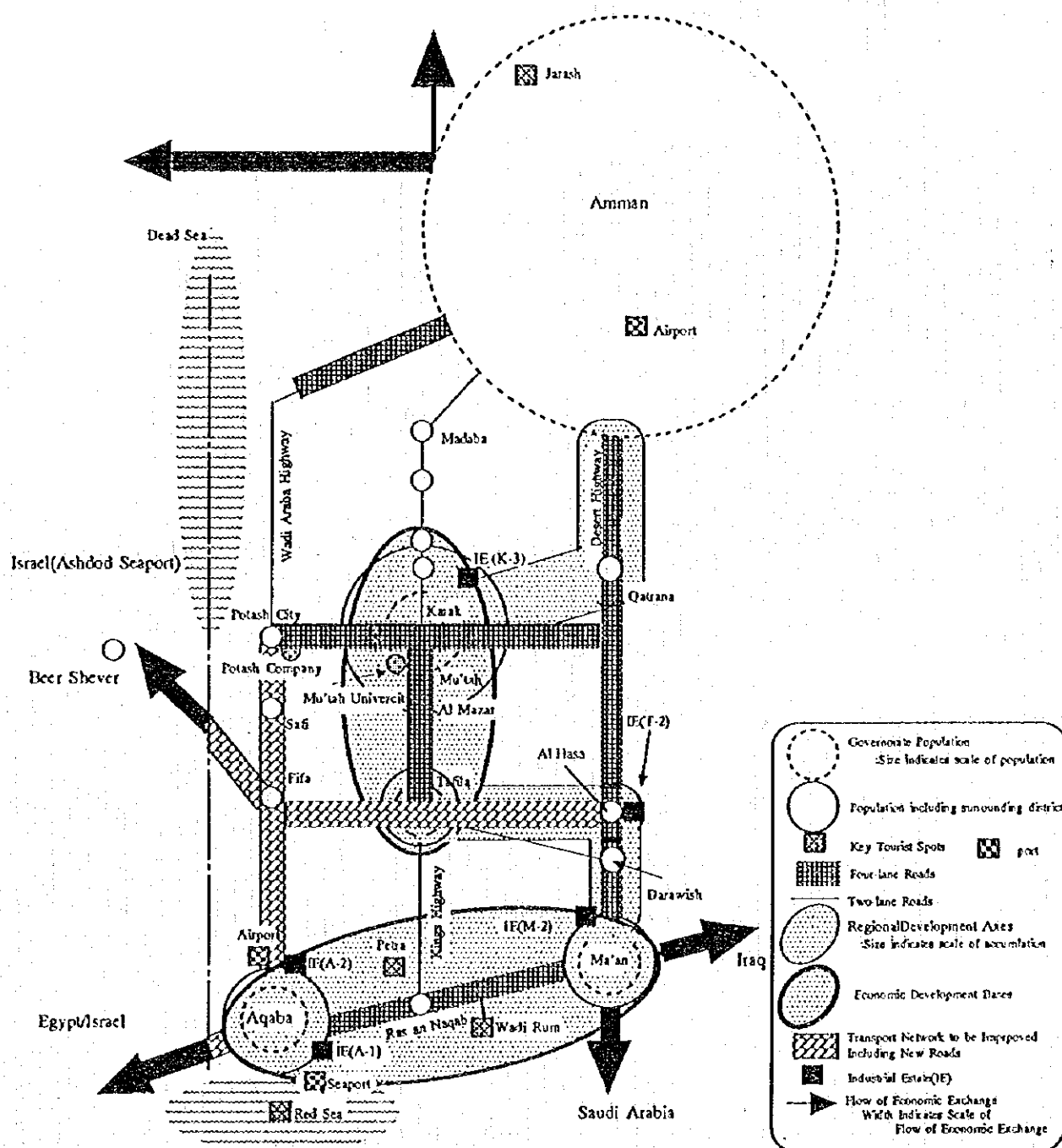
JAPAN INTERNATIONAL COOPERATION AGENCY

JORDAN INDUSTRIAL ESTATES CORPORATION

STUDY ON INDUSTRIAL DEVELOPMENT IN
THE SOUTHERN DISTRICTS OF THE HASHEMITE
KINGDOM OF JORDAN

Figure 6-2-2 Urban Economic Linkage and
Regional Development Axes
(Medium-Term: 2005)

NIIPPON KOEI CO., LTD
JAPAN INDUSTRIAL LOCATION CENTER
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JAPAN INTERNATIONAL COOPERATION AGENCY

JORDAN INDUSTRIAL ESTATES CORPORATION

STUDY ON INDUSTRIAL DEVELOPMENT IN
THE SOUTHERN DISTRICTS OF THE HASHEMITE
KINGDOM OF JORDAN

Figure 6-2-3 Urban Economic Linkage and
Regional Development Axes
(Long-Term: 2010)

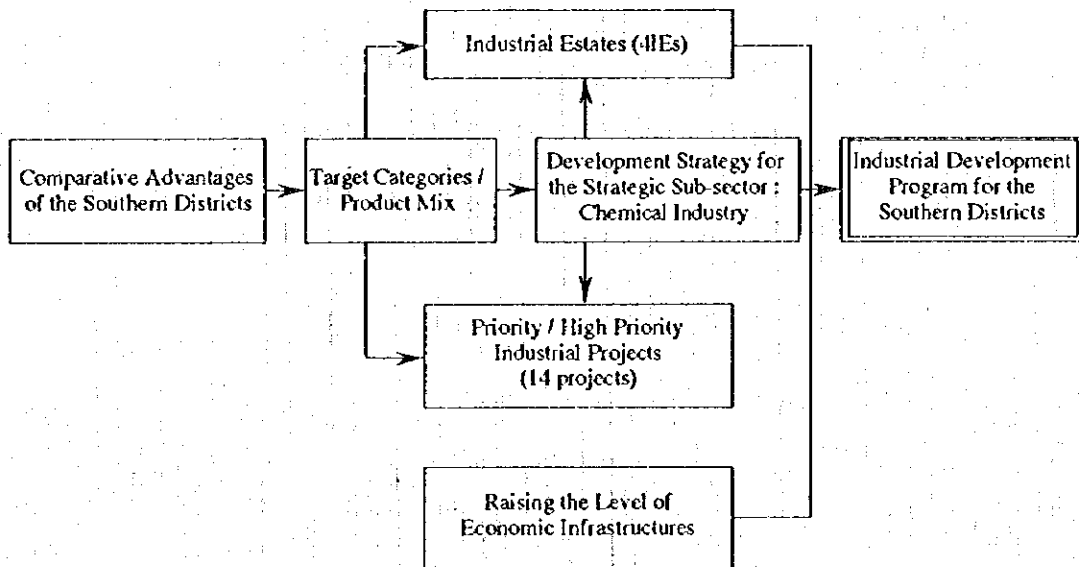
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VII. INDUSTRIAL DEVELOPMENT PLAN

The overall industrial development plan for the Southern Districts has been formulated in line with the proposed development strategies, as shown below:

Formulation of Industrial Development Plan for the Southern Districts

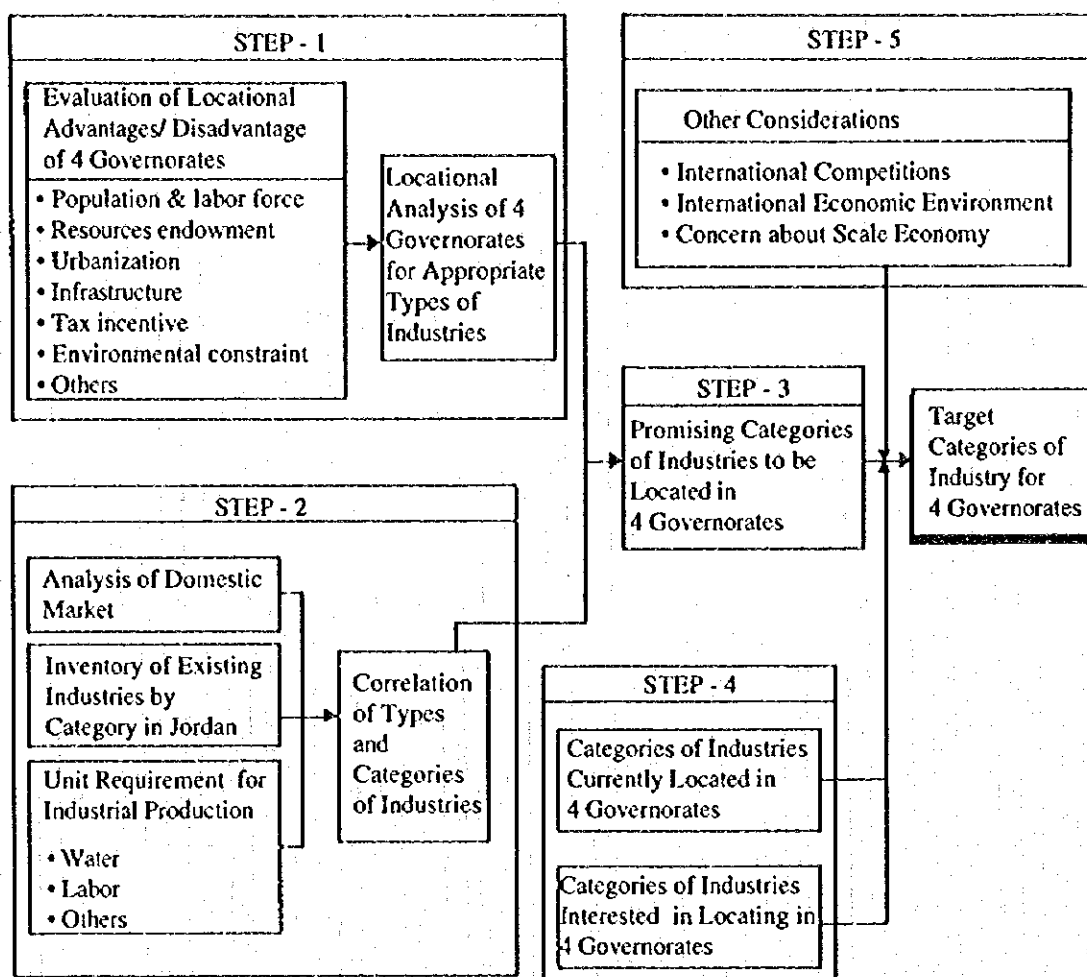


7-1 Development Strategy for the Strategic Industrial Sub-sector

7-1-1 Selection of Product Mix

(1) Selection criteria for target categories of industry

The basic principle for setting up the selection criteria is the potentiality of the industries in the light of the advantages / disadvantages of four governorates as well as of the country, not only in the current perspective but also middle and long-term perspectives.



Screening Procedure for Selecting Target Categories of Industry

The procedure for selecting the target categories of industry, which are evaluated to be fit for the development in either one or several of the four governorates either in the form of the reinforcement of the existing bases or new introduction / establishment into the four governorates, is shown in the above. The procedure comprises five steps as explained hereunder.

It should be noted that the target industries do not necessarily mean that those industries which are not among the target categories of industry should not be promoted. Rather "the target categories of industry" should be interpreted as those which should be brought into the focus for the accelerated development in the coming years.

1) Step - 1

Firstly, advantages as well as disadvantages of the four governorates of Karak, Tafila, Ma'an and Aqaba are evaluated from various aspects including labor force, resource endowment, infrastructure, tax incentives, etc. Based on the evaluation,

fitness of the various types of industries to the governorates are assessed, taking into account their locational requirements as shown in Table 7-1-1.

2) Step - 2

Secondly, correlation between the above mentioned types of industries and categories of industries are analyzed based on the relevant information and data including foreign trade statistics of Jordan, categories of industries currently in operation in Jordan, and unit water and labor requirement.

3) Step - 3

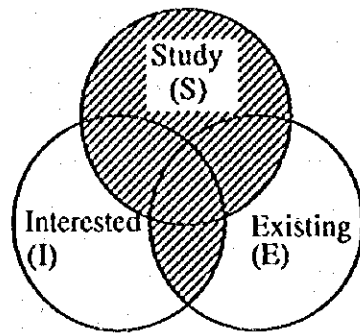
Appropriate types of industries for each governorate (Table 7-1-1) and correlation between types and categories of industries (Table 7-1-2) are compared to obtain the correlation between the governorates and categories of industries. The results are summarized in Table 7-1-3. If the governorate meets not less than 6 locational requirements of the category, i.e., not less than six (6) As (A+, A, A-) or B+s or not less than one third of the seventeen (17) requirements, the governorate should introduce or further promote the category of industries. These categories are considered as promising ones for the governorate and shown in Table 7-1-4.

4) Step - 4

In Step - 4, the promising categories for each governorate are compared with the inventory of the existing enterprises by category (Table 7-1-6) as well as the interested enterprises with preferred governorates by category (Tables 7-1-7). The comparison is shown in Table 7-1-5. In this study, the following criteria is set up in order to select the target categories of industry for each governorate unless eliminated in the subsequent and final step - 5.

- (a) Promising categories selected during Step - 3 (the circle indicated as Study (S) in the figure below) are all included in the target categories.
- (b) In case the category is currently existent (the circle indicated as Existing (E) in the figure below) and preferred by the potential inventors to be located in the governorate (the circle indicated as Interested (I) in the figure below), the category is included in the target categories of industry regardless it is among the promising ones.

The striped part in the figure below indicates the selected target categories of industry.



5) Step - 5

In this final step, other factors are taken into account which are not considered up to Step - 4 including :

- (a) International competitions
- (b) International economic environment
- (c) Concern about the economy of scale

Actually petroleum refineries which have been nominated in Aqaba and Ma'an Governorates by the work up to Step - 4 are eliminated by Step - 5. Although Jordan has an idea to build an export-oriented refinery, Jordan is not considered to have a comparative advantage for locating it over oil-producing countries in the Middle East.

These selected in Step - 4 and not eliminated in Step - 5 are the target categories of industries for the four governorates.

(2) Target categories of industry

The target categories of industry selected are given in the table below.

**Target Categories of Industry
to be Located in the Four Governorates**

Categories of Industry	Karak	Tafila	Ma'an	Aqaba
290 Mining	0	0	0	0
311 Food manufacturing	0			0
313 Beverage	0			
322 Wearing apparel	0		0	0
331/332 Wood & Cork / Furniture	0		0	0
341 Paper products	0			
351/352 Chemical, pharmaceutical	0		0	0
361/362/369 Pottery, glass & Non-metal	0	0	0	0
381 Fabricated metal	0		0	0
382 Machinery			0	0
383 Electrical machinery				0
384 Transport equipment			0	0
385 Professional equipment			0	0
The number of target categories	9	2	9	11

Source: The Study Team

As shown in the table, Aqaba is leading among the four governorates with eleven (11) target categories, followed by Ma'an (9) and Karak (9).

1) Appropriate categories for Karak Governorate

The selected target categories for Karak Governorate are, as shown in the above table: mining; food manufacturing; beverage; wearing apparel; wood and cork / furniture; paper products; chemical and pharmaceutical; pottery, glass and non-metal; and fabricated metal.

Among the four governorates, Karak has the largest population which is more than double the population of other three governorates. It has also agro-resources as well as mineral resources. This governorate is the closest to Amman Capital Region among the four governorates. However, it is not a suitable location for export and import of goods, except the fact that it is close to the Queen Alia International Airport. According to the investment promotion law, Karak is classified as Zone C and given the best tax incentives.

From these advantages and disadvantages, the target categories are mainly for the major domestic market and local market, except some chemicals and wearing apparels. They are mostly labor intensive categories, and mineral or agro-resources based categories.

2) Target categories for Tafila Governorate

The target categories for Tafila Governorate are only mining and pottery, glass and non-metal.

Tafila has the smallest population among the four governorates and is located not close to Amman Capital Region, seaport nor airport. It has rich mineral resources such as phosphate rock, limestone, natural sand and copper. Tafila is classified as Zone C by the investment promotion law, and given the best tax incentives, as well as Karak.

From these advantages and disadvantages, the target categories are limited to mineral resource-based category: mining and pottery, glass and non-metal industry, particularly cement manufacturing.

3) Target categories for Ma'an Governorate

Ma'an has the following advantages: rich mineral resources, particularly phosphate rock of Eshidiya mine with the largest reserves; relatively close location to the Aqaba Port and the Aqaba International Airport; close location to Disi water resources; suitability for technology intensive categories based on experience and accumulation in the manufacturing industry, such as car repairing and parts manufacturing which have been developed by the trade with the neighboring countries; the best tax incentive as Zone C by the investment promotion law; little restraint in providing enough space for manufacturing; and good location for industrial cooperation with Saudi Arabia and Iraq. On the other hand, its population is low despite a vast area size, therefore, local market is limited and labor is not enough for labor intensive industries.

From these advantages and disadvantages, the following are selected as target categories for Ma'an Governorate: mining; wearing apparel; wood and cork / furniture; chemical and pharmaceutical; pottery, glass and non-metal; fabricated metal; machinery; transport equipment; and professional equipment.

4) Target categories for Aqaba Governorate

Aqaba has the following advantages: The Aqaba Port and the Aqaba International Airport; close location to Disi water resources; experience and accumulation in the manufacturing industry, such as car repairing, building and repairing of small ships or boats; and good location for industrial cooperation with Israel, Saudi Arabia and Egypt. However, its location is far from Amman Capital Region.

From these advantage and disadvantages, the following categories are selected as target categories for Aqaba Governorate: mining; food manufacturing; wearing apparel; wood and cork / furniture; chemical and pharmaceutical; pottery, glass and non-metal; fabricated metal; machinery; electrical machinery; transport equipment; and professional equipment.

(3) Product Mix

The product mix has been selected based on the potentiality of the product mix in the light of the advantages / disadvantages of the four governorates, not only in the current perspective but also middle and long-term perspectives. The results are listed below by governorate:

Karak Governorate

<u>Categories of Industry</u>	<u>Product Mix</u>
290 Mining	Phosphate rock, gypsum, oil shale, limestone, wadi sediment and pure limestone
311 Food Manufacturing	Canning of fruits and vegetables, jams and jellies; pickles and sauces; biscuits; candies
313 Beverage	Soft drinks including fruit-flavored and carbonated fruit drinks
322 Wearing apparel	Wearing apparel of high and medium quality including underwear, outerwear, hat, etc.
331/332 Wood & cork / furniture	Lumber, building materials such a sash, doors window and door frames, wooden furniture and fixture, etc.
341 Paper products	Shipping boxes or cases made of corrugated or solid fiberboard.
351/352 Chemical, pharmaceutical	The Dead Sea mineral resource-based chemicals such as potassium chloride fertilizer, magnesium oxide, bromine and its derivatives, industrial and table salt, etc.; paint; synthetic detergent
361/362/369 Pottery, glass & Non-metal	Pottery; structural clay product such as bricks, tile, pipe and refractories; gypsum plaster; concrete block
381 Fabricated metal	Cutlery, hand tools and general hardware; structural metal products such as metal doors and screens, window frame and sashes, metal staircase and other architectural metal work; kitchen works

Tafila Governorate

Categories of Industry	Product Mix
290 Mining	Phosphate rock, oil shale, natural sand, limestone and copper
361/362/369 Pottery, glass & Non-metal	Glass and glass products; cement; gypsum-plaster; structural clay product such as bricks, tile, pipe and refractories; concrete block

Ma'an Governorate

Categories of Industry	Product Mix
290 Mining	Phosphate rock, limestone and kaolin
322 Wearing apparel	Wearing apparel of high and medium quality including underwear, outerwear, hat, etc.
331/332 Wood & cork / furniture	Lumber, building materials such as sash, doors window and door frames, wooden furniture and fixture, etc.
351/352 Chemical, pharmaceutical	Phosphoric acid and phosphate rock-based chemicals
361/362/369 Pottery, glass & Non-metal	Glass and glass products; structural clay product such as bricks, tile, pipe and refractories; concrete block
381 Fabricated metal	Cutlery, hand tools and general hardware; structural metal products such as metal doors and screens, window frame and sashes, metal staircase and other architectural metal work
382 Machinery	Alteration and repair of heavy machinery and equipment used by mining industry and chemical industry; agricultural machinery and equipment
384 Transport equipment	Assembling, alteration and repair of motor vehicles; manufacturing parts for small transportation equipment
385 Professional equipment	Laboratory and scientific instruments; watches and clocks

Aqaba Governorate

Categories of Industry	Product Mix
290 Mining	Granite and glass sand
311 Food Manufacturing	Ice cream; bakery; candies
322 Wearing apparel	Wearing apparel of high and medium quality including underwear, outerwear, hat, etc.
331/332 Wood & cork / furniture	Lumber, building materials such a sash, doors window and door frames, wooden furniture and fixture, etc.
351/352 Chemical, pharmaceutical	Phosphate rock-based chemicals such as phosphoric acid and phosphatic fertilizers; potash-based chemicals such as potassium sulfate; paint
361/362/369 Pottery, glass & Non-metal	Glass and glass products; structural clay product such as bricks, tile, pipe and refractories; concrete blocks; artificial marble board
381 Fabricated metal	Cutlery, hand tools and general hardware; structural metal products such as metal doors and screens, window frame and sashes, metal staircase and other architectural metal work
382 Machinery	Alteration and repair of heavy machinery and equipment used by seaport, construction industry and chemical industry; agricultural machinery and equipment
383 Electrical machinery	Renovation and repair of electric motors; assembling of electric appliances such as TV. and refrigerator; fluorescent lamp
384 Transport equipment	Ship building and repair; alteration and repair of motor vehicles; spare parts for vehicles
385 Professional equipment	Laboratory and scientific instruments; watches and clocks

7-1-2 Selection of the Strategic Industrial Sub-sector and Its Development Strategy

(1) Selection of the strategic industrial sub-sector

Among target categories of manufacturing industry selected in the previous section, the chemical industry has been selected as the strategic industrial sub-sector in the Southern Districts for the following reasons:

- 1) The chemical industry can effectively utilize mineral resources in the Southern Districts, such as phosphate rock and minerals involved in the Dead Sea water.
- 2) The chemical industry can generate more value added by processing local mineral resources followed by exports.

- 3) The chemical industry can produce exportable products, which enable Jordan to earn more foreign currency. Highly skilled-labors are not necessary for manufacturing high grade products for export, if the chemical plant is well designed and constructed.
- 4) The chemical industry that will be developed from the existing potash and phosphatic fertilizer industries can use accumulated know-how of technology, operation and product dealing. Utilization of a part of the existing facilities in these industries can reduce the required capital investment.
- 5) The chemical industry can manufacture chemical commodities which have possibilities of high cost-competitiveness by utilization of local mineral resources.
- 6) The presence of fund in the two large-scale enterprises of JPMC and APC make it possible to develop the chemical industry that is capital intensive.
- 7) In the Southern Districts, the site area is available for the chemical industry that needs a wide land and consumes a large amount of water.
- 8) The chemical industry has possibilities for new development.
- 9) The chemical industry development will have effects of development of other industries, such as machine and electrical machine industries.
- 10) In the field of the chemical industry, cooperation with Israel will be available along the peace process.

(2) Formulation of the strategy

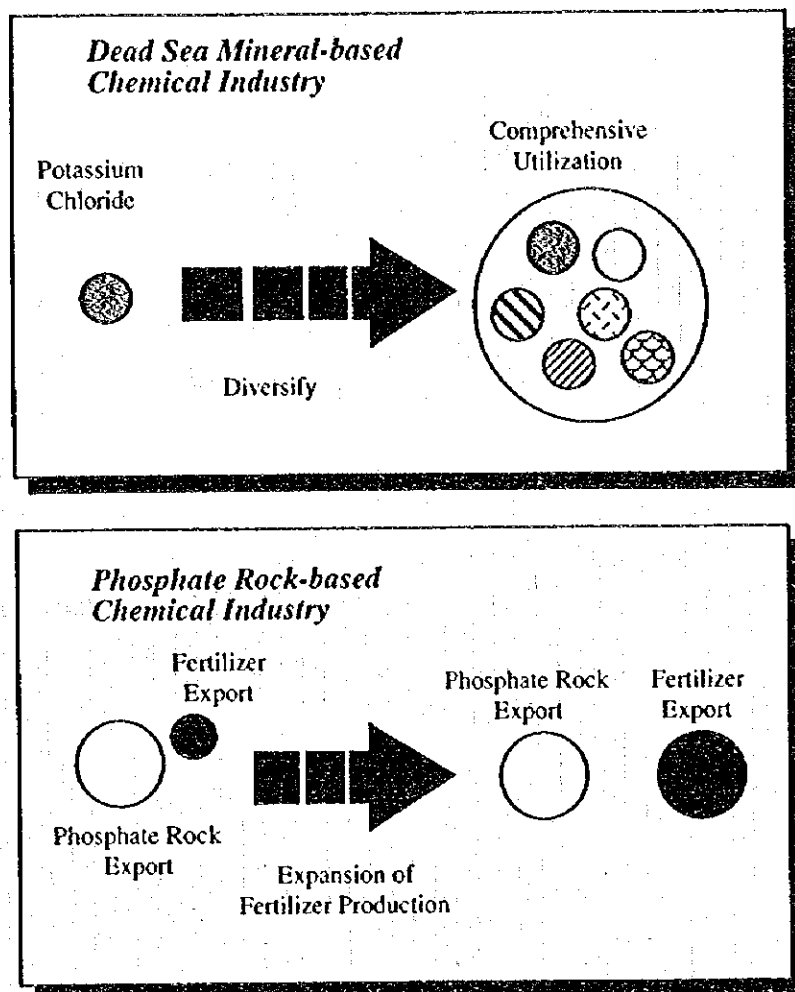
1) Core fields for development

For the development strategy for the chemical industry, a realistic measure is to concentrate in the following core fields that have great potentialities.

- Dead Sea mineral-based chemical industry
- Phosphate rock-based chemical industry

Although the Southern Districts already have existing factories of both fields, the applications are limited at present as illustrated below. The Study Team recommends to extend mineral resources utilization to wider application. Dead Sea mineral-based chemical industry should diversify its products from potassium chloride. Phosphate

rock-based chemical industry should expand fertilizer production capacity to convert about half of phosphate rock mined in Jordan to fertilizer.



Development Strategy for Chemical Industry

2) Dead Sea mineral-based chemical industry

(a) Background

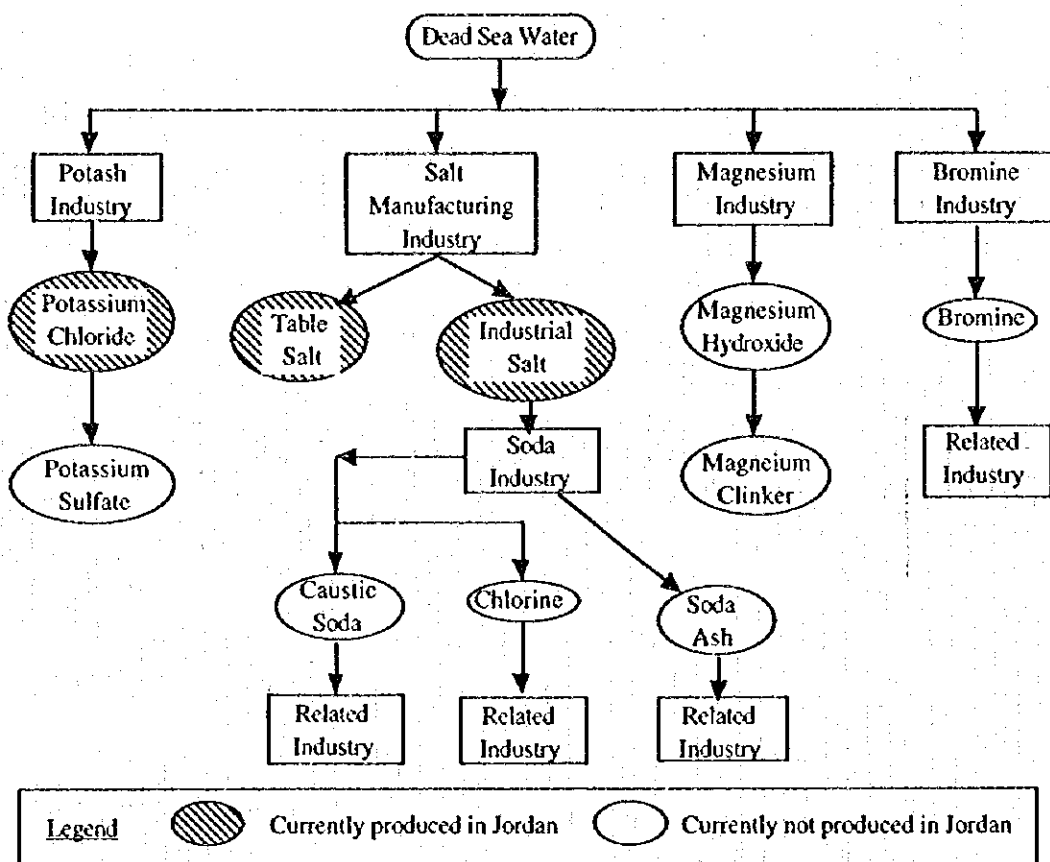
From mineral involved in water of the Dead Sea, potassium chloride that is one of the major exportable goods of Jordan, is being produced. The water of the Dead Sea involves salts of magnesium, bromine, sodium, calcium, etc. as well as potassium. The concentrations of such salts in the Dead Sea water are much higher than those in sea water. The concentration of the Dead Sea is as follows:

- Water 72.5%
- Magnesium Chloride 14.5%
- Sodium Chloride 7.5%
- Calcium Chloride 3.8%

- Potassium Chloride 1.2%
- Magnesium Bromide 0.5%

Diversifying products from the potassium chloride can lead development of the chemical industry.

(b) Description of the Dead Sea mineral-based chemical industry



The Planned Structure of the Dead Sea Mineral-Based Chemical Industry

The above figure illustrates the planned structure of the Dead Sea mineral-based chemical industry. This industry consists of a potash industry, a salt manufacturing industry, a soda industry, a magnesium industry and a bromine industry.

The Dead Sea mineral-based chemical industry is not as systematized as the petrochemical industry, because its starting material, i.e. the Dead Sea water is quite unique. Therefore, the above structure has been made with some assumption based the other inorganic chemical industries. The structure needs some verification.

The Dead Sea mineral based-chemical will be used for agricultural and industrial purposes as shown on the table below.

Users of the Dead Sea Mineral-Based Chemicals

	Agricultural		Industrial								Glass
	Fertilizer	Pesticide	Chemical	Pharmaceutical	Food	Textile	Paper and pulp	Oil Refining	Water treating	Non-metal	
Potassium Chloride	o		o								
Potassium Sulfate	o										
Table Salt					o						
Industrial Salt			o		o						
Caustic Soda			o	o		o	o	o	o		
Chlorine			o			o	o		o		
Soda Ash			o								o
Magnesium Hydroxide	o	o	o							o	
Magnesium Clinker										o	
Bromine		o	o								

a) Potash Industry

Potassium Chloride

Potassium chloride is produced, in the world, mostly from solid ores occurring in underground deposits 300-1700 m deep. However, it is produced from the Dead Sea water in Jordan and Israel. Carnallite ($\text{KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}$) separated from the Dead Sea water by the solar evaporation pond system are refined to potassium chloride by the hot leach plant or the cold crystallization plant.

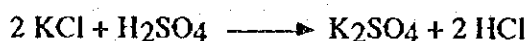
Potassium chloride is utilized mainly as fertilizer. Besides fertilizer, it is utilized for a raw material for other potassium salts and medicines; heat treatment agents; and analytical reagents.

Potassium chloride accounts for the most of potash in the global market. The global capacity of potash was about 35 million K_2O tons in 1995 and its 73 % is located in the North America and the CIS countries. The global production amount in 1994 was 22.5 million K_2O tons, of which Canada, the CIS countries and Germany together account for 73 %. Approximately 20 million K_2O tons of potash was consumed in the world, and the half was consumed in the United States, China and Brazil. The world production and trade amount had been decreased from the peak year 1988 by confusion of the former Soviet Union caused by a collapse of the economic structure, but it has been getting better since the bottom year 1993. During this change in market, Canada had stronger power as the largest producing and exporting country of potash in the world,

and it is expected that Canada control the world market by means of production adjustments in the future.

Potassium Sulfate

Several types of chemical processes are used to produce potassium sulfate. The traditional Mannheim process is used in countries that produce potassium chloride but that lack a natural resource of sulfate salts for converting the potassium chloride to potassium sulfate. In this process, potassium chloride reacts with sulfuric acid to yield potassium sulfate and hydrogen chloride as a co-product.



Compared with potassium chloride, potassium sulfate plays a minor role as sources of potassium in agriculture. Despite this small percentage in terms of total potash sales, potassium sulfate in simple form or combined with MgSO_4 as a double salt is an essential source of potassium for crops that are chloride sensitive. In arid parts of the world and where saline water is the only irrigation water available, potassium sulfate must be used instead of potassium chloride to avoid chloride toxicity. Potassium sulfate is also a well-established source of soluble sulfur, an essential element for plant growth.

b) Salt Manufacturing Industry

Industrial Salt

Industrial salt is manufactured from the Dead Sea water with high concentration of sodium chloride by the solar evaporation pond system utilizing dry climate.

Industrial salt is utilized for producing chemicals such as caustic soda and soda ash, and food industry.

Table Salt

Table salt is manufactured from industrial salt by adding magnesium chloride and other micro-ingredients for better taste and nutrition. Since these additives is easy to adsorb moisture, calcium phosphate, magnesium carbonate and starch are added in some cases to avoid deliquescence caused by adsorbed moisture. Table salt is utilized for the food industry and cooking.

c) Soda Industry

Caustic Soda

Caustic soda is produced, together with chlorine and hydrogen, from salt. Salt is decomposed by means of an electric current, after pre-treatment. An ion-exchange membrane process, a membrane process and a mercury cell process are used in the world.

Caustic soda has very wide applications as follows:

- Manufacturing rayon, cellophane and artificial fibers
- Manufacturing intermediate products of dyes, essence, medicine, etc.
- Refining of oils and fats, manufacturing soap and manufacturing paper and pulp
- Oil refining
- Manufacturing alumina and various kinds of soda
- Softening of water
- General chemical cleaning, neutralization, chemical analysis

As the chloro-alkali industry, caustic soda is produced together with chlorine. The worldwide production of caustic soda is approximately 40 million tons per year and about 60 % is produced in the North America, the Western Europe and Japan. Supply and demand in four regions which include the above three regions and Asian region, and the balance of caustic soda and chlorine are important factors to grasp the medium and long term trend of the world market .

Caustic soda production in the Middle East and Africa region is 1.3 million tons per year and Saudi Arabia plays a central role. In Saudi Arabia, about 450 thousand tons of caustic soda is annually produced and exported, while a total amount of produced chlorine is used for ethylene dichloride (EDC) production that is also exported.

Chlorine

Chlorine is manufactured by the electric decomposition together with caustic soda.

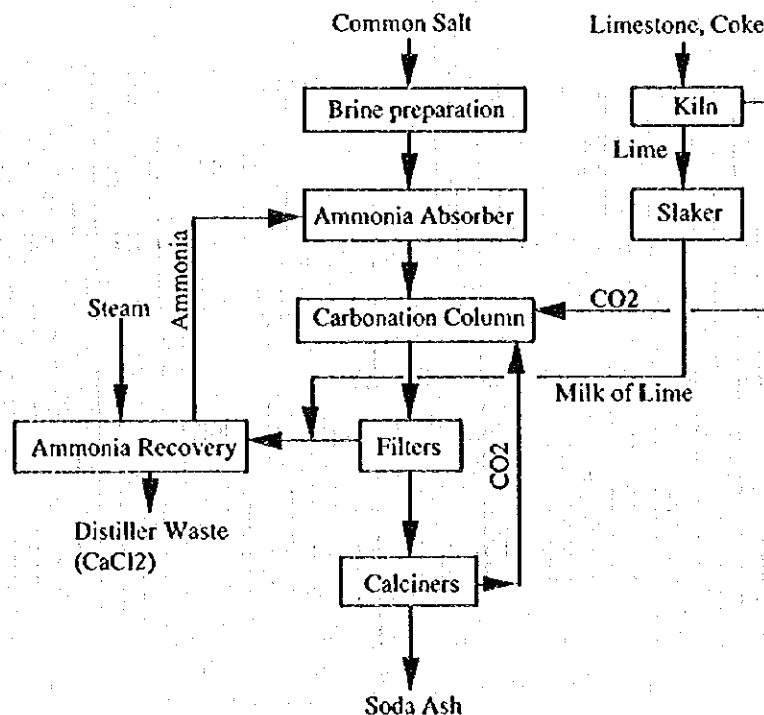
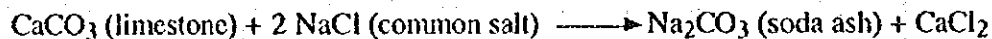
Chlorine is utilized as raw material of polyvinyl chloride (PVC), vinyl chloride monomer (VCM) and ethylene dichloride (EDC). Chlorine is also raw material of bleaching powder and sodium hypo chloride that are used for bleaching of paper and fiber, and for treatment of tap water and sewage.

Chlorine based solvent such as carbon tetrachloride is also manufactured from chlorine.

Soda Ash (Sodium carbonate anhydrous)

Soda ash is generally produced by the ammonia-soda method (Solvey process). The raw materials are common salt and limestone. Ammonia enters into the process but is not consumed, and only a very small amount is lost. Consequently, it is not a raw material in the usual sense.

The overall reaction for the entire process shown below does not take place directly, but in a number of steps.

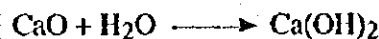


Reaction scheme of the Solvay ammonia-soda process

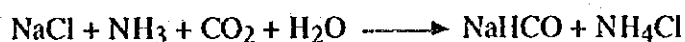
The first step is calcination of limestone with fuel in a kiln to produce carbon dioxide and lime (CaO).



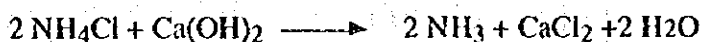
The lime is slacked with excess water to form a thick milk of lime (Ca(OH)₂).



Common salt, in the form of near-saturated, purified brine, is treated with ammonia and carbon dioxide producing ammonia chloride and precipitating sodium bicarbonate, which is filtered.



The milk of lime is added to the filtrates and distilled to recover ammonia.



Filtered sodium bicarbonate is thermally decomposed at about 200 degree centigrade to soda ash.



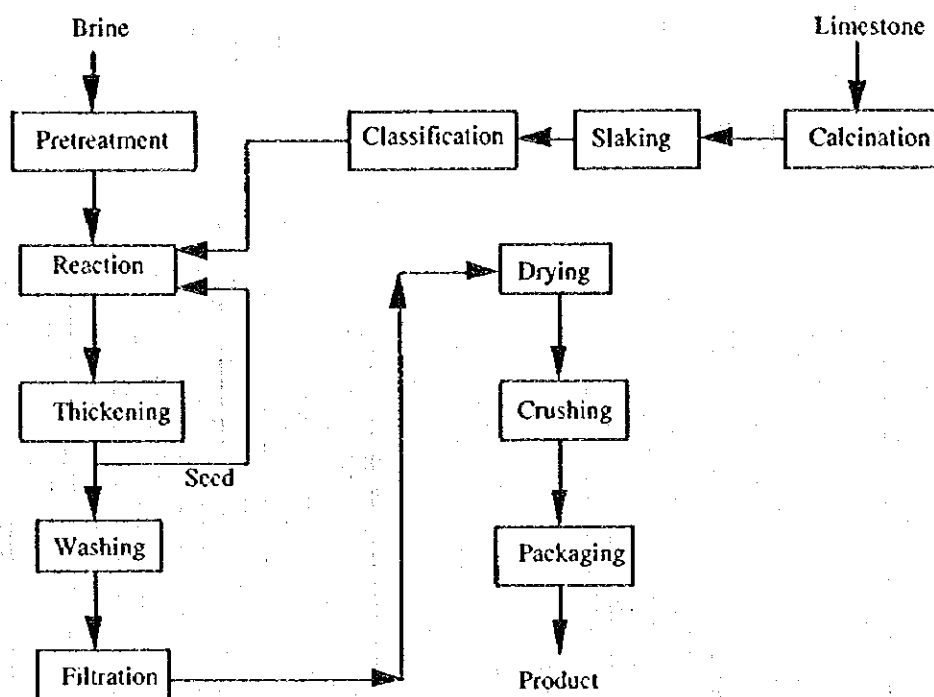
The largest use of soda ash is in glass manufacture. It is also used in the production sodium bicarbonate, sodium silicate, barium carbonate, glutamic acid, amine acid, detergent, intermediate of dyes, sodium dichromate, etc.

d) Magnesium Industry

Magnesium Hydroxide

Calcium carbonate is produced as a co-product by adding slaked lime into the Dead Sea water without pre-treatment, since the Dead Sea water involves carbonic ion together as well as magnesium ion. Therefore, carbon dioxide is removed from the raw material followed by a reaction with slaked lime to produce magnesium hydroxide. The reaction product is rather colloidal form that is not easy to precipitate and washing. In order to avoid such phenomena, magnesium hydroxide particles are enlarged, by means of seeds circulation, to make magnesium hydroxide with good precipitation and filtration.

Solid magnesium hydroxide is used to produce adsorbents, fertilizers, medicines, ceramics, artificial marble, additives to heavy fuel oil, detergents, polyvinyl chloride stabilizers, phosphatic magnesium etc. Slurry magnesium hydroxide is used for flue gas desulfurization.



Manufacturing Process of Magnesium Hydroxide

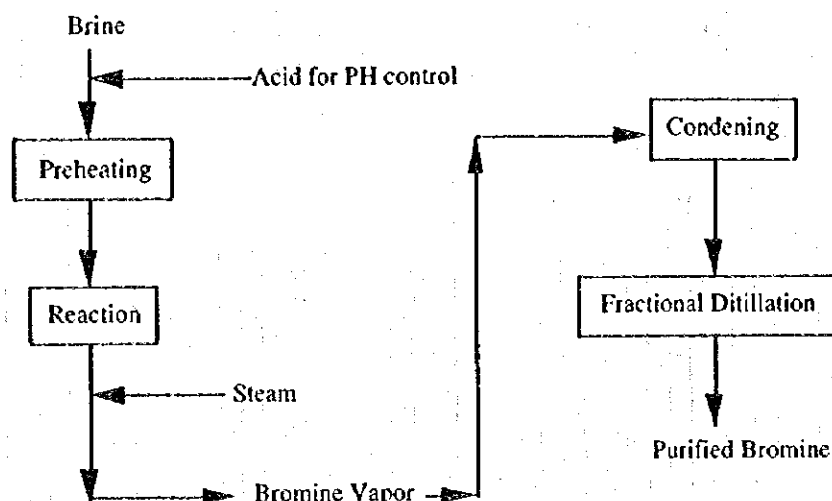
Magnesium Oxide

Magnesium oxide is the principal product of the magnesium industry. It is usually produced by calcining magnesium hydroxide.

Commercial magnesium oxide is available as caustic-calcined magnesia, dead-burned magnesia, and fused magnesia. Caustic-calcined magnesias are produced below 900 °C and are characterized by moderate to high chemical reactivities. Dead-burned magnesia are produced above 1400 °C and are characterized by their low chemical reactivities and their resistance to the basic slag employed in the metal-refining industry. Pure fused magnesia is produced at temperatures above 2750 °C. It is superior to dead-burned magnesia in terms of strength, abrasion resistance, and chemical stability.

e) Bromine Industry

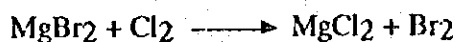
The most readily recoverable form of bromine occurs in the hydrosphere as soluble bromine salts. The bromide concentration in sea water is reported generally to be 65 mg/liter, although many data are varied. Other extractable sources of bromine occur in salt lakes, salines, and inland seas. The Dead Sea is the richest source, containing nearly 4 g/liter of bromide at the surface and 8.3 g/liter of bromide in the effluent water of potassium chloride production.



Manufacturing of Bromine

The manufacturing process of bromine consists of four steps: (1) oxidation of bromide to bromine; (2) bromine vapor removal from solution; (3) isolation of bromine from the vapor; (4) purification. For the step (1), chlorine is usually used for oxidation. In the step (2), to remove bromine vapor, it is economical way that steam is normally used in the case that the raw material contains more than 1 g/liter of bromine, on the other hand air is used in the case of the raw material with lower bromine concentration like sea water.

Of the raw material, after preheating, acidity is controlled at around pH 3 by adding sulfuric acid, etc. Then the pretreated raw material and chlorine gas are fed to a reactor from the top and the bottom, respectively. The raw material contacts with chlorine gas in the reactor to liberate bromine. The reactant is sent by steam-out to a condenser where crude bromine is obtained. The crude bromine is then fractionated for purification.



Bromine is used to produce agricultural chemicals, fire retardants for plastics and synthetic chemical fibers, other industrial chemicals, etc.

Fire retardants are divided into halogen, phosphorus and inorganic fire retardants. Halogen fire retardants are further divided into bromide and chloride. The typical bromine based fire retardants is tetrabromobisphenol-A and its demand is increasing, because a restriction of non-combustibility has been strengthened for electric appliances.

(c) Dead Sea mineral- based chemical industry in the Southern Districts

a) Jordan Dead Sea Industries Company (JODICO) was established as a holding company, with the following shareholders: APC (51%), Social Security Corporation (18%), Jordan Investment Corporation (10%), Jordan Phosphate Mines Company (6%) and others (15%), for investment to the Dead Sea mineral resources development as mentioned in the previous chapter. This company is proceeding the projects for industrial and table salt, potassium sulfate, magnesium oxide and bromine. In this way, the Dead Sea mineral-based chemical industry has been started diversifying. Successive implementation of the projects and their comprehensive expansion encourage the industrialization in the Southern Districts.

b) The following attentions should be paid to promote the Dead Sea mineral-based chemical industry:

- It is not a realistic measure that industrialization is promoted for all products mentioned above simultaneously. Phase-in program of products is recommended in consideration of product linkage.
- It is necessary to investigate the potential markets, from view points of the current status, the future prospect and possibility of Jordan's joining. Stable markets are essential for the success in projects, therefore, equity participation by potential customers may be required for some cases.
- Selection of production technology needs to investigate the requirement of raw materials and utilities, product quality, kinds of by-products, experiences in commercial operation, required investment.
- Feasibility studies are essentially required for detail investigation.
- Cooperation with Israeli enterprises should be considered as much as possible, because Jordan and Israel can use a common mineral resources from the Dead Sea. Technology introduction from Israel, cooperative distribution of products, and research and development are seemed suitable for cooperation.

c) Site location for the Dead Sea mineral-based chemical industry should be selected based on the two categories of products as follows:

- For the products that needs large amounts of the Dead Sea water or the brine from the existing potassium chloride plants, near Safi in Karak

Governorate where the existing potassium chloride plant exists is a mandatory location. Industries belonging to this category are manufacturing of potassium chloride, industrial/table salt, magnesium hydroxide, magnesium oxide and bromine.

- For other products that can be exported, suitable location is Aqaba where there is a port for exportation, or near Safi where raw material linkage is available. Industries belongs to this category is manufacturing of potassium sulfate and caustic soda.

3) Phosphate rock-based chemical industry

(a) Background

The table below shows reserves of phosphate rock of the three phosphate mines in Jordan.

Reserves of Phosphate Rock
(as of January 1, 1996)

	Unit: Million tons			
	Confirmed	Probable	Possible	Total
Al Abyad	46	6	68	120
Al Hasa	60	8	8	76
Eshidiya	814	340	320	1,474
Total	920	354	396	1,670

Source: Jordan Phosphate Co., Annual Report, 1995

Among three mines, the Eshidiya mine has the largest reserve of phosphate rock, accounting for 88% of whole Jordan. A total of confirmed, probable and possible reserves reaches 1.67 billion tons that corresponds to over 330 times of current annual production rate in Jordan. This is quite enough for exportation and industrialization. Production capacity of the mines are shown below.

Design Capacity of Phosphate Mines

		Design Capacity Thousand tons/year	Remarks
Al Abyad		2,500	to be closed in 2006-2010
Al Hasa		2,500	to be closed in 2007-2010
Eshidiya	No.1	3,350	developed during 1988-1997
	No.2	4,200	development to be started from 1999
	No.3	3,000	development to be started from 2003-2005

Source: Jordan Phosphate Co.

Al Abyad and Al Hasa mines are scheduled to be closed during 2006-2010 due to exhaustion of phosphate rock, although the exact schedule depends on whether maintaining mining activity will be economical or not at the price level of phosphate rock and cost of mining at that time. On the other hand, the production of Eshidiya mine will increase gradually to replace the current production at Al Abyad and Al Hasa mines. JPMC's strategy is to concentrate the progressive development of Eshidiya mine. A total production capacity of phosphate rock will reach 10-11 million tons per year at the end of this century and this level will be kept since then.

**Production of Phosphate Rock
(1995)**

Production, tons/year	
Al Hasa	1,920,220
Al Abyad	1,900,155
Eshidiya	1,035,591
Resaifa	122,934
Total	4,978,900

Source: Jordan Phosphate Co., Annual Report, 1995

Approximately five million tons of phosphate rock was produced in Jordan in 1995 as shown on the above table. 1.1 million tons of phosphate rock that accounts for 22% of the total production was sent to the industrial complex in Aqaba to produce phosphatic fertilizer, the rest 3.9 million tons being exported as phosphate rock.

It is recommended to increase the amount of phosphate rock to be processed up to half of the total production. Based on this strategy and increase in production, the balance of phosphate rock will become as follows:

Total produced	10-11 million tons/year
Domestic consumption	5.0-5.5 million tons/year
Industrial complex in Aqaba (Existing)	1.1 million tons/year
Phosphoric acid plant (IJC)	0.8 million tons/year
Increase by new projects	3.1-3.6 million tons/year
Export	5.0-5.5 million tons/year

The phosphate rock-based chemical industry should be promoted in the Southern Districts to process 3.1-3.6 million tons/year of phosphate rock, in addition to the

existing industrial complex in Aqaba and the phosphoric acid plant under construction in Eshidiya.

(b) Description of the phosphate rock-based chemical industry

Almost 90% of mined phosphate rock is used to produce fertilizer and the rest 10% is used in chemical industries, livestock feed supplement, detergent, pesticides, soft drinks, match heads, aluminum polish, tooth paste, etc. Therefore, the development should focus on the phosphatic fertilizer industry, because of its vast dimension.

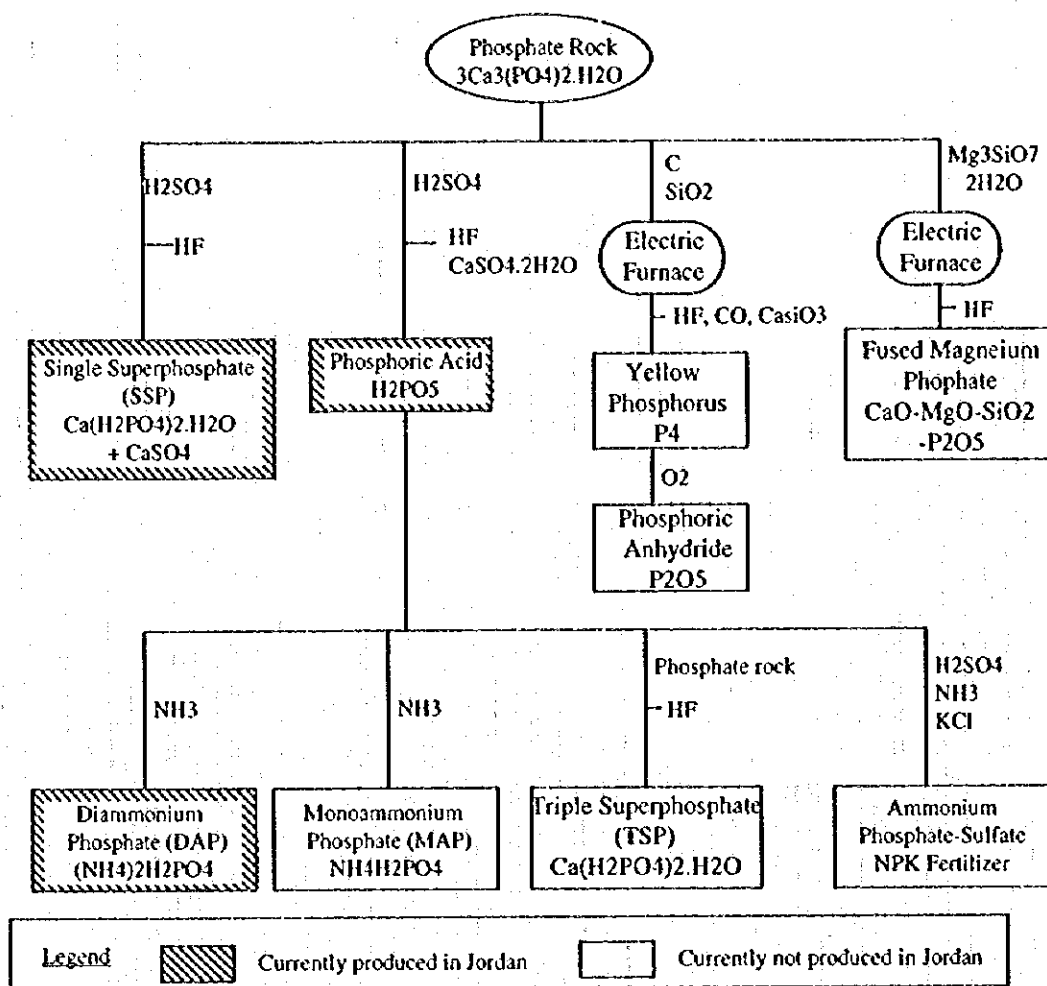
It is recommended to develop the phosphatic fertilizer industry selecting from those which illustrated in the next figure.

a) Single superphosphate (SSP)

Single superphosphate (SSP) is produced by the reaction of phosphate rock with sulfuric acid. SSP is the mixture of calcium dihydrogen phosphate ($\text{Ca}(\text{H}_2\text{SO}_4)_2 \cdot \text{H}_2\text{O}$) and gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$).

SSP is manufactured by the three steps, i.e. crushing of phosphate rock, the reaction of crushed phosphate and sulfuric acid, and aging.

SSP contains soluble phosphoric acid P_2O_5 by 16 to 20 %. SSP is used as single fertilizer and also used as a raw material of combined fertilizer, mixing with ammonium sulfate, urea and potassium salts.



The Planned Structure of the Rock Phosphate-Based Chemical Industry

b) Phosphoric acid

The phosphoric acid can be produced by the two process; the dry process by reduction of phosphate rock in the electric furnace with coke and silica; and the wet process by a reaction of phosphate rock and sulfuric acid.

Besides manufacturing of fertilizers, phosphoric acid is used for phosphoric salts manufacturing, metal surface treatment, plating, medicine, dyes, food additives, tooth paste, etc.

c) Diammonium phosphate (DAP) and monoammonium phosphate (MAP)

Phosphoric acid reacts with ammonia and acidity is controlled at around pH 4. Then, iron and alumina are deposited and can be removed by filtration. Ammonia is injected to filtrate after concentration, and it is sent to a crystallizer, where crystal of DAP is obtained.

MAP is also produced from phosphoric acid and ammonia, in granular and nongranular (powder) forms by several methods.

Desirable fertilizer has been shift to combined fertilizers from single fertilizers. Combined fertilizer with high concentration of nutrients is particularly needed for the reason of reducing delivery cost and saving labor for supplying fertilizers to crops. Consumption of ammonium phosphate, which consists of DAP and MAP, is increasing for such high-nutrient combine fertilizer.

d) Triple superphosphate

By using phosphoric acid instead of sulfuric acid of SSP manufacturing, high concentration of calcium dihydrogen phosphate, called triple superphosphate (TSP), can be obtained without by-producing gypsum.

TSP contains soluble phosphoric acid P_2O_5 by 30 to 48 %. TSP is used as single fertilizer and also used as a raw material of combined fertilizer.

e) Ammonia phosphate-sulfate type NPK fertilizer

Compound fertilizers that contain more than two nutrients, e.g. N-P, N-K, P-K or N-P-K, with more than 30% in total is called high analysis compound fertilizer. The high analysis compound fertilizer is classified depending on raw materials, production process and composition. Among them, ammonium phosphate-sulfate type NPK fertilizer is commonly used.

Ammonia phosphate-sulfate type NPK fertilizer is produced by the following two methods:

- Ammonia gas is fed to mixture of sulfuric acid and phosphate acid, followed by adding potassium salt and slurry form product is obtained. This slurry form product is granulated in the next step.
- In the first step, ammonium phosphate or ammonium phosphate-sulfate is produced. Potassium salts, urea, or ammonium sulfate is blended to them and granulated in the next step.

Ammonium phosphate-sulfate type NPK fertilizer, which contains high concentration of nutrients and is granular, has the economic advantages of low transportation and storage costs, less time required for fertilization, being suitable for mechanical fertilization.

f) Fused magnesium phosphate (FMP)

FMP is produced by the reaction of phosphate rock and serpentine under the high temperature in an electric furnace. The fused product from the furnace is cooled by cold water to make particles with about 2 mm diameter. The particles are drained and dried, followed by crushing.

FMP has functions not only as phosphatic fertilizers, but also as soil conditioner, since it contains silic acid, lime and magnesium. It is effective for an superannuated acid paddy.

(c) Phosphate rock-based chemical industry in the Southern Districts

a) JPMC is proceeding two projects which are categorized as the phosphate rock-based chemical industry. One is the phosphoric acid plant construction project proceeded by a joint venture with Indian company. The other is the NPK fertilizer plant construction project by a joint venture with Japanese companies.

As the result of development of the phosphate rock-based chemical industry, raw material exports will be converted to exports of finished products or intermediate products with higher value added. This conversion is quite essential for industrial development in the Southern Districts.

b) The following matters are recommended for the development of the phosphate rock-based chemical industry:

- Market development is quite important for the fertilizer industry. Based on the market requirements, a product should be selected from many fertilizers.
- The most promising market of fertilizer is Asian region where economy is growing very rapidly and location is relatively close to Jordan. Therefore, Asian region should be the target market for Jordan's phosphate rock-based chemical industry.
- It is suggested to realize projects by a joint venture with global fertilizer makers and global grain dealers, because fertilizers are international marketable commodities.
- Manufacturing technology of fertilizers is considered to be reliable, from the fact that many commercial plants are running without serious problem.

It should be selected based on requirements of raw materials and utilities, product quality and usage, by-products and required investment.

- Besides fertilizers, phosphate is consumed to produce inorganic chemicals whose market size is much smaller than fertilizers purpose. Before starting the projects, the size of potential market should be researched whether it is economically enough for the new plant in Jordan.
- Needless to say, profitability of the project should be well investigated in advance.
- Transportation infrastructure should be improved to reduce distribution cost. Cost is one of the most important factor for competitiveness.
- A feasibility study should be conducted for each project.

c) Site location

Eshidiya or Aqaba is seemed to be the best location of the plant of the phosphate rock-based chemical industry. Eshidiya, where Jordan has the largest reserves of phosphate rock, is suitable to provide phosphate rock. Aqaba, where Jordan has a seaport, is the best for product exports.

Site location should be selected depending on the type of products. For example, the wet process phosphoric acid plant, which needs 3.2 tons of phosphate rock to produce 1 ton of phosphoric acid (as 100 % P_2O_5), may be better to locate in Eshidiya from view points of transportation cost.