8-2 Industrial Estates In Turkey

The term "industrial estate" is usually taken to mean "a tract of land developed and subdivided into plots according to a comprehensive plan with provision for roads, transport and public utilities with or without built-up factories, sometimes with common facilities and sometimes without them, for the use of a community of industrialists".* An industrial estate is understandable as a comprehensive system of basic infrastructure which is needed by investors, mainly by manufacturers, sometimes by distribution and trading businesses. It's composed of not only plots of land but also a complex of such facilities as transportation, telecommunication, clean water supply, electric power supply, drainage system, garbage treatment system and sewage treatment system. In most developing economies the efficiency of manufacturers is usually affected by the shortage of these facilities and systems. Then the public sector has to develop industrial estates in order to provide efficient environment for manufacturers. Even in Filyos district, the infrastructure doesn't seem sufficient for industrial investors. Therefore the development of industrial estates will be required to utilize effectively the port services and to raise the economic base of the region.

* W.Bredo. The Industrial Estate -- Tool for Industrialization (Stanford Research Institute, 1960)

8-2-1 Experiences of Industrial Estates Development in Turkey

Industrial estates in broad sense have been developed and managed by two ministries in Turkey. The Free Trade Zones are supervised by the States Planning Organization, while the organized industrial estates and the Small Scale Industrial Estates are subsidized by the Ministry of Industry.

(1) Free Trade Zones (F.T.Z.s)

The government to Turkey has developed four F.T.Zs so far as a measure to realize outward-looking industrialization. They are located at Mersin, Adana (Iskendern), Antalya and Izmir. (See Figure 8-2-1), All of them are

located on the Mediterranean and Aegean coasts. Two of them are in operation: Antalya and Mersin.

A document, which was presented for the OECD Seminar, states the objective of FTZs as below:

> The objective of Turkey's Trade Zones (FTZ) are: to increase the inflow of foreign investment, to attract high-tech industries which do not exist in Turkey through Free Zones and to learn from them, to increase the service and export revenues, hence, to contribute to the valance of payments and growth of the economy. Furthermore, the achievement of the above objectives will also contribute to increased employment and overall wealth. (Free Zones in Turkey, prepared by Yalcin Alaybeyoglu)

The basic information of these two FTZs shall be shown on Table 8-2-1. The number of tenants has reached 45 in Antalya and 120 in Mersin. However, most of them, 88 per cent of 165 tenants, are in the trade & service businesses, not in manufacturing.

Fig. 8-2-1 Location of Free Trade Zones in Turkey

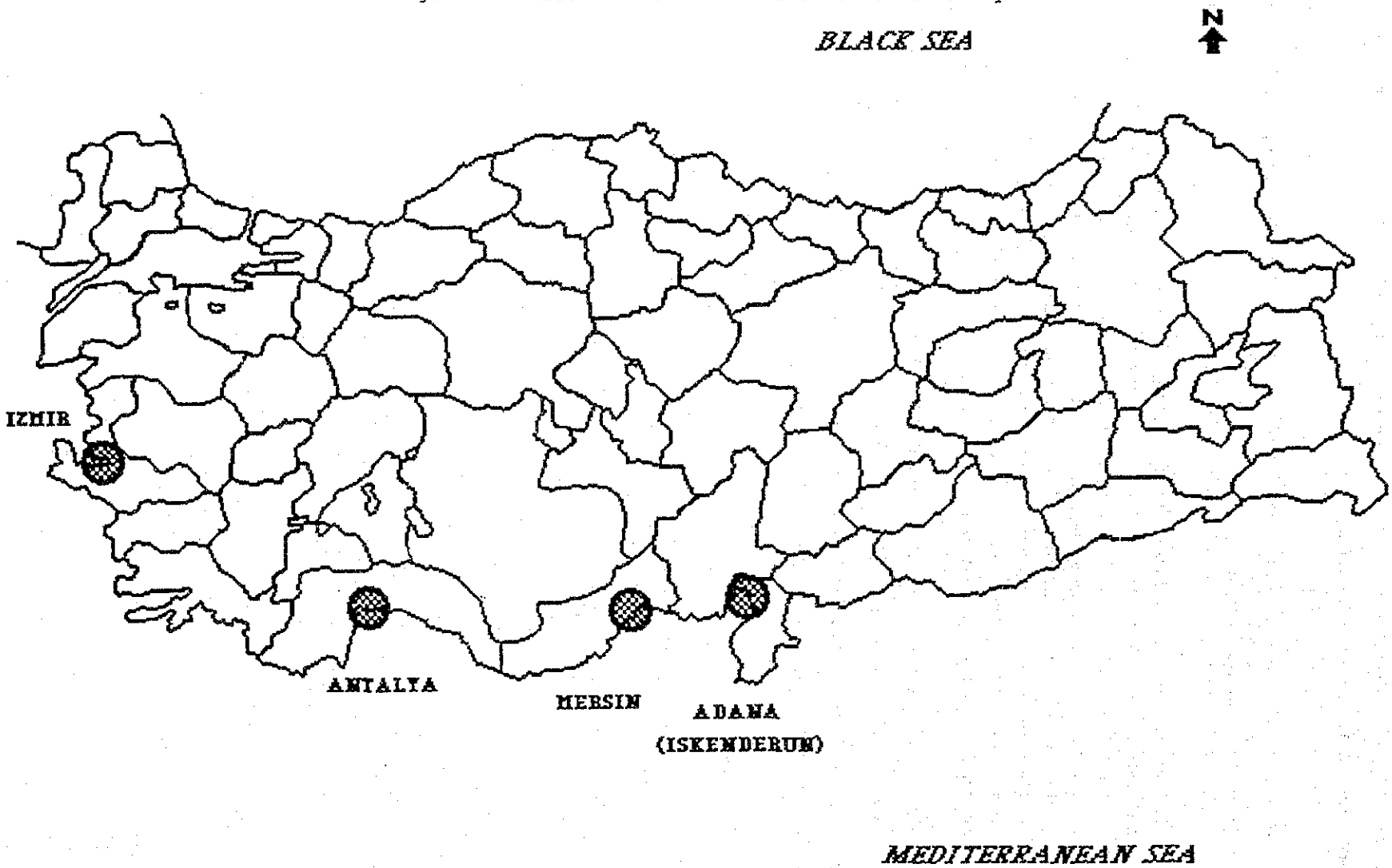


Table 8-2-1(1) Basic Experiences of Antalya and Mersin Free Zones

Zones	Antalya	Mersin
Total Land Area('000 sq. m)	544	776
Distance from Urban Center (kms)	4.0	6.0
Beginning Date of Construction	01-04-86	12-08-85
Start of Operation	06-02-88	23-2-88
Number of Tenants (as of Nov.89)	45	120

Source: Free Zone Directorate, State Planning Organization

Table 8-2-1(2) Actual Performances of Antalya and Mersin Zones

Type of Activities	Manufacturing	Trade & Services	Total
Number of Tenants	19	146	165
Registered Investment (million US $)	14.5	29.0	43.5
Number of Employment	2,336	2,553	4,889
Added Value (million US $)	113.1	121.6	234.7
Occupied Area (sq.m)	64,000	157,060	221,060

Source: Free Zone Directorate, State Planning Organization

Table 8-2-1(3) Land Use Efficiency

Type of Activities	Manufacturing	Trade & Services	Mfg/T&S
Employment (Person/sq.m)	0.037	0.016	2.31
Investment ('000 US $/sq.m)	0.226	0.185	1.22
Added Value ('000 US $/sq.m)	1.767	0.774	2.28

Source: Free Zone Directorate, State Planning Organization

(2) Organized Industrial Estates and Small Industrial Estates

Although the FTZs are managed by the State Planning Organization, the Ministry of Industry has subsidized the development of Organized Industrial Estates ('Organize Sanayi Bolgesi", OSB) and Small industrial Estates ("Kucuk Sanayi Siteleri", KSS).

So far, 16 OSBs have been completed, 20 OSBs are under construction and it has been decided to develop 9 OSBs during the 6th Plan Period in the whole country as shown on Table 8-2-2. The approximate location of these estates shall be shown in Figure 8-2-2. Three OSBs have been completed in the study region: Ankara, Bolu, and Cankiri.

The Ministry of industry has supported local manufacturers by providing subsidies to improve the infrastructures for operation. The projects under this scheme are named as KSS, experiences of which shall be indicated on Table 8-2-3. According to that, 165 projects have been subsidized until the end of 1989, and 270 projects are loaned to get governmental support during the coming Plan Period. In the Study Region (four provinces), there are 22 KSSs completed already and 11 KSSs are now under construction as shown on Table 8-2-4. The KSSs can be designated in particular cities or towns where some sort of industrial agglomeration exists. In case of Zonguldak province, DEVREK, EREgLi, ALAPLI, KARABuK and CAYCUMA are cities which have an industrial agglomeration related to the major factory. Such agglomeration will be the basic ground work for the further stage of industrialization.

Table 8-2-2 Organized Industrial Estates in Turkey

Location	Land Area(Ha)	Development Period
Completed		
Ankara(Central)	400.00	1978-90
Bolu(Central)	60.00	1977-90
Burdur(Central)	70.00	1982-90
Hatay(Iskenderun)	180.00	1983-90
Malatya(Central)	300.00	1976-90
Mardin(Central)	300.00	1976-90
Nigde(Central)	200.00	1984-90
Denizli(Central)	400.00	1982-90
Elazig(Central)	200.00	1985-90
Cankiri(Central)	110.00	1981-90
Corum(Central)	260.00	1979-90
Bilecik(Central)	150.00	1977-90
Bursa(Inegol)	300.00	1977-90
Eskisehir(Central)	190.00	1979-90
Kayseri(Central)	600.00	1977-90
Izmir(Cigli)	600.00	1980-90
Under Construction		
Adana(Central)	1100.00	1977-93
Afyon(Central)	400.00	1981-91
Aksaray(Central)	286.00	1987-92
Antalya(Central)	196.00	1976-91
Aydin(Central)	150.00	1985-92
Balikesir(Central)	300.00	1986-92
Gaziantep(Central)	700.00	1987-93
Icel(Tarsus)	350.00	1986-93
Istanbul(Tuzla)	240.00	1983-91
Izmir(Menemen)	200.00	1988-93
Kars(Central)	200.00	1976-91
Kocaeli(Gobze)	230.00	1986-91
Konya(Central-2)	300.00	1977-91
Kutahya(Central)	170.00	1985-92
Manisa(Central)	200.00	1987-92
Sakarya(Central)	100.00	1980-92
Samsun(Central)	150.00	1982-92
Tokat(Central)	200.00	1978-91
Trabzon(Central)	150.00	1985-92
Usak(Central)	360.00	1985-91
Planned		
Bursa(Demirtas)	180.00	1990-95
Giresun(Central)	150.00	1990-95
Kahramanmaras(Central)	250.00	1990-95
Karaman(Central)	50.00	1990-95
Kirsehir(Central)	200.00	1990-95
Ordu(Central)	120.00	1990-95
Yozgat(Central)	245.00	1990-95
Sivas(Central)	300.00	1990-95
Usak(Central)	300.00	1990-95

Source: "1990 YILI YATIRIM PROGRAMI", on the Government Gazette,Oct. 16,1989

Fig. 8-2-2 Location of Organized Industrial Estates

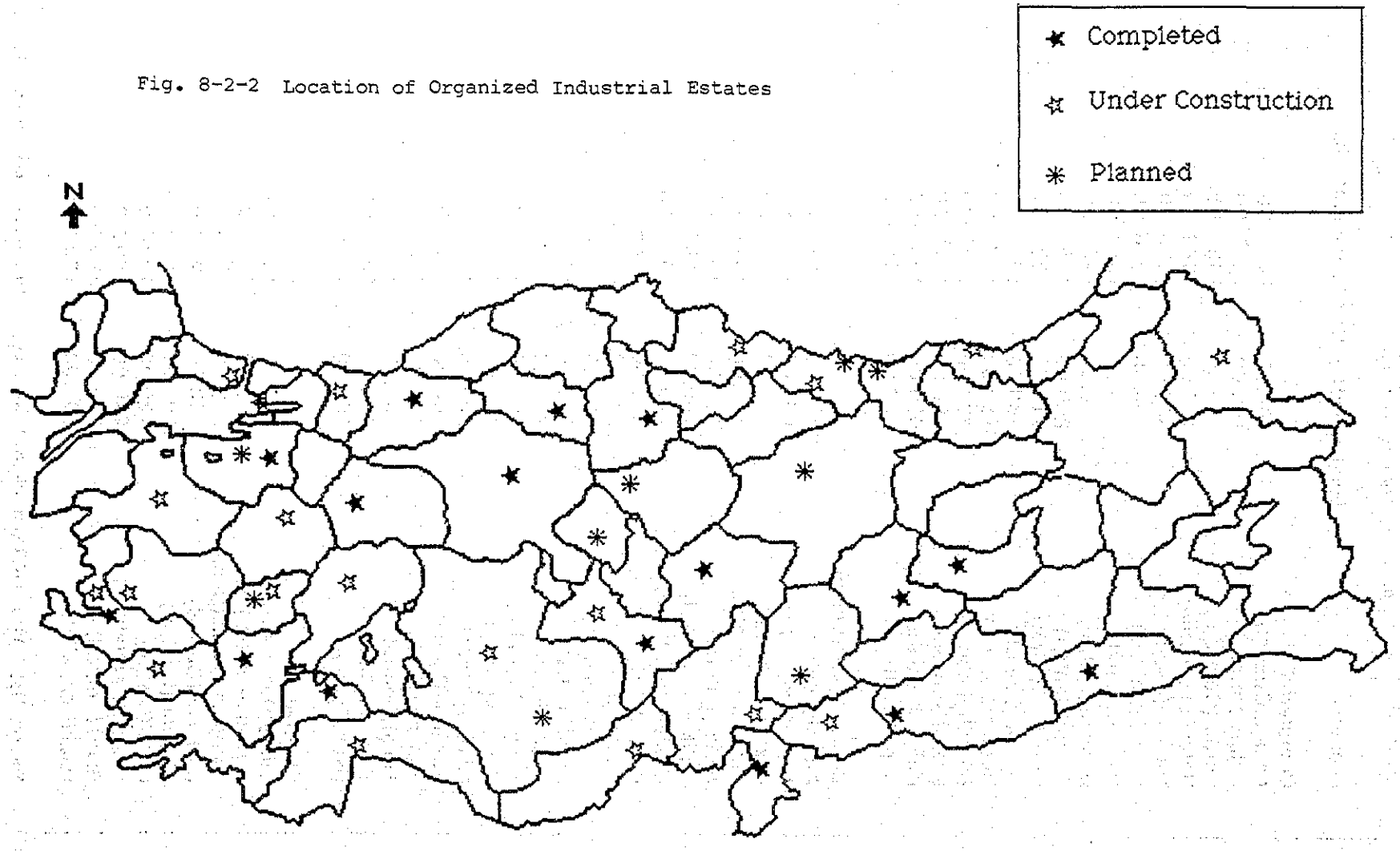


Table 8-2-3 Experiences of KSSs Financed by Ministry of Industry

Period	No. of Projects	No.of Companies	No. of Workers
1) Completed until the end of 1988			
a) 1965-1983	80	24,744	148,000
b) 1984-1988	75	19,925	120,000
2) To be completed in 1989	10	2,282	13,700
SUB TOTAL (A)	165	46,951	281,700
3) Planned in 6th Plan Period			
To be completed in:			
a) 1990	54	15,662	93,972
b) 1991	53	12,401	74,412
c) 1992	55	13,692	82,152
d) 1993	53	15,732	94,392
e) 1994	55	15,146	90,876
SUB TOTAL (B)	270	72,633	435,804
GRAND TOTAL (A+B)	435	119,584	717,504

Source: Document prepared by Ministry of Industry

Table 8-2-4 Status of Existing KSSs Financed by Ministry of Industry in the Study Region

Location of Project	Starting Year	No. of Companies
In Ankara:		
Completed		
BINA	1971	0
MADENI ESYA	1972	144
AgAC ISLERI	1974	69
POLATLI	1980	269
OTOMOBILCILER	1988	1198
OSTIm	1986	0
DoKuMCuLER	1987	117
BEYPAZARI	1987	192
KIZILCAHAMAM	1989	100
Under Construction		
S.KOCHISAR	1990	250
HAYMANA YENI	1990	100
DoKuMCuLER(II)	1991	100
In Zonguludak:		
Completed		
DEVREK	1984	115
EREgLI	1982	314
ALAPLI	1988	100
KARABuK	1988	188
Under Construction		
CAYCUMA	1990	212
In Kastamonu:		
Completed		
KASTAMONU	1974	300
TOSYA (I)	1979	105
TASKoPRu	1984	120
TOSYA(II)	1986	74
DEVREKANI	1989	100
Under Construction		
YENI	1991	250
ARAC	1990	100
In Bolu:		
Completed		
BOLU	1976	298
GEREDE	1976	107
YENICAgA	1983	248
Under Construction		
DuZCE	1991	450
GoYNuk	1991	30
YENI	1991	200
AKCAKOCA	1991	100
In Cankiri:		
Completed		
CANKIRI	1980	120
Under Construction		
CERKES	1990	50

Source: Document prepared by Ministry of Industry

8-2-2 Experiences of Particular Estates

(1) ESKISEHIR Organized Industrial Estate

Eskisehir is located between Ankara and the Marmara Sea. The Eskisehir industrial estate is one of the most successful estates in Turkey because 109 companies have already been installed there. The area of the first stage of development as of 100 ha was fully occupied and the area of the second stage as of 100 ha is also well occupied in Figure 8-2-3. The location of this estate is favorable for investors since the investors can access by roads and railway to major economic growth poles in Turkey.

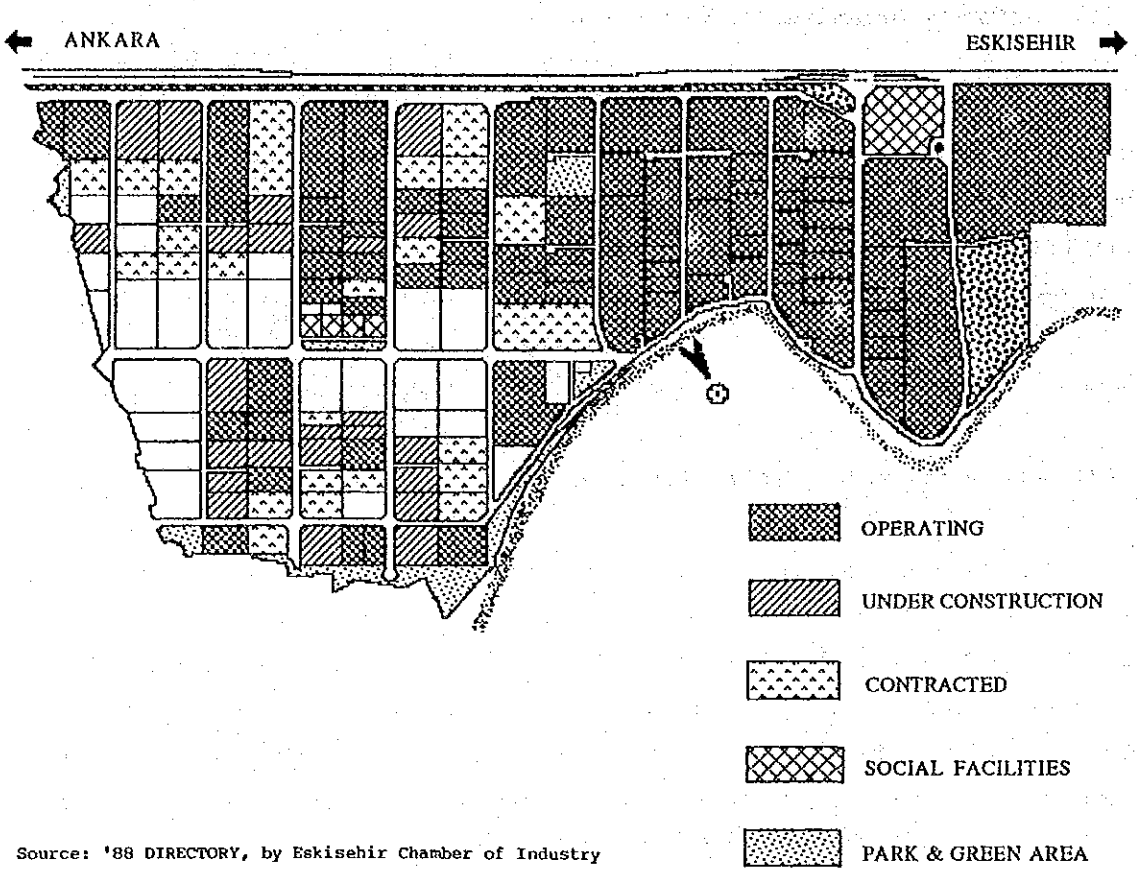
(2) BOLU Organized Industrial Estate

Bolu Industrial Estate is also located between Ankara and Istanbul exactly at the road side of the E5. However, the distances are pretty far: 184 km to Ankara and 251 km to Istanbul. The estate is divided into 61 parcels of land. So far 56 of salable 61 parcels have already been sold. Though only 2 factories are now operating, 26 factories are under construction, most of which are running wood processing works (See Figure 8-2-4). An expansion program as of 80 ha is proposed toward eastern direction of the completed area. If the Filyos Port were to be constructed, BOLU industrial estate could enjoy better transportation services with importation of materials and exportation of products. Timbers produced in the province are exported through Derince Port at the moment. But it's said that the exporters suffer from crowded loading at Derince.

(3) CANKIRI Organized Industrial Estate

CANKIRI industrial estate is located at Korgun town, 19 km north of the Cankiri urban center. It prepares 72 parcels of land area for investors and 6 parcels have been sold to 5 investors as shown in Figure 8-2-5. The port development at Filyos must contribute to acceleration of investment into the CANKIRI industrial estate, since it depends on Samsun Port at moment. Filyos Port will be closer than Samsun and will be major outlet of investors in this estate by using roads and the railway.

Fig. 8-2-3 Eskisehir Industrial Estate (Phase I and Phase II)



Source: '88 DIRECTORY, by Eskisehir Chamber of Industry

Fig. 8-2-4 Bolu Industrial Estate

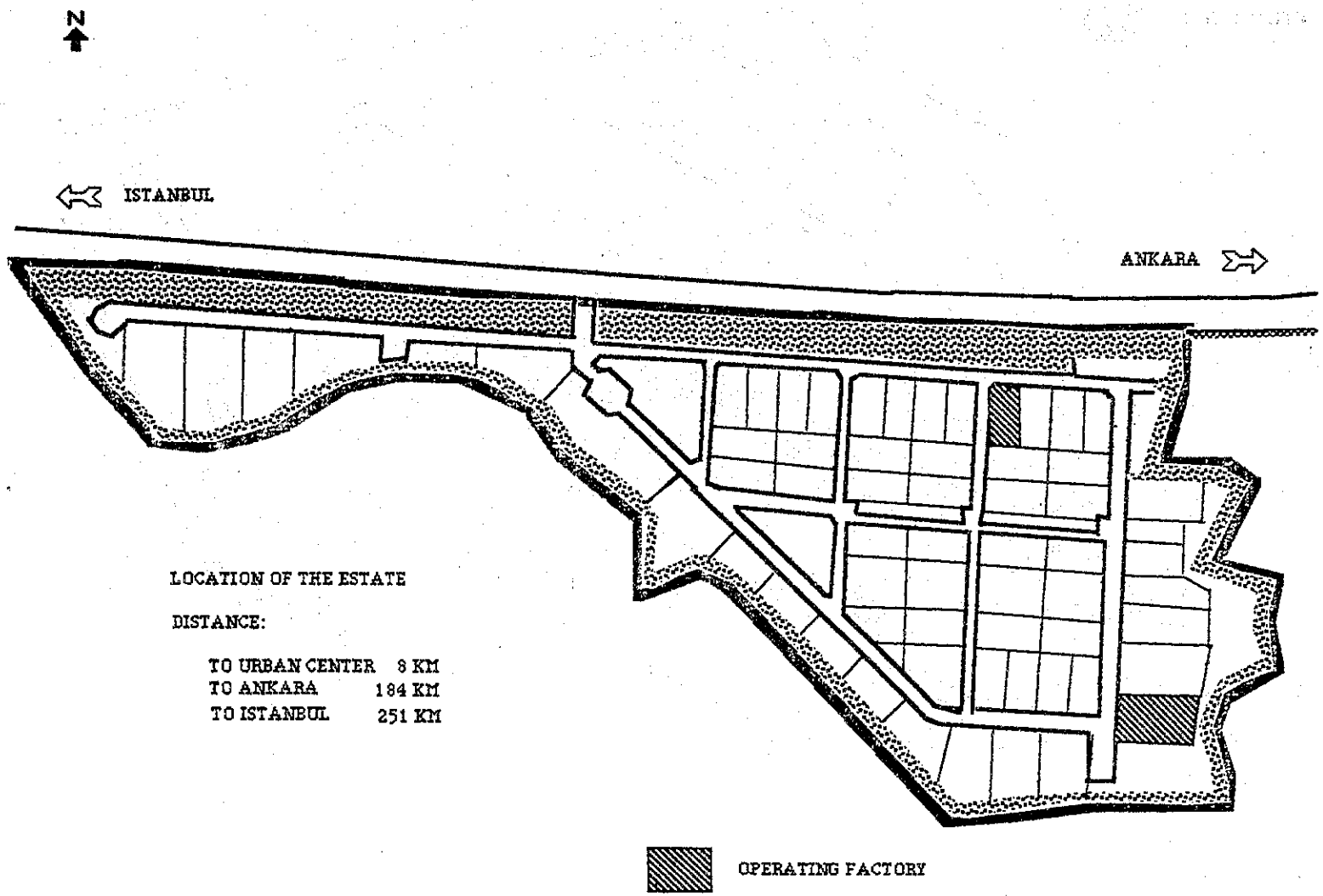
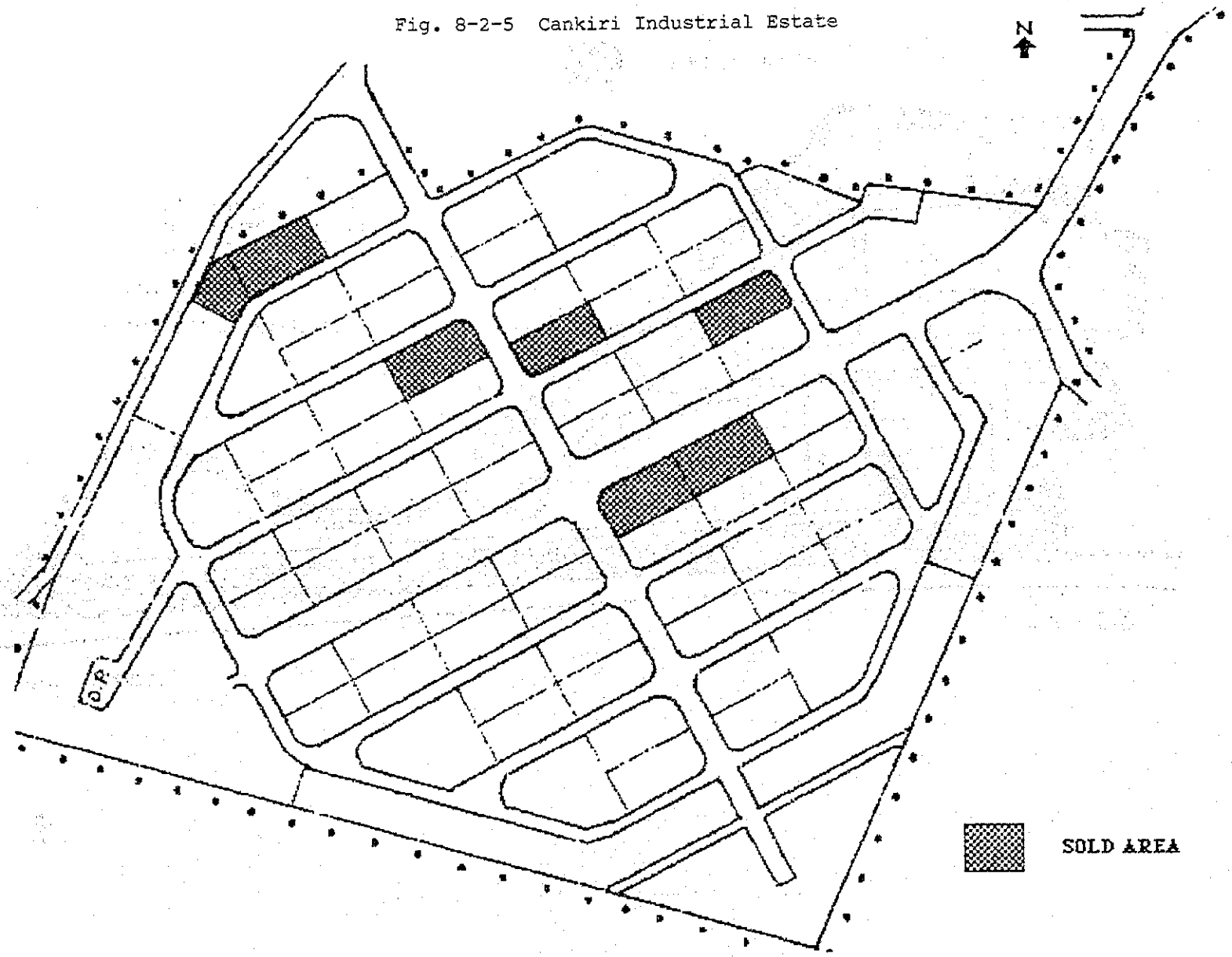


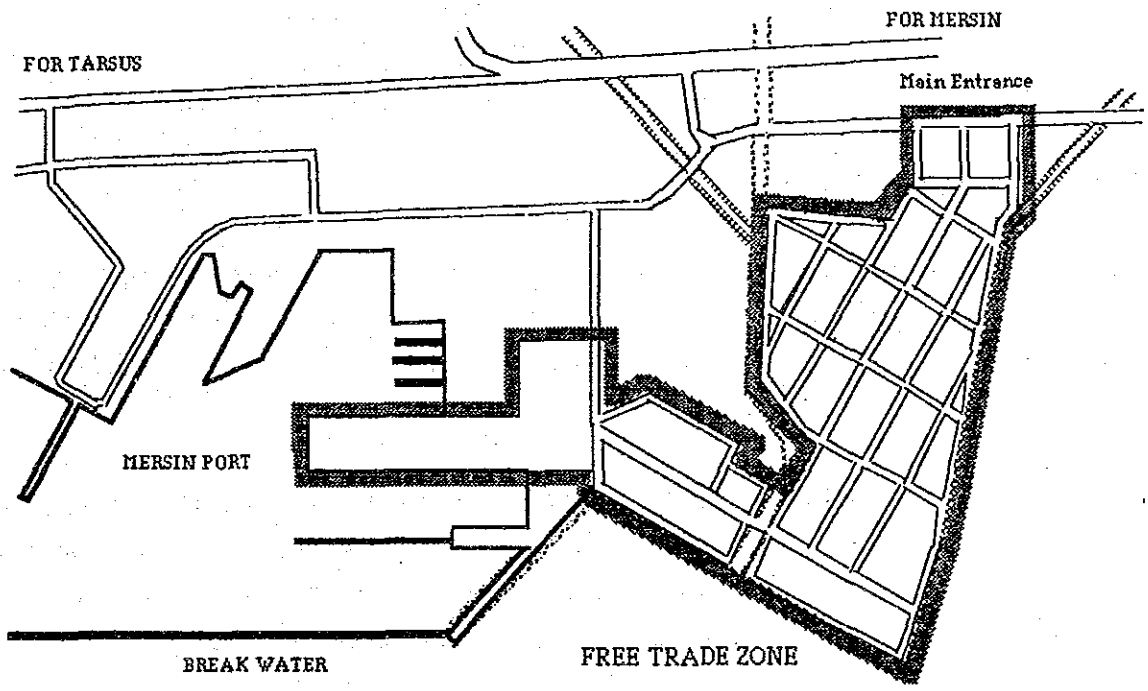
Fig. 8-2-5 Cankiri Industrial Estate



(4) MERSIN Free Trade Zone

It occupies 765,000 square meters of land consisting of around 115 parcels, as shown in Figure 8-2-6. The most advantageous condition for investors in this zone, who run international businesses, must be the proximity to port facilities, because the zone lies next to Mersin Port which has sea connections with ports of the whole over the world as well as rail connections with inland areas. A quay with two berths is under construction to serve the marine cargo transportation of investors in the zone. Although there are 120 investors, most of them run trading businesses and are not manufacturers. The Filyos Export Processing Zone, which proposed later in this report, shall be intended to attract manufacturing industries that produce export goods.

Fig. 8-2-6 Mersin Free Trade Zone



8-3 Conditions of Filyos District for Industrial Development

In this section the present conditions of the district and their possibility for improvement shall be investigated after the definition of the district.

8-3-1 Definition of the District

Zonguldak Province must be influenced directly by the construction and operation of the proposed port at Filyos. But the port operation will affect an enormously wide range of economic activities. Demand forecast of marine cargo transportation assumed an influenced area of proposed Filyos Port in a previous section of this report. From the viewpoint of industrial development, the district shall be defined as below:

Directly Influenced District	Zonguldak Province
Influenced District	Kastamonu Province Bolu Province Cankiri Province Northern Part of Ankara

8-3-2 Geographical Location

Around 67% of the area of Zonguldak province is covered by mountains. It brings some difficulties for the settlement of people and the growth of agriculture. Filyos River has a broad catchment area and the district plenty of water resources.

It should be noted that Filyos District is located on the Black Sea Coast. The Black Sea Rim seems to have an enormous potential of economic development towards the coming century and this will present the Filyos District with a great opportunity for industrial development.

The long distance from major seaports is one of the bottlenecks of hampering economic growth of the Ankara Metropolitan Area (AMA). Filyos Port shall support its growth by providing a mass transportation services, because Filyos Port will be the nearest sea port to AMA. The Central Anatolia Regions should benefit from the new Port of Filyos.

8-3-3 Transportation System

(1) Roads

Distance by roads between major urban centers and urban center of Zonguldak City is as followings:

in the district		outside the district	
to BALTIN	34 km	to ISTANBUL	334 km
to CAYCUMA	50 km	to iZMiT	240 km
to DEVREK	46 km		
to EFLANi	186 km		
to EREgLi	66 km		
to KARABuK	180 km		
to KURUCASiLE	158 km		
to SAFRANBOLU	170 km		
to ULUS	132 km		
to ANKARA	272 km		
to BOLU	173 km		
to KASTAMONU	277 km		

The connecting road between the Port and E5, and major urban center in the district should be improved in order to efficiently use the port functions.

(2) Railway

The Ankara-Zonguldak railway passes through such major industrial areas as Karabuk. From Zonguldak to the provincial border, Hankoy, it is 143 km; to Ankara, 485 km; and to Karabuk, 121 km. There are two branch lines in the province: between Zonguldak and Kozlu (4 km) and between Eregli and Arumtcuk for coal transportation (14 km). The railway network will be expected to raise the efficiency of the port's operations.

(3) Marine Transportation

There are three secondary ports in Zonguldak Province, namely Zonguldak, Eregli and Bartin. Zonguldak port has been constructed for the purpose of coal transportation excavated by Turkish Coal Institute. Eregli Port is developed mainly for ERDEMiR (Iron & Steel Works). Bartin is a fishery port as well as a local commercial port. It has to be noted that the marine transportation system is insufficient as compared with the enormous economic potential in this region and hinterland including the AMA.

8-3-4 Population

Population by provinces in the 1985 census are almost 5.57 million as shown as below. This is equivalent to around 11 per cent of total population of Turkey.

ZONGULDAK	1,044,945
BOLU	504,778
KASTAMONU	450,353
CANKIRI	263,964
ANKARA	3.306.327
TOTAL OF THE DISTRICT	5.570.367

According to the municipal classification, the population of the province can be broken down as follows:

ZONGULDAK Province	1.044.945
Rural Population	694,113
Urban Population	350,832
Provincial Center	250,164
BARTIN district	147,212
DEVREK district	104,186
EFLANi district	20,145
EREgLi district	181,548
KARABuK district	142,569
KURUCASiLE district	11,564
SAFRANBOLU district	41,778
ULUS district	45,491
CAYCUMA district	100,288
Rural Population	88,699
Urban Population	11,589
MERKEZ Sub district	34,786
HiSARoNu Sub district	9,553
PERSEMBE Sub district	26,131
SAKTUKOVA Sub district	18,229

The proposed area for port construction belongs to HISARONU sub district, CAYCUMA district and ZONGULDAK province.

8-3-5 Industries and Resources

(1) Mining Industry and Mineral Resources

The mining industry is a major economic sector in the province. In particular, coal mines have been developed since 1848. There are five coal mines managed by the Turkish Coal Institute (TKK): ARMUTCUK, KOZLU, UZULMEZ, KARADON and AMASRA. Besides these mines there are four ore processing (washing) establishments operating at ARMUTCUK, ZONGULDAK, CATALAGZI and AMASRA. Their total capacity is 2,150 tons/hour, In 1985, 45,784 persons were working for the mines and processing plants. The excavation capacity is 5 million tons. Dolomite mines exist in KURUCASILE area and huge reserves of this mineral are found in CANKIRI province. Some manganese reserves are distributed between EREGLi and DEVREK, estimated as of 275,000 tons. Although there are 7 million or 8 million tons of bauxite reserves between MERKEZ and KOKAKSU, they haven't been developed because of low quality. Silica sand reserves are estimated as 200 million tons in western part of the province. Some of reserves have been owned by Turkish Bottle and Glass Fabrics. Rock salt reserves are abundant in CANKIRI province.

(2) Manufacturing Industry

Manufacturing establishments are classified into sub-sectors as follows:

SUB-SECTOR	NUMBER OF ESTABLISHMENT PUBLIC	PRIVATE	TOTAL
IRON & STEEL	2	64	66
CEMENT AND BAKED CLAY	2	21	23
FOREST INDUSTRY	5	14	19
PULP & PAPER	1	7	8
FOOD	-	28	28
CHEMISTRY	-	16	16
METAL GOODS	-	106	106
PLASTIC GOODS	-	2	2
PRINTING	-	7	7
ELECTRICAL MACHINE	-	3	3
SHIP CONSTRUCTION	-	5	5
TOTAL	10	274	284

Totally 28,821 personnels are working in 284 establishments. They distributes as below in each districts of the province:

DISTRICT	NUMBER OF ESTABLISHMENT
MERKEZ	16
BARTIN	31
CAYCUMA	7
DEVREK	8
EFLANi	1
EREgLi	72
KARABuK	121
SAFRANBOLU	27
ULUS	1

Major companies in the province are listed on Table 8-3-1.

(3) Resources

Besides the mineral resources which have been mentioned above, there are potential resources for industrial use in the district. Marine fish in the Black Sea could be processed into food, animal feed and some chemicals, like protein. Forestry and agricultural products are also materials for manufacturing industries. But in the case of forestry products, they have been exhausted and reforestation should be accelerated in order to keep stable supply of materials for wood processing industries. In the near future it will be necessary to import logs & timbers and chips to expand production capacity of these processing industries.

Table 8-3-1 Major Manufacturing Industries in Zonguldak Province

NAME OF COMPANY	ADDRESS	PRODUCTS
1 Sumerbank-Ates Tuglasi	Hisaronu	Fire-resisting Brick
2 Pulp & Paper Mills of Turkey	Caycuma	Kraft Pulp and Kraft Paper
3 Bartin Cement Industry	Bartin	Cement
4 Iron & Steel Works of Turkey	Karabuk	Iron & Steel
5 Eregli Iron & Steel Mills	Eregli	Iron & Steel
6 Turkish Canned Food	Bartin	Canned Food
7 DOKAP Food Industry and Commerce	Zonguldak	Flour and Bran
8 MUSTAFA Fish Food Commercial & Industry	Bartin	Canned Fish
9 Persas-Persembe	Caycuma	Corn Starch, Corn Flour, Protein and Animal Feed
10 Devrektas	Zonguldak	Chipboard
11 ASAS Wood Industry	Ulus	Timber and Parquet
12 BAKSAN Bartin Paper Industry	Bartin	Packing Bags of Kraft Paper
13 Ferit Medicine and Perfumes Industry	Bartin	Medical Preparations
14 BARKISAN Limestone	Bartin	Packed Limestone Powder
15 DOLKA-Industrial Raw Materials	Eregli	Extraction and Operation of Dolomite
16 YURT Machinery	Caycuma	Bricks and Tiles
17 Tile Industry	Bartin	Bricks and Tiles
18 ERHAL Iron Rolling Industry	Safranbolu	Hot Iron Rolling
19 BASARAN Iron Rolling Industry	Karabuk	Hot Iron Rolling
20 KAPTAN Iron-steel Industry	Karabuk	Hot Iron Rolling
21 AZMOZ Rolling Industry	Karabuk	Hot Iron Rolling
22 VERGILI	Karabuk	Hot Iron Rolling
23 AKLER Rolling Industry and Commerce	Karabuk	Hot Iron Rolling
24 YILMAZ oZDEMiR Hot IronRolling Works	Karabuk	Hot Iron Rolling
25 YAZICI Iron and Steel	Karabuk	Hot Iron Rolling
26 Isik Business House	Karabuk	Hot Iron Rolling
27 EZER Rolling	Karabuk	Hot Iron Rolling
28 PAKiS Iron and Steel	Karabuk	Hot Iron Rolling
29 Iron Knob Industrial and Commerce	Karabuk	Hot Iron Rolling
30 SEVIL Pipe Profile	Akcakoca	Various Machineries and Spare Parts
31 BASAS, Bartin Battery Industry	Eregli	Battery Parts
32 NURGuR Electricals	Bartin	Electric Pylons
33 EMiTAS, Electro-Machanics		Electronic Auto Alternators, regulators
34 Long Iron Shipyard	Alapli	Dry Load Ships made of Sheet Iron
35 Metal Ship Industry	Eregli	Dry Load Ships made of Sheet Iron
36 ERDEN Shipyard	Eregli	Dry Load Ships made of Sheet Iron

Source: Ministry of Industry and Commerce, "Potential for Industry : Zonguldak", 1986

8-4 Industrial Development Strategy and Possible Industries in the Region

In this section, possible industries in the proposed Filyos Port District shall be selected to meet the expectations of national economic development and the conditions of the region.

8-4-1 Principles to Select Possible Industries

(1) Possible industries shall be selected to meet the direction of the national development plan and policy, especially of industrial development. In one period, form 1990 to 1994, the strategic guidelines of the 6th Five Year Development Plan must be held in high regard. After this Plan period, the possibility shall be evaluated in condition that the industrial structure of Turkey will incline to the outward looking, integration, diversification and labour intensity in the earlier stage, and will direct to high-technology at a later stage.

(2) Possible industries shall be selected to encourage the policy to correct the income differences among regions. The industrial development of Filyos district must be an effective tool to stimulate the economic development of the surrounding regions as well as the district itself. The ministry of industry is undertaking a study to draw the strategic plan for the industrial development of Zonguldak province. Although the results of this study have not been presented by the completion of JICA study report, it will be necessary to connect the port construction and operation with the comprehensive industrial development in the province.

(3) The inter-linkage between existing industries and newly induced industries shall have to be encouraged. And the effective use of local resources shall also be taken into consideration. The distribution or spatial location of industries and its tendency behind the proposed port shall be examined to identify possible industries in the port area. On the one hand, this will make it possible to identify the function and facilities required for the port itself. On the other hand, it will present suggestions on the possibility of the horizontal and vertical interlinking between the existing industries and those later attracted to the area.

(4) The possible industries shall have to be harmonious with the environmental conditions of the region. Right now, the district has enough capacity to absorb various industries. But the effects of new industries on the environment should be carefully considered.

(5) It is necessary to select industries that are suitable to the local conditions for industrial location. However the infrastructure of the region is still weak at the moment. Thus improvement to the basic infrastructure will be required in order to realize industrial development in this region. The proposed plan must contain recommendations on the improvement of the infrastructure besides port construction. The construction of a new deep sea port must be the most effective improvement of industrial infrastructure. However, inland transportation system, land preparation for industrial use, water supply system, power supply system and urban facilities will have to improve.

(6) Industries related closely to the construction and operation of the port shall be given the highest priority. Therefore the function of Filyos Port will be one of most important factors to select possible industries. And some industries require their own berths for unloading materials and loading products. They are called coastal-oriented industries or basic material industries. They usually depend on bulky imported materials and on large-scale economy.

(7) Institutional, organizational or legal systems shall be reviewed and improvement of these systems shall have to be recommended, because these soft-infrastructure will have important effects on industrial investment.

8-4-2 Strategic Viewpoint for Selection of Possible Industries and Candidates

(1) Request from Existing Industries in the Region

There are several major industries in the region. They are Iron and Steel, Pulp and Paper, Brick and Wood Processing. These industries requires deep-sea port facilities on the Black Sea coast, mainly because they tend to depend on imported materials as they expand their operations.

The most urgent request comes from the Iron and Steel Works at Karabuk. It needs a port facility to unload iron ores and coking coal, and also a loading facility for its products. This issue shall be investigated in more detail later. In Kastamonu Province and Bolu Province, there are a lot of wood processing industries, including furniture factories. There requests shall be taken into account. Candidate from this point of view are as follows:

* Unloading facilities of coal and iron ore for iron-steel industries and of thermal coal for fuels in the earlier stage and an integrated Iron & Steel factory in the later stage of development
* Unloading facilities of logs. timbers and chips for pulp and paper, and wood processing industries in the earlier stage and a Pulp & Paper factory in the later stage of development
* Unloading facilities of ferrous-bricks for the Brick Factory at Hisaronu.
* Loading and unloading facilities of grain and loading facilities for grain products in earlier stage, and an Food Processing Complex in the later stage.
* Chemical fertilizers and animal feeds for agriculture

(2) Further Processing of Local and Domestic Resources and Materials

The second factor to select possible industries is on the further processing of local or regional resources which flew out of the region as raw materials for manufacturers, or which haven't still been utilized.

Local resources worthy of notice are marine fish in the Black Sea, abundant reserves of rock salt in Cankiri Province, coal & lignite in Zonguldak Province, wood & lumber in Bolu and Kastamonu Province and lime stone and dolomite reserves in Cankiri Province. Besides the above, experimental drilling of wells to search for petroleum is under way. But the possibility of production succeeding is not certain at the moment. In the region, a lot of wood processing factories including furniture factories have traditionally depended on forestry resources. However, they have to import materials at the moment since forests have been exhausted.

Although a pulp & paper factory in Caycuma was established depending on local forests, it'll need imported materials to expand its capacity in order to meet increasing demand. Coal and lignite resources have already been developed to support the iron & steel works in Karabuk and Eregli. But these local coals are gradually substituted by imported coal because of their low quality. The industries listed below are those that could possibly expand or be newly developed depending on local and regional resources.

* Wood processing industries including furniture
* Cold storage and freezing facilities for seafood
* Cement and products
* Glass and products
* Processing of Iron and Steel
* Processing of Pulp & Paper
* Sodium carbonate, Sodium hydroxide from Rock Salt
* Processing of Dolomite

(3) Development of Basic Industries to Support the Integration and Improvement of Industrial Structure

Turkey will reach the mature stage of industrial development in the decades to 2010. A variety of industrial structures will make progress. and intra-linkage among industries will be closer and deeper. These trends require the expansion of the production capacity of such basic materials as iron & steel, chemical materials (ethylene, etc.), pulp & paper, nonferrous metals (aluminium, lead, copper and zinc) and cement. If will be necessary to expand supply capacity of these basic materials and to improve economic efficiency in order to meet the demand from various industries. The coastal districts are advantageous in terms of developing these basic industries because the transportation of a huge quantity of materials and products are needed for their operation. The idea of constructing a basic industrial complex at Filyos Port should be expected because the closer mutual relations among Black Sea Rim economies must bring an opportunity to develop it on the Black Sea coast of Turkey. The candidates from this point of view are as follows:

* Integrated Iron & Steel Factory
* Petroleum Refinery and Petrochemical Complex
* Pulp & Paper
* Glass & Products
* Cement & Products
* Natural Gas Processing (Chemical fertilizers and ammonium)
* Nonferrous Metals and their Products

(4) Export Oriented Industries

Another major point of industrial development in Turkey is the outward-looking strategy. After the oil crisis most developing countries tended to adopt an export-oriented policy regarding industrial development. The 6th Five Year Development Plan puts the emphasis on the development of export-oriented industries. The Filyos District will be one of mainstays of export promotion because it will be a major port in the Black Sea Rim economy. Then the plan to establish an Export Processing Zone must be an important issue for consideration.

* An Export Processing Zone (The 5th Free Trade Zone in Turkey)

(1) Labor Intensive Export
In the early stage of development, Turky will be at an advantage with labour-intrusive exports.

(2) Technology Intensive Export
In the later stage of development, Turkish industries will move into technology-oriented exports.

(5) Industries Related to Port Construction and Operation

(1) Candidates on the construction stage

* Cement manufacturer and products of cement for construction work (stone clashing, concrete pipes, piles. blocks, etc.)
* Repairing shops of construction machinery
* Steel works for construction works

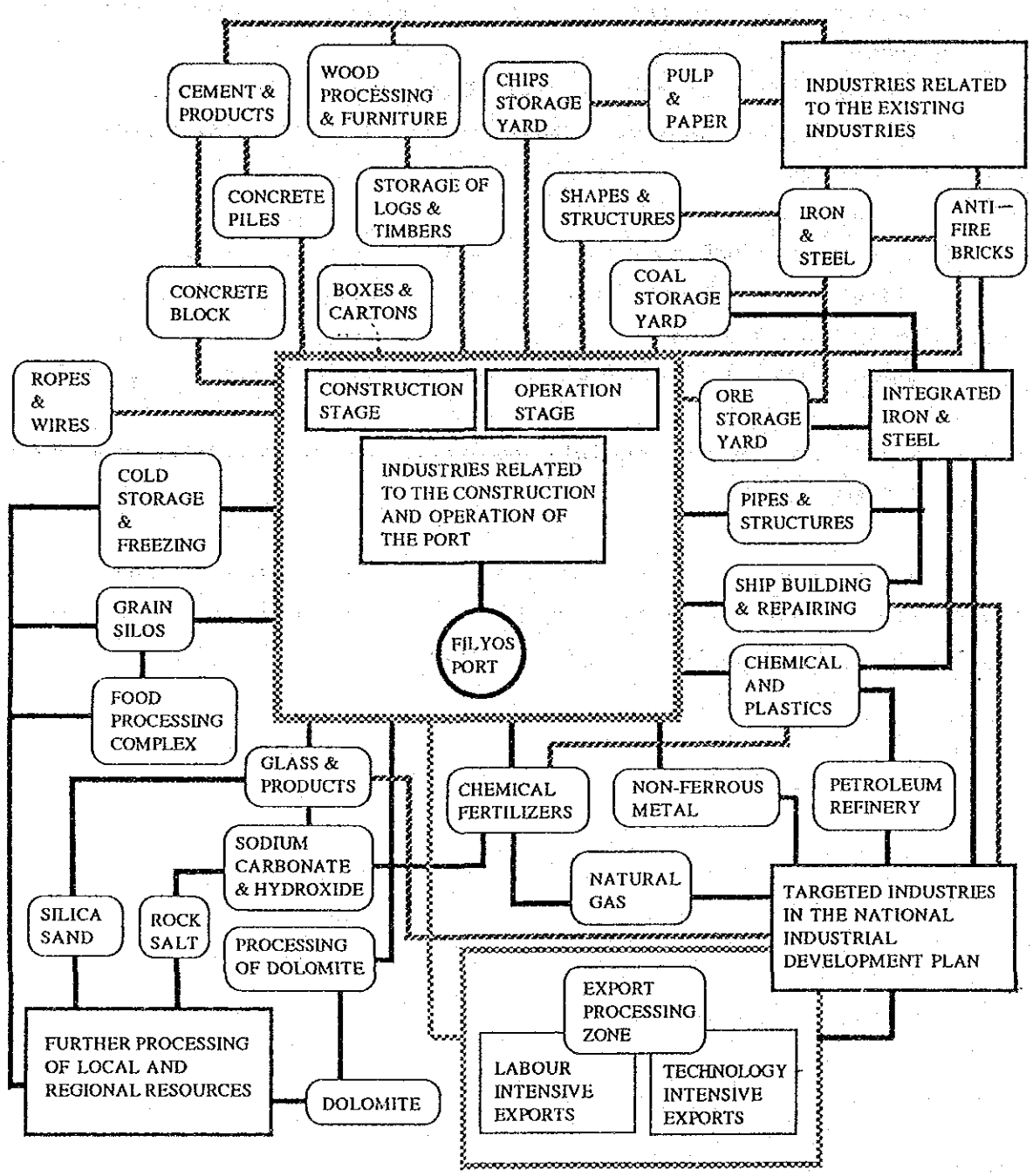
(2) Candidates on the operation stage

* Ship building and repairing
* Maintenance and repairing of containers, machines and equipment
* Manufacturers of packing materials, made of wood, paper, metal, fibre, and plastics (boxes, cartons, bags, pallets, ropes, wires and cases)
* Grain silos
* Cold storage and freezing facilities
* Storage yard of coal, ore, logs and timbers, scrap iron, and chips for pulp & paper
* Storage and distribution of natural gas and petroleum products

8-4-3 Overall Structure of Possible Industrial Projects and Interrelations of Them

Based on the above observations, candidate projects shall be identified as shown in Figure 8-4-1. In this Figure, inter-linkages between candidate projects are also indicated.

Fig. 8-4-1 Possible Industrial Complex in the Filyos Port Area



8-5 Master Plan of Industrial Complex

A relatively wide variety of industries have been identified in the previous section as candidates for the industrial complex in the Filyos Port Area. If the region, which includes four provinces, were to be taken into consideration, almost all of them could be developed over the longer term. However, it will be necessary to present some particular industries in order to draw up a Master Plan for Filyos port and the industrial complex, which will be composed of industries closely related to the port construction and port operation.

COMMON COMPLEX RELATED CLOSELY TO PORT OPERATION

The Industrial Complex in the Filyos Port Area shall be classified into several types. The first one is the Iron & Steel Complex, because it has been decided that the initial stage of port construction will begin with the facilities for the State Iron & Steel Works in Karabuk. It will start with a pier to unload iron ore and hard coal for Karabuk and to load the products of the Karabuk plant and the private steel mills in the region. Together with an iron ore & coal pier and storage yard, a shipbuilding and repairing plant, logs & timber storage facilities, a sawmill, and a grain & cereal silo shall be constructed in the early stage of development. In the later stage, various processing industries of grain & cereal and also logs & timber could be developed, so called as the food processing complex and the wood processing complex.

COMPLEX TYPE (I):IRON AND STEEL COMPLEX

The major coastal industries that could be developed in the port area, can be classified into three types of industrial complex. The first one is a complex of integrated iron & steel plant and agglomeration of steel works. It characterizes the Filyos Port as the steel complex. Although the coastal iron and steel industry in Turkey will be expanded at Eregli and Iskendern, there will be a need to construct another coastal integrated iron and steel industry dependent on imported raw materials after 2000. Since adequate sites for deep-sea ports are quite limited, Filyos is one of the best locations for an integrated large-scale iron and steel industry,

because it has advantageous conditions with regard to constructing a deep-sea port. In this sense, an integrated iron and steel industry shall be given higher priority than the industrial complexes (II) or (III) proposed below.

COMPLEX TYPE (II): PROCESSING OF LOCAL RESOURCES DEPENDING ON THERMAL ELECTRIC POWER

The second type is an industrial complex composed of several industries that depend on local or regional resources. These include a sodium hydroxide plant depending on rock salt, glass and glass products plant depending on sodium hydroxide and silica sand, and a pulp & paper products, particularly paperboard mill, which could rely enormously on electric power. If an unloading facility for imported coal with a deep wharf is constructed in the early stage, the importation of thermal coal will be advantageous for the Filyos Port Area, since a thermal power plant fueled by coal could be developed. It could be the nucleus of an industrial complex depending on electric power. It is assumed that an electric arc furnace would be present in this type of complex. Although scrap iron should be imported, pig iron could be supplied from Karabuk Works and higher-value steel could be produced and there will be a close relation between Filyos Port and Karabuk Iron & Steel Works.

COMPLEX TYPE (III): PETROLEUM COMPLEX

The third type of complex is a combination of petroleum refinery and petrochemical plant,. characterizing Filyos Port as petroleum port. The consumption of petroleum products must increase in due course of further industrialization of the Turkish economy. A petroleum complex in the Filyos Port will contribute to the stable supply of basic petroleum products by diversifying the crude oil resources and by development of efficient operation of the developed complex.

Candidate industries in these four criteria are shown on Table 8-5-1 an well as their standard capacities.

8-5-1 Common Industries in Every Complex

In all industrial complexes, four types of industry should be developed. These are as follows:

(1) Food PROCESSING COMPLEX

1) Reinforced Concrete Grain Silo

The transportation of grain and cereals in Turkey has been inefficient so far due to the shortage of deep wharfs. It is possible to construct a deep-sea port for large vessels of more than 60,000 dwt (PANAMAX) in Filyos. A port silo with a relatively larger capacity would be required to serve imports and exports as well as domestic transportation of grain and cereals. Though the exact capacity should be determined in a detailed feasibility study later, its capacity shall here be assumed as 60,000 tons. According to the silo operating system of the T.M.O, port silos run on shifts of 7 times a year. In Filyos this could be assumed 4 times to 7 times a year. The annual volume of loading /unloading of grain and cereal is estimated as between 240,000 (in case of 4 times) tons and 420,000 tons (in case of 7 times).

CAPACITY OF SILO:	60,000 TONS
ANNUAL SHIFTS:	4 TO 7 TIMES
VOLUME OF LOADING/UNLOADING:	240,000 TO 420,000 TONS/YEAR
SIZE OF VESSELS;	
OCEAN VESSELS:	50,000 DWT AND 30,000 DWT
COASTAL VESSELS:	5,000 DWT ANS 3,000 DWT

In a case of 240,000 tons/per year, it is assumed that half of this amount shall be transported by road & rail and the other half by vessels. It is also assumed that imports and exports shall be balanced in volume. Corn rice and soybeans must be imported, while wheat, barley and rye could be exported. However, these balances will differ year by year, due to the yield of crops and domestic demand for various crops. Thus it seems that

imports will exceed exports in Filyos because its location is rather far from the main crop cultivation areas in Turkey and close to urban areas with large demand of foodstuffs.

The silo should be located just behind the grain wharf. Other processing industries, which have close links with the grain and cereal silo, should be installed in industrial zones planned behind the port area. These industries shall be developed into a complex consisting of food processing industries. See figure 8-5-1.

2) Flour Mills and Flour Products

Wheat, barley and rye can be exported after milling, and imported rice, soybeans and corn shall be transported to other industries inside the industrial zone as well as various regions outside the zone after being milled. Flour products will be noodles such as spaghetti and macaroni.

3) Edible Oil Plant

Edible oil can be extracted from imported soybeans and corn. In Turkey, sunflower oil and olive oil are popular because they can be produced from domestic materials. Soy and corn increase the variety of edible oil products and also introduce the possibility of producing animal feed as a byproduct.

4) Animal Feed Plant

Waste from flour mills and edible oil factories provides the material to produce animal feed, compounded one mainly for poultry businesses which will grow in the region, particularly in Bolu and Kastamonu Provinces. Wastes from processing plants of fish and meat can be used for the production of animal feed.

5)Cold Storage and Processed Fish & Meat

Another core facility of the food processing complex will be a cold storage facility to store the fish or meat needed as materials for food

processing industries. These produce dried, frozen, canned, salted and pasted fish and meat, and also ham and sausages (see Figure 8-5-2).

(2) WOOD PROCESSING COMPLEX

Since Bolu and Kastamonu are rich in forests and rich in wood material, there are lots of wood processing factories. The forestry department has provided the pulp & paper factory with inadequate quality of logs and timbers for the wood processing industries in the region. But the local materials have been exhausted and it is said that wood processing industries will have to import their materials in future. As wood processing is an enormously important industrial sector in the region, an unloading and storage yard for logs and timber will be a necessary facility in the proposed Filyos Port. This, as well as a sawmill, will be included in the port master plan. The dimensions of the sawmill will be as indicated below:

Standard Dimensions of Proposed Saw Mill

Capacity:	300,000 m^3/year
Imported Volume of Logs:	270,000 ton/year
Maximum Size of Vessel:	250,000 dwt
Volume of Products:	250,000 ton/year
For Domestic:	150,000 ton/year
For Export:	100,000 ton/year
Required Land Area:	5 ha

These facilities will create an opportunity to develop such processing industries as plywood, decorated plywood, particle board and furniture as such construction wood materials as boards, flooring bars, etc.(see Figure 8-5-3). These wood processing industries shall be allocated in the industrial zone on the left side of the replaced river.

(3) SHIPBUILDING AND REPAIRING UNIT

The third project in the common industrial complex, is a shipbuilding and repairing factory. The 6th Plan stated that the shipbuilding sector had to be developed in Turkey, especially in the Black Sea coast region.

Filyos Port seems to be a good location to develop a shipbuilding and repairing factory. Thus a shipyard should be included in the port master plan.

(4) STORAGE YARD OF COAL AND IRON ORE

The Port of Filyos has been requested by the government to construct an unloading facility and storage yard for iron ore and hard coal, which will be supplied to the State Iron & Steel Works in Karabuk. This will be the most important project in the early stages of port construction. An urgent construction of these facilities has decided at Hisaronu where an abandoned jetty exists. This jetty shall be rehabilitated immediately.

The Turkish Iron & Steel Works has two major plants at Karabuk and Iskendern. ISDEMIR at Iskendern will be able to construct enough port facilities inside the owned land area of the factory, but KARABUK factory is located far from any port area. Thus domestic materials have been transported to the factory by the railway and highways. The heavy cost burden imposed by the inland transportation of huge amount of coal and ore must be a serious problem for Karabuk Iron & Steel. Thus it has to be considered that if further expansion of production capacity is required, it will be better to establish an integrated plant on the coast with deep sea port, which reduces the cost of material transportation.

Two stages can be assumed in establishing the unloading facilities of iron ore and coking coal for the iron & steel works in the port area. In the earlier stage through the year 2000, only unloading and storage facilities for materials and loading facilities for products needed for the planned production capacity of 900,000 tons of liquid steel per year will be needed. In the later stage, after 2000, an integrated iron and steel plant, with an economical capacity of 2 million tons per year at least, shall be developed along with expansion of storage capacity of materials and products.

ASSUMED HOTMETAL PRODUCTION CAPACITY

AND REQUIRED VOLUME OF MATERIALS

YEAR	PRODUCTION CAPACITY (tons/year)	REQUIRED VOLUME OF IRON ORE (tons/year)	HARD COAL (tons/year)
1990	900,000.	1,500,000.	1,100,000.
1995	1,100,000.	1,900,000.	1,375,000.
2000	1,280,000.	2,200,000.	1,600,000.

1) Unloading and Storage Facilities for Ore and Coal

i Iron Ore

According to a document presented to the study team, the Karabuk Iron and Steel Works will require 2,200,000 tons of per year after 1995. The imported amount of ore is estimated as 700,000 tons because of the low quality of domestic ore and transportation problems. Thus it is realistic to assume 700,000 tons of ore will be imported and 1,500,000 tons will be domestically supplied for the expanded capacity of the Karabuk Iron and Steel Works. According to this assumption, only 500,000 tons can be transported by highway and railway, and 1,700,000 tons of ore shall be unloaded through port, and transported to the plant site by rail, as shown in Figure 8-5-4.

ii **Hard Coal**

The hard coal consumption levels so far were as below:

YEAR	HOT METAL PRODUCTION	BOUGHT AMOUNT DOMESTIC	BOUGHT AMOUNT IMPORTED	BOUGHT AMOUNT TOTAL	USED AMOUNT VOLUME	USED AMOUNT UNIT
1980	545,898	880,057	-	880,057	878,812	1.60
1981	546,003	881,438	-	881,438	881,013	1.61
1982	487,864	939,793	-	939,763	902,353	1.85
1983	516,249	888,608	-	888,608	911,324	1.77
1984	533,799	780,488	-	780,488	782,367	1.47
1985	550,614	677,844	144,596	822,440	744,116	1.35
1986	654,542	643,211	235,856	879,067	968,915	1.48
1987	576,488	826,655	185,783	1,012,438	1,009,784	1.75
1988	589,424	981,611	221,401	1,203,012	1,057,702	1.79
	(tons)	(tons)	(tons)	(tons)	(tons)	

* Used amount is divided by hot metal production

According to the plan,the required volume of hard coal is estimated to be 1.25 times the hot metal production and the imported coals assumed to account for 50% of total consumption. After 2000, a new integrated plant producing 2 million tons per year shall be assumed to use 2.5 million tons of hard coal. These features are shown below:

YEAR	HOT METAL PRODUCTION (tons)	HARD COAL REQUIREMENT (tons)	IMPORTED VOLUME (tons)
1990	900,000	1,100,000	216,000
1995	1,100,000	1,375,000	306,000
2000	1,280,000	1,600,000	500,000
2010	1,280,000	1,600,000	1,600,000

It is thought that the domestic coal will be directly transported from Zonguldak to KARABUK by rail, but it will be gradually substituted by imported coal in future.

iii Auxiliary Materials

Auxiliary material requirements for Karabuk Iron & Steel Works in 2000 are estimated as shown as below. Approximately 45,000 tons of materials are assumed to use Black Sea port.

Limestone	300,000 tons
Dolomite	120,000 tons
Manganese	9,000 tons
Culminate	7,500 tons
Quartz	13,000 tons
Ferro-Manganese	10,000 tons
Ferro-Silicon	1,500 tons
Fluorspar	200 tons
Phosphorite	3,800 tons
TOTAL OF ABOVE	465,000 TONS

iv Total Volume of Unloaded Materials for Karabuk Iron & Steel Works in 2000

Iron Ore	1,700,000 tons (including 700,000 tons of imported ore)
Hard Coal	800,000 tons
Auxiliary Materials	45,000 tons
Scrap	255,000 tons
Total of Unloaded for Karabuk Works	2,770,000 tons

v **Total Volume of Unloaded Materials for Private Mills in 2000**

Billet 900,000 tons

iv **General Total of Unloaded Cargoes**

3,670,000 tons

2) Loading of Iron & Steel Products

i **Products of Karabuk Iron & Steel Works (in thousand tons)**

PRODUCTS TYPE	PRODUCTION CAPACITY in 1995	in 2000
Foundry Pig	100	270
Small & Medium Shape	25	25
Wire Rod	500	600
Bar	330	430
Cast Iron Pipe	25	50
Coke for Sale	274	274
Granulated Slag	85	100
Steel Construction	20	20
TOTAL OF ABOVE	1,359	1,769
THROUGH FILYOS PORT	815	1,150

ii **Products of Private Sector's Rolling Mills**

Private-sector rolling mills near Karabuk are producing around 1 million tons of products per year. The document prepared for this study tells that 70% of these products may be transported through Black Sea port after 1995. Then, the volume of loaded products produced by private-sector rolling mills can be estimated as 700,000 tons per year.

ORIGIN OF LOADED PRODUCTS	IN 1995	IN 2000
KARABUK	815,000	1,150,000

PRIVATE SECTOR	700,000	700,000
TOTAL OF ABOVE	1,515,000	1,850,000

8-5-2 ALTERNATE COMPLEX (I): INTEGRATED IRON & STEEL AND STEEL PROCESSING INDUSTRIES

(1) Correlation between GDP and Consumption of Iron & Steel

Data from various countries in the world show that a close relationship exists between per capita GDP and the consumption of iron and steel per capita. The volume of iron and steel consumed closely depends on the level of economic development or industrialization as shown in Table 8-5-2 and 8-5-3. Observed data bring a correlating equation as below:

$$\text{Ln [I \& S Cons/PC]} = 0.6187 \text{ Ln [GDP/PC]} + 0.1043$$
$$R = 0.9198$$

This means that an increase of per capita GDP of 10% will raise the per capita consumption of iron & steel by 6.187%.

(2) Iron and Steel Consumption in Turkey

As crude steel production in 1989 was 8.5 million tons, the consumption per capita can be estimated as 130.5 kg/person. The correlation between per capita GDP and consumption per capita of iron and steel can be formulated as below:

$$\text{Ln [I \& S Cons]} = 4.4852 \text{ Ln [GDP/P]} - 33.4532$$
$$R: 0.9808$$

A parameter of 4.4852 is very high in comparison with the observed one for selected countries, 0.6187. It is affected by the relatively higher growth rate of iron and steel consumption in this period. It seems to be unrealistic to adopt this higher parameter in the estimation of future consumption in 2000 and 2010.

When a parameter obtained by cross-nation analysis as of 0.6187 can be adopted, GDP and population, which have been assumed as the macro-framework

of this study, will bring the volume of iron and steel consumption in 2000 and 2010. They are as below:

Year	G.D.P. per capita in 1968 prices(TL)	I & S consumption per capita (kg/person)
1989	5,088	130.53
1994	7,189	162.11
2000	8,938	185.67
2010	13,300	237.87

Given that the Turkish economy will accelerate its industrialization and realize a relatively higher growth rate, it is reasonable to assume 200kg and 250kg of iron and steel consumption per capita, respectively, in 2000 and 2010. These assumptions will make it possible to estimate iron and steel consumption in 2000 and 2010 as below:

Year	I & S consumption per capita(kg)	Population (thousand)	Iron & Steel Consumption (tons)
2000	200	69,741	13,948,000
2010	250	82,364	20,591,000

(3) Estimation of Production Capacity of Iron & Steel in Turkey

Exports of iron & steel products were 2,861 thousand tons and 2,861 thousand tons, and imported products were 1,600 thousand tons and 1,611 thousand tons, respectively, in 1988 and 1989. The net trade surplus was made up 15.4% and 14.7% by crude steel production in these years. This percentage may increase in the coming decades because the Turkish economy will pursue outward looking strategies. If two alternate net export ratios, 15% and 20% were to be adopted, the production capacity of iron and steel in term of crude steel should be as follows:

Year	Domestic Consumption	Production Capacity	
		Export Ratio: 15%	Export Ratio:20%
2000	13,948,000	16,409,000	17,435,000
2010	20,591,000	24,225,000	25,739,000

(Figures in tons per year)

(4) Necessity of New Integrated Iron & Steel Plants

This means that the production capacity of crude steel should be two times and three times the present level, respectively, the present level in 2000 and 2010. On the other hand, ERDEMIR is planning to expand its capacity to 3 million tons in the short term and 6 million tons in the long term. KARABUK will expand its capacity to 900,000 tons per year and the present capacity of ISDEMIR can be expanded twice or more, which will be needed into more than 10 million tons. Even if the production capacity of these three major plants were to be 6 million, 1 million and 4-10 million tons per year, respectively, plus the expansion of other steel mills, especially of electric furnaces, new integrated iron and steel plants will be required on a large scale.

(5) Recommendation of an Integrated Iron & Steel Plant

After the completion of the expansion plan of the KARABUK Iron & Steel Works and construction of port facilities for handling and storage of iron ore, hard coal and steel products at Black Sea Port, construction of a new integrated iron and steel plant is recommended on a economical scale of at least 2 million tons per year, because Filyos can provide the deep-sea port required for efficient importation of raw materials. Also, it is in an excellent location for exportation of products to foreign markets, particularly to Black Sea Rim Areas.

Here several alternative scenarios can be identified relating to the Iron & Steel Complex in Filyos as below:

Scenario A Establishment of Large-Scale Integrated Complex with 5 or 6 million tons/year-capacity blast furnace plant. In this scenario almost the entire area of arable land just behind the port must be occupied by the Iron & Steel Complex, and the existing KARABUK Works shall be restructured into rolling mills and a processing plant.

Scenario B Establishment of a new blast furnace on an at least marginal economical scale. In this scenario a new plant shall be coordinated with KARABUK Works. Filyos plant and its complex shall

mainly produce export products. In this case, other manufacturing industries could be developed in the port area.

Scenario C Establish an electric arc furnace plant of adequate capacity in Filyos to produce higher-value alloys and their products. Pig iron will be supplied from KARABUK Works. Other industries can be introduced into the port area.

For these scenarios, three types of organization should be taken into consideration. The first is based on the assumption that the new plant shall be constructed and managed by the Turkish Iron & Steel Works (the State Company). The second one assumes that a private company shall invest in the new Integrated Iron & Steel Complex. The third is based on the assumption that the Turkish Iron & Steel and an other private company, domestic or foreign, shall organize a joint-venture to build a new Iron & Steel Works in Filyos. The most important point in determining the best option must be economic efficiency as well as improving the operation of the existing state company.

	Invested in by TDCI	Invested in by Other Private Companies	Invested in by Joint-Venture
Integrated Iron & Steel Plant in Large Scale as of 5 or 6 million tons/year	[A-1]	[A-2]	[A-3]
Integrated Iron & Steel Plant in Least Economical Scale as of 2 million tons/year	[B-1]	[B-2]	[B-3]
Electric Arc Furnace Plant with Adequate Capacity	[C-1]	[C-2]	[c-3]

Table 8-5-1 Cargo Volume of Candidate Industries (1)

INDUSTRY	CAPACITY	MATERIAL INTAKE		PRODUCTS OUTPUT		LAND AREA
		ON ROAD OR RAIL	BY SHIP	ON ROAD OR RAIL	BY SHIP	
COMMON INDUSTRIES						
GRAIN SILO	60,000 ton (x 4 cycles) 240,000 t/y	120,000 ton	120,000 ton 60,000 dwt 30,000 dwt 10,000 dwt	120,000 ton	120,000 ton 60,000 dwt 30,000 dwt 10,000 dwt	4 ha
SAWMILL	300,000 m^3/y		270,000 ton 25,000 dwt	150,000 ton	100,000 ton 10,000 dwt	5 ha
SHIPBUILDING & REPAIRING	16 ships/year	10,000 ton	30,000 ton			20 ha
STORAGE OF COAL & IRON ORE			3,670,000 ton		1,850,000 ton	40 ha
ALTERNATE (I)						
INTEGRATED IRON & STEEL	2,000,000 ton/y		4,500,000 ton	1,000,000 ton	1,000,000 ton	200 ha

Table 8-5-1(Cont.) Cargo Volume of Candidate Industries (2)

INDUSTRY	CAPACITY	MATERIAL INTAKE		PRODUCTS OUTPUT		LAND AREA
		ON ROAD OR RAIL	BY SHIP	ON ROAD OR RAIL	BY SHIP	
ALTERNATE (II)						
THERMAL COAL POWER PLANT	600,000 kw		1,500,000 ton			50 ha
ELECTRIC ARC FURNACE	380,000 ton/y	330,000 ton	100,000 ton	180,000 ton	180,000 ton	43 ha
SODIUM HYDROXIDE	100,000 ton/y	160,000 tons		60,000 ton	60,000 ton	4 ha
GLASS & PRODUCTS	500,000 cases/m	400,000 ton		150,000 ton	150,000 ton	30 ha
PAPERBOARD	4,000,000 m^2/m	18,100 ton	20,000 ton	20,000 ton	17,000 ton	4 ha
ALTERNATE (III)						
PETROLEUM REFINERY	100,000 BPSD		4,480,000 ton	1,280,000 ton	3,200,000 ton	80 ha
ETHYLENE PLANT	200, 000 ton/year	275,000 ton			50,000 ton	100 ha

Fig. 8-5-1 A Hypothetical Food Processing Complex

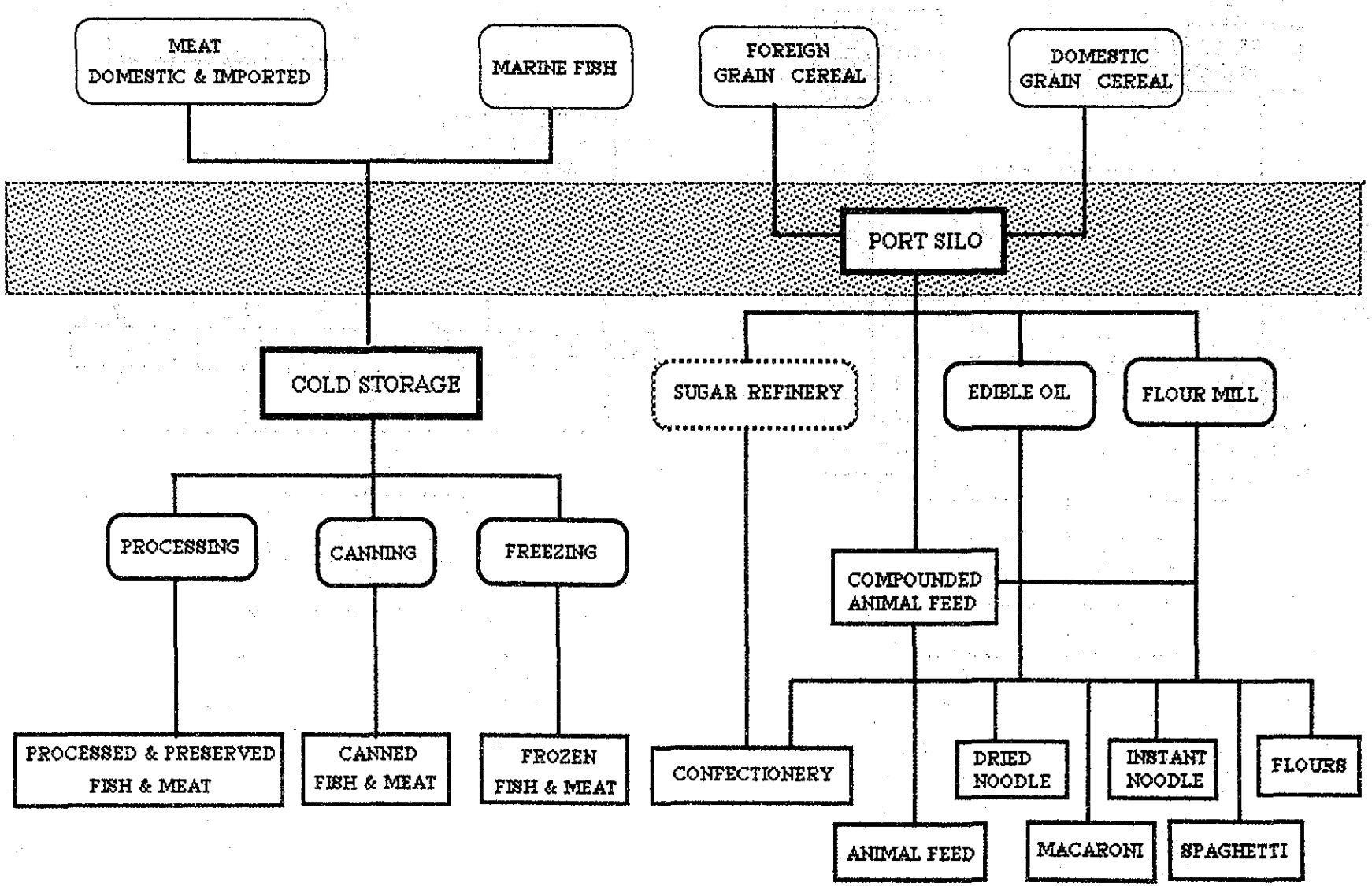


Fig. 8-5-2 The Concept of Fish and Meat Processing Complex

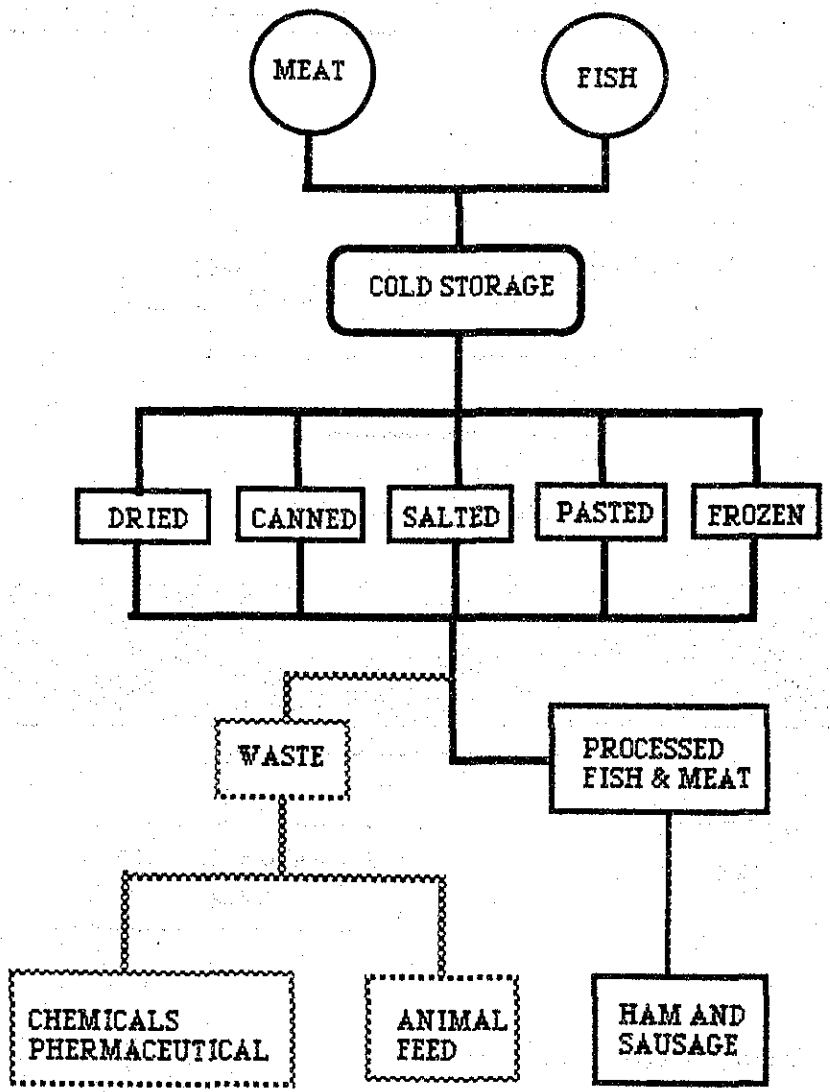


Fig. 8-5-3 The Concept of Wood Processing Complex

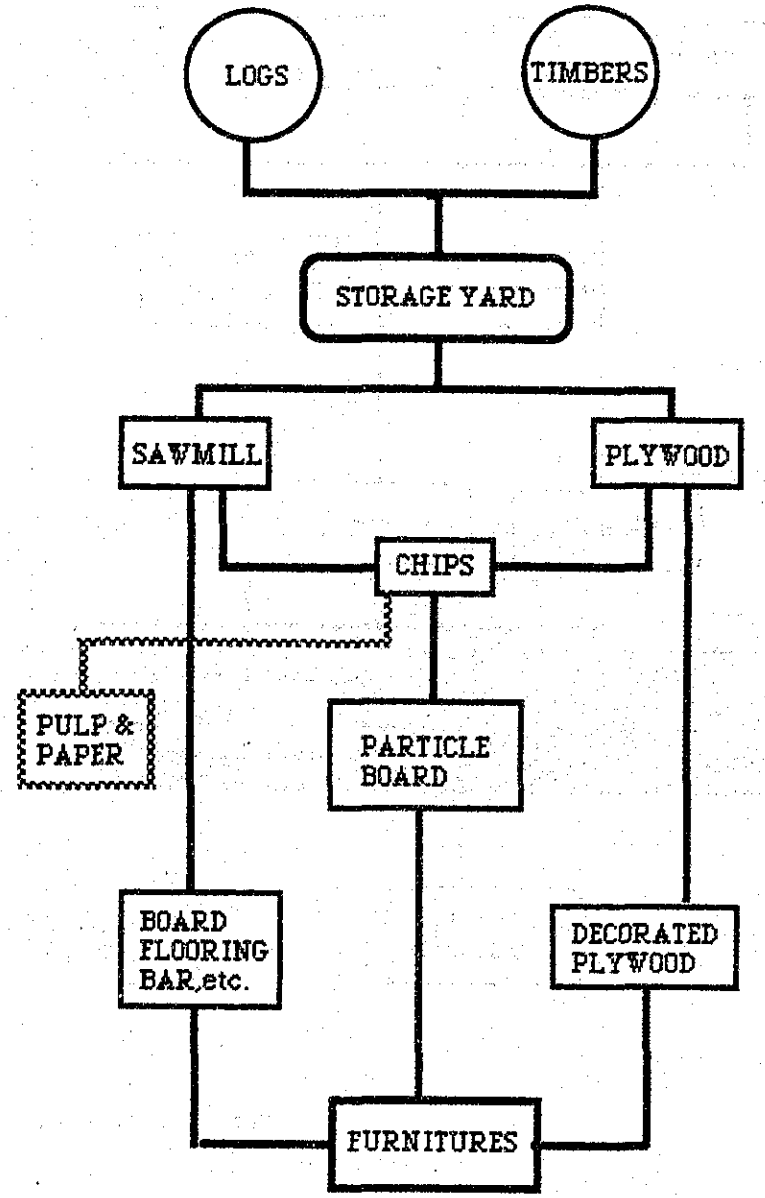


Fig. 8-5-4 Transportation System of Iron
(in the earlier development stage through 2000)

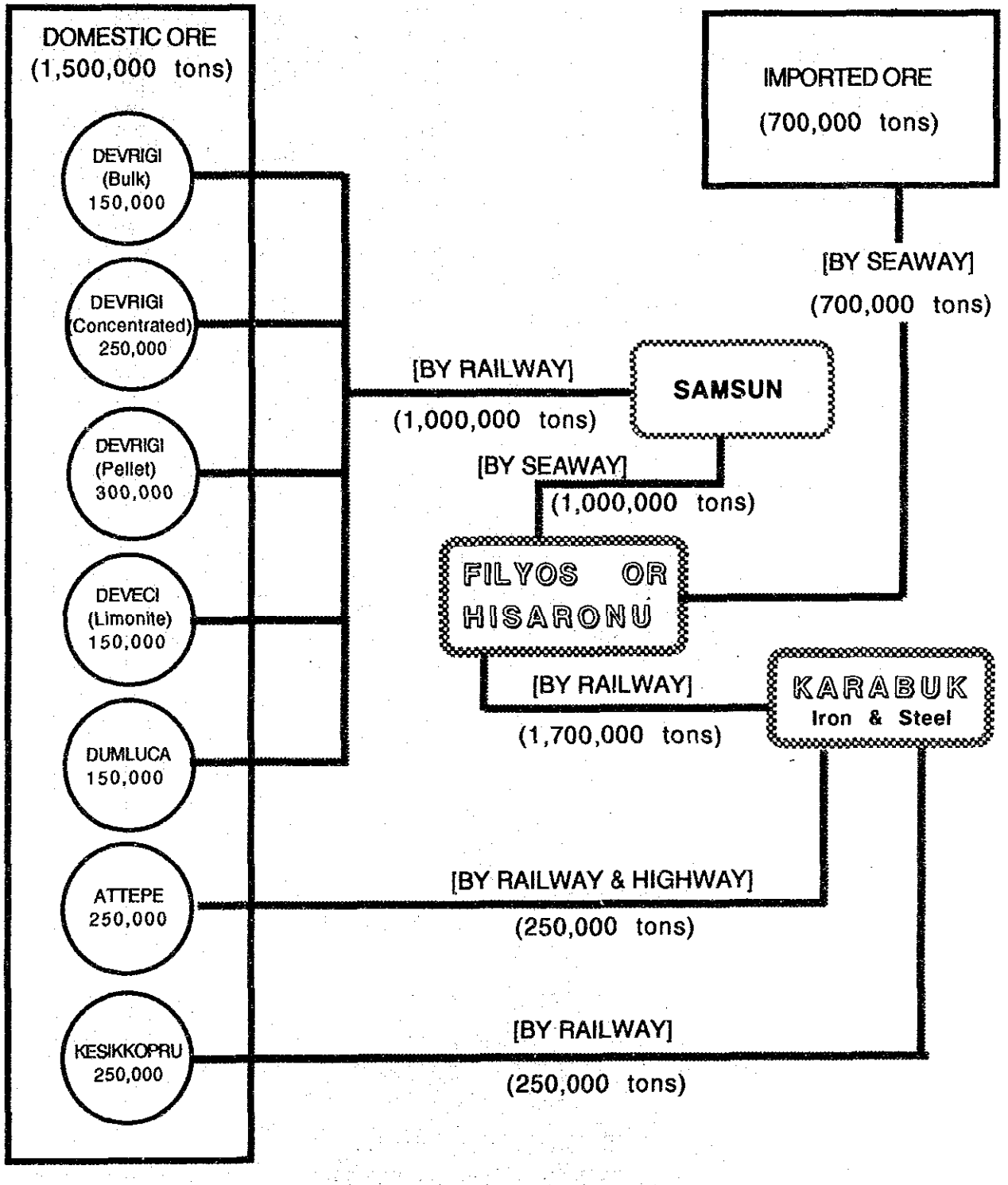


Table 8-5-2 Iron and Steel Consumption Per Capita

(in kg. per capita per annum)

	Y1985	Y1986	Y1987	Y1988
JAPAN	606	578	601	710
USSR	574	586	592	585
CANADA	524	493	485	568
TAIWAN	47	71	478	548
WEST GERMANY	481	483	485	496
SWEDEN	384	417	453	476
ITALY	362	381	371	398
AUSTRALIA	364	372	391	389
SOUTH KOREA	234	254	304	387
NETHERLANDS	305	300	300	313
AUSTRIA	235	283	306	302
UNITED KINGDOM	248	252	261	285
FRANCE	258	254	254	274
SPAIN	156	224	214	255
TURKEY	100	99	108	110
BRAZIL	84	101	98	94
MEXICO	97	84	87	89
MAINLAND CHINA	67	70	71	75
INDIA	18	19	21	23

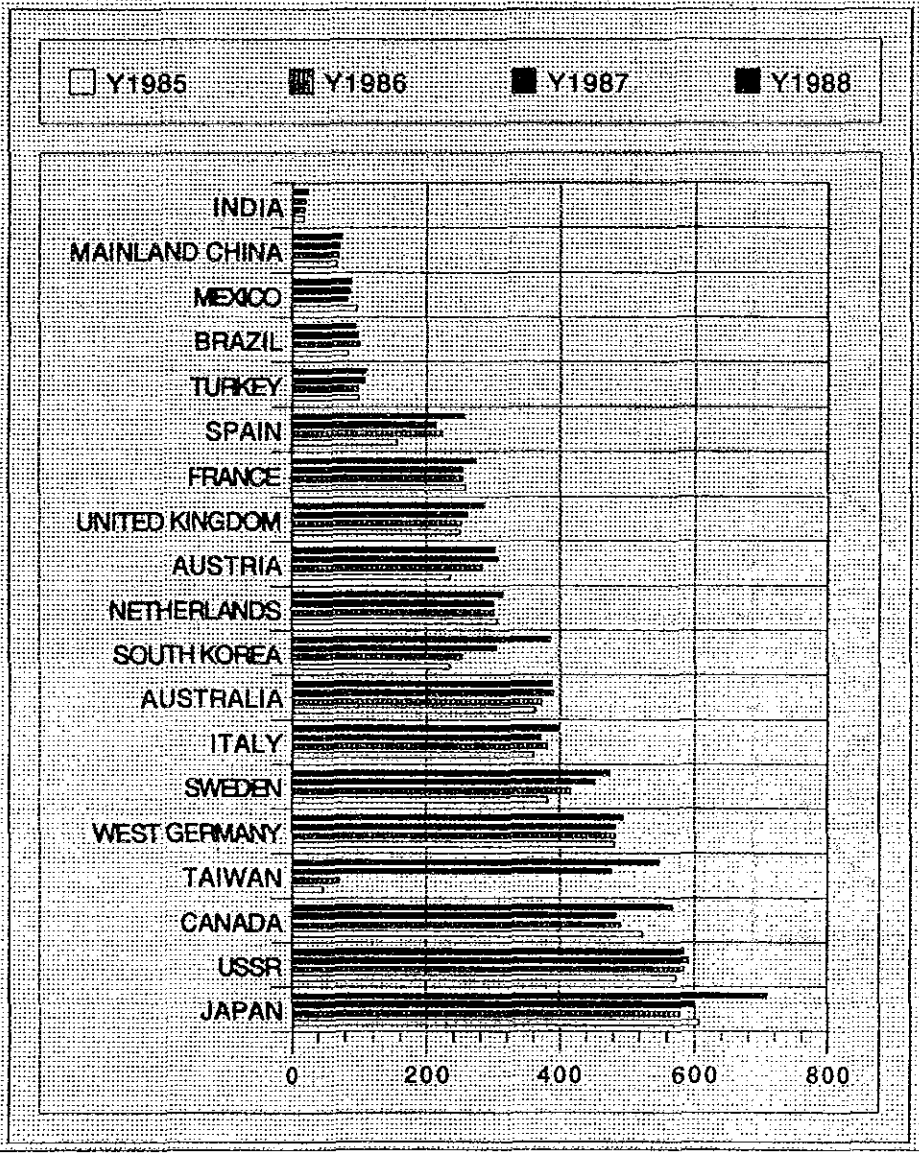
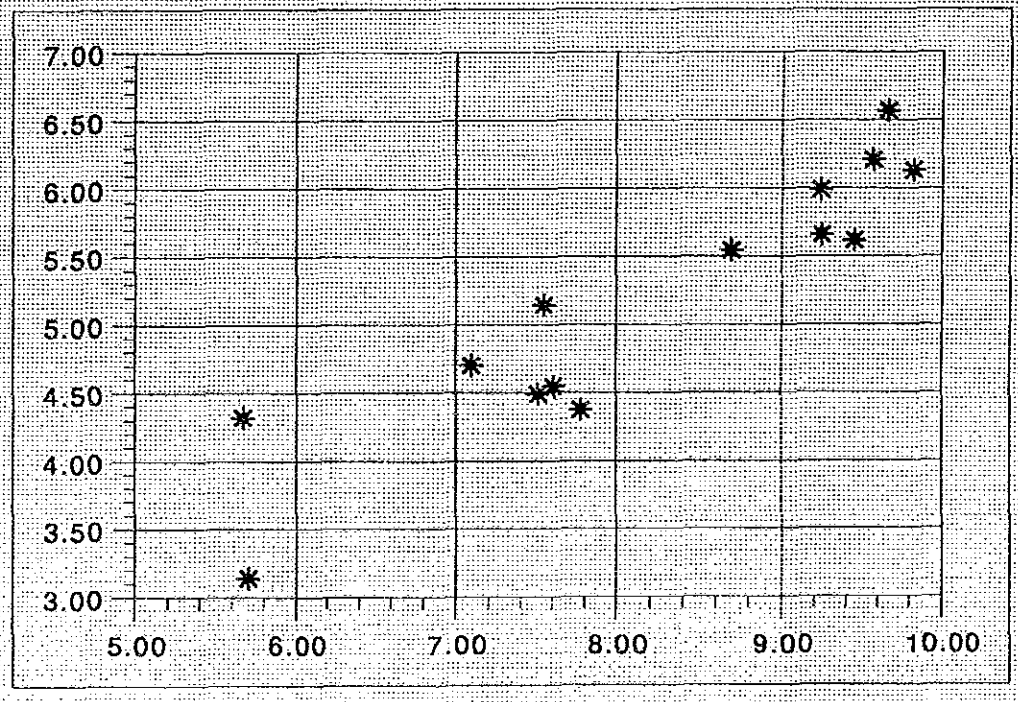


Table 8-5-3 Correlation of GDP and I&S Consumption Per Capita

	Ln[GDP/P.C.]	Ln[I & S Cons.]	GDP/P.C.	I & S Cons.
CHINA	5.67	4.32	290	75
INDIA	5.70	3.14	300	23
TURKEY	7.10	4.70	1,210	110
MEXICO	7.51	4.49	1,830	89
SOUTH AFRICA	7.54	5.14	1,890	171
BRAZIL	7.61	4.54	2,020	94
ARGENTINA	7.78	4.37	2,390	79
SPAIN	8.70	5.54	6,010	255
ITALY	9.24	5.99	10,350	398
UNITED KINGDOM	9.25	5.65	10,420	285
FRANCE	9.46	5.61	12,790	274
GERMANY, FED.REP.	9.57	6.21	14,400	496
JAPAN	9.67	6.57	15,760	710
UNITED STATES	9.83	6.13	18,530	458



8-5-3 ALTERNATE COMPLEX (II): ELECTRIC POWER PLANT, ELECTRIC ARC FURNACE AND RESOURCE-BASED INDUSTRIES

The second alternative complex would use an electric power produced by a newly established thermal power plant. In order to improve the economic efficiency of power generation, importation of thermal coal with more than 5000 kcal/kg will be required. Filyos Port can provide unloading facilities to import thermal coal for power plant together with hard coal for iron & steel.

If the installation of a thermal power plant were to be realized, various industries depending on sufficient supple of power and local resources such as an electric arc furnace, a sodium hydroxide plant, a glass manufacturing factory and a pulp & paper plant could prosper here.

(1) Thermal Electric Power Plant

At present power supply capacity is sufficient for power demand. However, it will be necessary to install more power plants in future to maintain the rapid growth of industrial production. Filyos is a suitable site for construction of power plants, because it can provide excellent facilities to import thermal coal. Thus the installation of thermal power plants is recommended.

Standard Size of Power Plant

Generating Capacity:	600,000 kw
Thermal Coal Consumption:	1,500,000 tons/year
Required Land Area:	50 ha

(2) Electric Arc Furnace Plant

Although liquid steel production by Electric Arc Furnace (EAF) plants accounted for only 26% of total production in Turkey in 1980, it increased enormously to 59% in 1989 (see Table below). The government is going to restrict new investments on electric arc furnaces at the moment. But, in Filyos, an electric arc furnace plant can be efficiently operated by keeping close relation with the Iron & Steel Works in Karabuk, which produces pig iron that could be materials for high valued ferroalloy. Such

an operation system will contribute to raise the economic efficiency of the state-owned iron & steel company.

Liquid Steel Production by Factories in Turkey (in thousand tons)

	ISDEMIR	ERDEMIR	KARABUK	EAFs	TOTAL
1980	420	892	565	658	2,535
	(17 %)	(35 %)	(22 %)	(26 %)	(100 %)
1981	375	920	558	767	2,620
	(15 %9	(35 %)	(21 %)	(29 %)	(100 %)
1982	460	1,106	540	1,076	3,182
	(14 %)	(35 %)	(17 %)	(34 %)	(100 %)
1983	563	1,473	549	1,355	3,940
	(14 %)	(37 %)	(15 %)	(34 %)	(100 %)
1984	831	1,544	501	1,455	4,331
	(19 %)	(35 %)	(12 %)	(34 %)	(100 %)
1985	1,103	1,514	519	1,728	4,864
	(23 %)	(31 %)	(11 %)	(35 %)	(100 %)
1986	1,416	1,514	609	2,389	5,928
	(24 %)	(26 %)	(10 %)	(40 %)	(100 %)
1987	1,710	1,578	595	3,164	7,044
	(24 %)	(22 %)	(9 %)	(45 %)	(100 %)
1988	1,815	1,775	582	3,810	7,983
	(23 %)	(22 %)	(7 %)	(48 %)	(100 %)
1989	931	2,014	322	4,667	7,934
	(12 %)	(25 %)	(4 %)	(59 %)	(100 %)

Source: Directorate of Turkish Iron & Steel Works, Annual Report, 1990
Note: Production at Karabuk and Isdemir in 1989 was affected by long strikes.

There were 17 private EAFs in 1989 in Turkey. The production capacity of crude steel by these 17 EAFs was 6,474,000 tons/year in 1989. One of them ended its operation in 1989. One will start up its production in 1991 and one is in the planning stage. The location of EAFs is concentrated in four provinces: 5 in Izmir, 4 in Istanbul, 4 in Kocaeli, and 2 in Bursa. Others are in Sivas, Kirikkale (Ankara) and Iskendern.

The capacity of the proposed EAF plant at Filyos shall be assumed as 380,000 tons/year. Consumption of pig iron shall be 330,000 tons/year, which will come from the Karabuk Iron & Steel Works, while 100,000 tons of scrap iron shall be imported. The EAF will contribute to improving the

economic efficiency of the Karabuk Works by producing such high-value products as ferroalloy and steel pipes. Around half of these products will be exported.

(3) Sodium Hydroxide Plant and Glass Factory

The sufficient supply capacity of electric power will make it possible to utilize local resources like rock salt and silica sand by establishing a sodium hydroxide plant and a glass factory.

Standard Size of Sodium Hydroxide Plant

Capacity:	100,000 tons/year
Material Consumption:	160,000 tons/year
Required Land Area:	4 ha

Standard Size of Glass Plant

Capacity:	500,000 cases/month
	(300,000 tons/year)
Material Consumption:	400,000 tons/year
Required Land Area:	30 ha

(4) Paperboard Plant

It has to be noted that the domestic demand for paper and paper products is envisioned to grow at a relatively high rate as of 7.3% annually, while the production capacity is planned to increase at a rate of 6.9% per annum according to the 6th Plan. The total production capacity shall be 1,259 thousand tons per year in 1994. The ratio of exports to production has increased from 6.1% in 1984 to 7.2% in 1989, and it is expected to rise to 8.6% in 1994, while imports are expected to increase an average 8.7% per annum. Based on this, per capita consumption of paper and paperboard will be as follows in 1994:

Production:	1,259,000 tons
Exports:	179,658 tons
Imports:	300,000 tons
Domestic Consumption	1,379,342 tons
Population	61,825 thousand
Consumption	22.3 kg/capita

If an elasticity of per capita consumption of 0.8998 to the growth rate of G.D.P. per capita towards 2000 and 2010 were to be applied on the basis of 22.3 kg of consumption per capita in 1994, the average per capita consumption of paper and paperboard will be 27.14 kg in 2000 and 31.91 kg in 2010. Though these figures are quite low as compared with the observed data for middle-income countries in the rest of the world, total domestic consumption must be 2,628,235 tons in 2010. It will be more than double the production capacity targeted in 1994. If the Turkish economy grows to the level of advanced countries in these two decades, per capita consumption may be more than 50 kg. A consumption of 50 kg per capita means that the total domestic consumption will be 4,118,200 tons per annum.

These observations mean that more pulp & paper plants will be required. The 6th Plan proposes an increase in production capacity of at least 700,000 tons in the plan period. After this plan period more capacity will be needed to meet rising domestic consumption. The location of pulp & paper plants is exclusively dependent on the availability of raw materials. The Plan expressed anxiety about the exhaustion of domestic materials. The increase of production capacity will be accompanied by imports of raw materials as well as the encouragement of planting fast-growing trees such as eucalyptus. It would be better to establish new plants in forested regions or in port districts. The Filyos district is advantageous in terms of the location of pulp and paper plants.

There is a state company that produces pulp and paper, SEKA, in CAYCUMA City. It produced 49,417 tons of craft paper in 1989. Although the construction of Filyos Port will help the stable supply of imported raw materials, it seems advantageous to establish a new plant in the port area in order to raise the pulp and paper production capacity.

Sodium Hydroxide can be used as material to produce pulp and paper. The SEKA plant at Caycuma buys chemical materials from Izmir and produces craft paper mainly for packaging cement. Sodium Hydroxide production in Filyos will be able to improve the economic efficiency of SEKA Caycuma, which has an expansion plan to raise its capacity from 60,000 tons/year to 100,000 tons/year. It is recommended that a paperboard plant be established at Filyos in connection with SEKA Caycuma.

Standard Size of Paperboard Plant

Capacity:	4,000,000 m^2
	(37,000 tons/year)
Material Consumption:	38,000 tons/year
Required Land Area:	4 ha

8-5-4 ALTERNATE COMPLEX (III): PETROLEUM REFINERY AND PETROCHEMICAL INDUSTRIES

A third alternate industrial complex shall be generated by crude oil importation and the installation of the petroleum refinery and petrochemical industries.

(1) CRUDE OIL CONSUMPTION BY COUNTRIES IN THE WORLD

The consumption of crude oil indicates the stage of industrialization and economic development. Table 8-5-4 shows the crude oil consumption per capita by country. It can produce a meaningful correlation as follows:

$$LN[OIL.CONS/POP]=0.7969\ LN[GDP/POP]+0.3638$$
$$R=0.9340$$

(2) PETROLEUM INDUSTRY AND PETRO-CHEMICAL INDUSTRY IN TURKEY

Though crude oil production in Turkey was 2,629 thousand tons in 1987, it decreased slightly to 2,564 thousand tons in 1988. However, it went up to 2,868 thousand tons in 1989. Since that amount is very small as compared with the domestic consumption of crude oil, estimated to be around 22 billion liters, Turkey has had to import crude oil so far and will be more dependent on imports in order to meet increasing domestic demand for petroleum products. Petroleum is the basic resource for various manufacturing products, particularly for chemical products. It's necessary to keep a stable supply of materials to realize industrialization.

The production levels of four refineries in Turkey have been recorded as below (in thousands of tons):

Plant	1984	1985	1986
IZMIT	10,463	9,969	10,472
IZMIR	4,056	4,056	4,193
KIRIKKALE	-	-	186
BATMAN	815	788	780

PETKIM Petrokimya Holding A.S. has two chemical plants, ALIAGA and YARIMCA, and one tyre factory, PETRAS. The flow diagram of two chemical plants are shown on Figure 8-5-5 and Figure 8-5-6.

(3) Necessity of Establishing a New Petroleum Complex

In order to meet the increasing domestic demand for petroleum products, it will be necessary to establish more petroleum refinery plants and petrochemical complexes in future. At moment Turkey has four refinery plants at Izmir, Izmit, Kirikkale and Batman. A crude pipeline runs from Iraq to Yumurtalik and branches out into two lines, one to Kirikkale and the other to Batman. If another route of crude oil distribution, which could have its terminus on the Black Sea coast, were to be implemented, Turkey could realize the diversification of resources and would obtain a stable supply of crude oil.

(4) Proposed Capacity of Refinery and Ethylene Plant at Filyos

Petroleum Refinery Plant

Capacity:	100,000 BPSD
Crude Oil Consumption:	4,480,000 tons/year
Required Land Area:	80 ha

Ethylene Plant

Capacity:	200,000 tons/year
Consumption of Naphtha:	275,000 tons/year
Volume of Products:	450,000 tons/year
Required Land Area:	100 ha

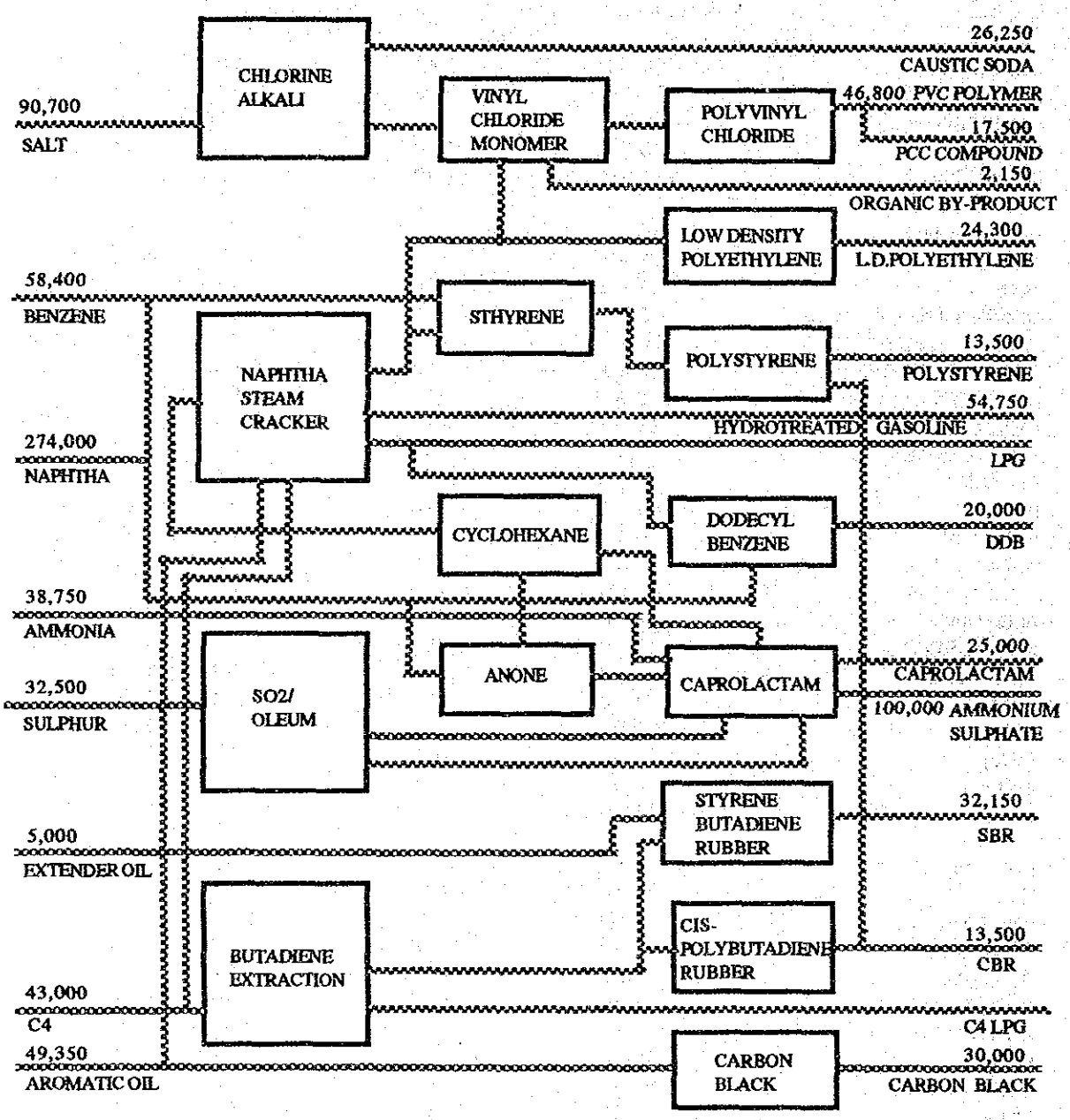
The Sodium Hydroxide plant will produce Chlorine Alkali and Vinyl Chloride Monomer, as well as Sodium Hydroxide, which will be able to produce such products as Ethylene Oxide, Ethylene Glycol, Low Density Polyethylene and High Density Polyethylene by combining with Ethylene. Thus it has to be noted that the petrochemical and the sodium hydroxide plants will be combined to form an industrial complex.

Table 8-5-4 Crude Oil Consumption Per Capita by Country

	(A) POPULATION (millions) mid-1987	(B) GDP per capita (US $) Y1987	(C) OIL CONS/ POP (litre) Y1985	(D) LN[B]	(E) LN[C]
CHINA	1,068.50	290	100	5.67	4.61
INDIA	797.50	300	70	5.70	4.25
PAKISTAN	102.50	350	100	5.86	4.61
NIGERIA	106.60	370	130	5.91	4.87
INDONESIA	171.40	450	170	6.11	5.14
PHILIPPINES	58.40	590	200	6.38	5.30
EGYPT, ARAB REP.	50.10	680	540	6.52	6.29
THAILAND	53.60	850	250	6.75	5.52
TURKEY	52.60	1,210	420	7.10	6.04
COLOMBIA	29.50	1,240	350	7.12	5.86
PERU	20.20	1,470	440	7.29	6.09
SYRIAN ARAB REP.	11.20	1,640	1,090	7.40	6.99
MALAYSIA	16.50	1,810	650	7.50	6.48
MEXICO	81.90	1,830	1,140	7.51	7.04
SOUTH AFRICA	33.10	1,890	640	7.54	6.46
POLAND	37.70	1,930	520	7.57	6.25
BRAZIL	141.40	2,020	480	7.61	6.17
HUNGARY	10.60	2,240	1,240	7.71	7.12
ARGENTINA	31.10	2,390	790	7.78	6.67
YUGOSLAVIA	23.40	2,480	830	7.82	6.72
ALGERIA	23.10	2,680	440	7.89	6.09
KOREA, REP.	42.10	2,690	800	7.90	6.68
PORTUGAL	10.20	2,830	980	7.95	6.89
VWNIEZUELA	18.30	3,230	1,280	8.08	7.15
GREECE	10.00	4,020	1,430	8.30	7.27
SPAIN	38.80	6,010	1,280	8.70	7.15
IRELAND	3.60	6,120	1,290	8.72	7.16
SAUDI ARABIA*	12.60	6,200	4,410	8.73	8.39
ISRAEL*	4.40	6,800	1,780	8.82	7.48
SINGAPORE*	2.60	7,940	4,830	8.98	8.48
ITALY	57.40	10,350	1,690	9.24	7.43
UNITED KINGDOM	56.90	10,420	1,650	9.25	7.41
AUSTRALIA	16.20	11,100	2,370	9.31	7.77
BELGIUM	9.90	11,480	1,540	9.35	7.34
NETHERLAND	14.70	11,860	2,490	9.38	7.82
AUSTLIA	7.60	11,980	2,560	9.39	7.85
FRANCE	55.60	12,790	1,890	9.46	7.54
GERMANY, FED.REP.	61.20	14,400	2,230	9.57	7.71
FINLAND	4.90	14,470	2,560	9.58	7.85
KUWAIT*		14,610	4,110	9.59	8.32
DENMARK	5.10	14,930	2,610	9.61	7.87
CANADA	25.90	15,160	3,470	9.63	8.15
SWEDEN	8.40	15,550	2,400	9.65	7.78
JAPAN	122.10	15,760	2,080	9.67	7.64
UNITED ARAB EMIRATES*	1.50	15,830	5,200	9.67	8.56
NORWAY	4.20	17,190	2,500	9.75	7.82
UNITED STATES	243.80	18,530	3,810	9.83	8.25
SWIZERLAND	6.50	21,330	2,360	9.97	7.77

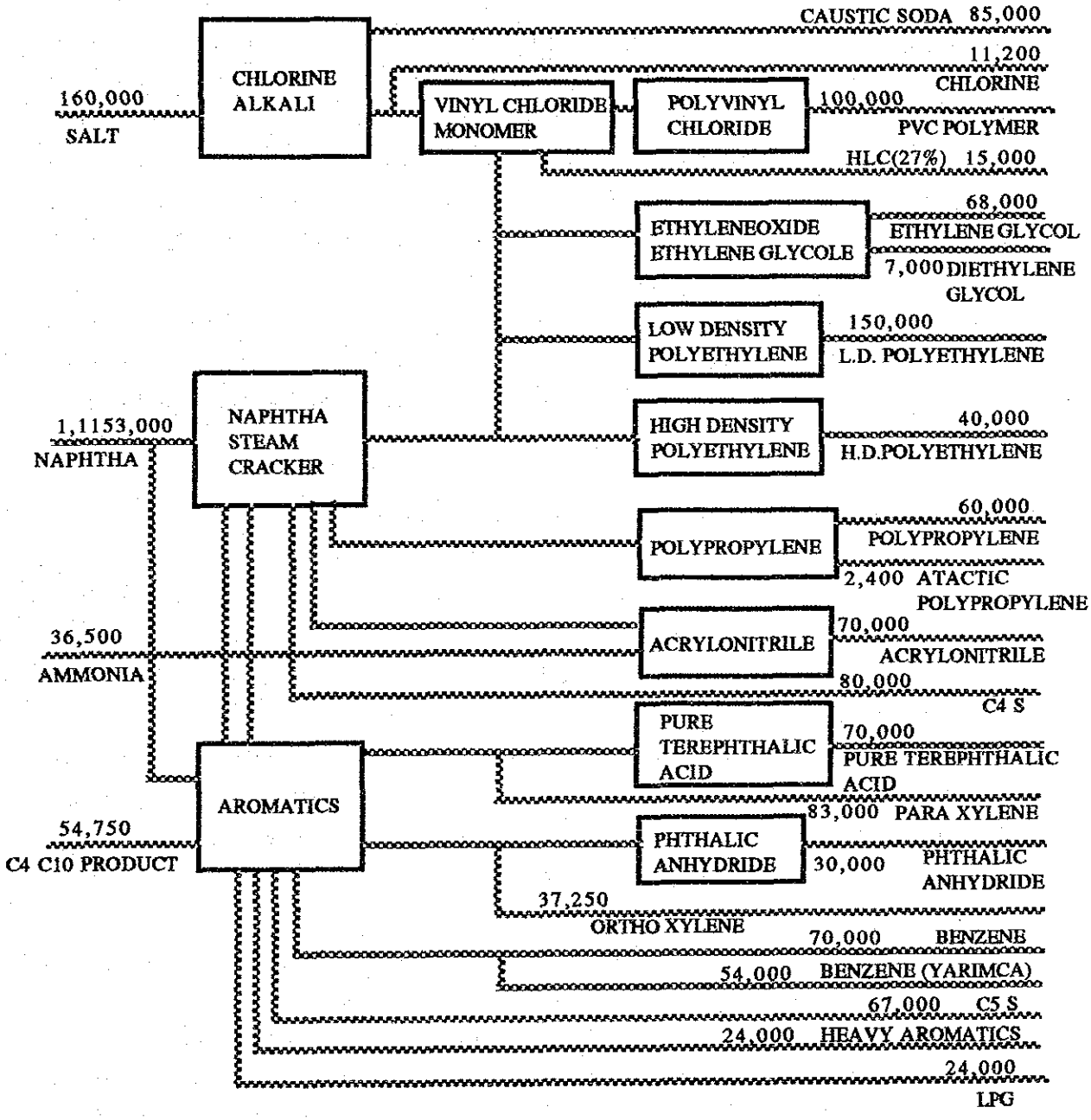
Source: World Bank "World Development Report"

Fig. 8-5-5 Flow Diagram of Yarimca Petrochemical Complex



Note : All values are in tons/year
Source: PETKIM,"ANNUAL REPORT 1988"

Fig. 8-5-6 Flow Diagram of Aliaga Petrochemical Complex



Note: All values are in tons/year.
Source: PETKIM, "ANNUAL REPORT 1988".

8-6 Recommendations

8-6-1 Necessity of Further Study on the Integrated Iron & Steel

The establishment of an integrated iron & steel plant has been proposed as the most desirable industrial project on a scale exceeding 2 million tons per year in the port area of Filyos. It is assumed that the plant will be developed after the year 2000, Although the Turkish government has not yet decided to establish a new integrated iron & steel plant besides the three existing plants, the macro analysis of the national economy presented in this report suggests that a new plant will be needed. In order to decide whether it can be built or not, a detailed study to justify the necessity of this project, to draw up a master plan and to evaluate its feasibility will be expected. This study should be carried out in the preparation period of port construction.

8-6-2 Dealing with Alternative Industrial Complex

This report presents alternative industrial complexes in line with the request of the steering committee. The desirable alternative would be selected by common understanding among concerned agencies and organizations, public and private, coordinated by the State Planning Organization. Alternatives present the basic ideas that provide the basis for discussions leading to a decision. Not only the ports construction but also the area's industrial development should be considered from the point of view of the regional development strategy.

8-6-3 Effects of the New Port on Regional Development

The construction and operation of Filyos Port and the industrial complex in the port area will have enormous effects on regional development. In this study, the region to be thus affected is held to comprise five provinces; Zonguldak, Bolu, Cankiri, Kastamonu and Ankara (particularly the northern part). A comprehensive regional development plan for this region should then be organized. The Ministry of Industry, Commerce and Technology has started a study of the industrial development strategy in Zonguldak province which can be closely related to the

development of the port and coastal industrial complex Filyos district. Since the Caycuma district is the most promising district from the industrial and urban development points of view, a plan to develop the inland industrial estate on a relatively large scale could be proposed in this district, namely Organize Sanay Caycuma according to the Turkish concept. Some sort of urban development plan in Hisaronu should also be prepared because it will have been influenced directly because its population will increase due to the development of the port and industry.

8-6-4 Environmental Conservation

Needless to say, environmental conservation has to be carefully taken into consideration in the planning, construction and operation stages. Although Filyos district has a great capability to absorb industrial activities compared with established urban areas, social infrastructures to prevent pollution should be prepared together as well as asking investors to establish facilities to prevent pollution. The Black Sea, especially, has to be protected from waste water.

8-6-5 Advancing Toward Black Sea Economic Rim

The location of Filyos is advantageous in accessibility to the Black Sea Economic Rim. Therefore it has enormous potential to adopt an outward-looking strategy for economic development. Filyos Port will play a great role in this context. Through Filyos Port materials will come into Turkey from Black Sea Economies and Turkish products can be exported to Black Sea Rim. Such circumstances will result in this districts being more able to encourage various industries. It is noted that the proposed industries have been identified by assuming such a condition. But there will be a need to evaluate the available resources and the market potential of the Black Sea Rim in more detail. The possibility of establishing an export processing zone in the port area also depends on the market potential of the Black Sea Rim Economy.

8-6-6 Accelerate the Construction of Infrastructures

As Filyos district is not developed to a great extent, construction of

such infrastructures as electric power, water supply, treatment of wastes, transportation and telecommunications should be accelerated in order to encourage industrial development.

CHAPTER IX MASTER PLAN

9-1 Evaluation of the Site Selection

9-1-1 Alternatives for the Development Site

As regards the sites for a port able to accommodate the future traffic demand as projected in the preceding chapter, the following 2 (two) places are conceived as the possible alternative sites, as opposed to building a new port at Filyos:

(1) Expansion of the existing Samsun Port
(2) Expansion of the existing Eregli Port

These alternatives are identified for the following reasons:

(1) They have ample space for expansion and re-development to meet the anticipated traffic demand,
(2) They have good road access to the hinterland of Filyos Port as analysed in the preceding chapter
(3) They are located on the Black Sea Coast and near Filyos, and
(4) They have the infrastructure required for port activities.

The Port of Zonguldak is mainly used for loading domestically produced coal needed and its existing harbor has limited space for expansion. Other ports or locations neighboring Filyos have also space limitations in terms of the expansion to meet the future traffic demand.

9-1-2 Comparative Evaluation of the Alternative Development Sites

Filyos is likely the best option for port development among the three alternatives (Eregli, Samsun and Filyos) to achieve the expected roles as analysed in "Development Strategy". In identifying the best option, the pros and cons of all the alternatives are examined and compared from various planning aspects such as 1) proximity to markets, 2) conditions of landward access links, 3) conditions of maritime access, 4) availability of required space, 5) other obstacles to development and 6) development

effects. The evaluation results are indicated in Table 9-1-1.

The outcomes of the evaluation can be summarised as follows:

(1) Port of Samsun

The port of Samsun is located at the City of Samsun on the Black Sea coast, 169 kilometers west of Ordu and 167 kilometers east of Sinop. The port is operated by the TCDD.

The port seems to have enough room for expansion to accommodate the future traffic demand of containers and other general cargoes up to 2010 projected at Filyos, although some of its existing berths would need to be redeveloped for this purpose.

However, the port is located far from the AMA, about 420 kilometers by road, which nearly equals the distance between the AMA and Istanbul (about 450 kilometers). Therefore, no saving on inland transport cost can be expected in terms of the seaborne trade cargoes to/from the AMA. In addition, the length of sea crossing to the port is about 360 miles from Istanbul Port (200miles from Filyos) and the port location seems too disadvantagous compared to Filyos in terms of maritime access. Poor navigability in rough winter conditions would also disrupt the regular service, which is significant, since regular service is one of the crucial pre-conditions of maritime container services. Because of these reasons, the Port of Samsun is not in a position to replace Filyos as a port to serve for the hinterland including the AMA. On the other hand, the port has good inland road and railway links to the central part of the Black Sea Coast and the Middle Anatolian Region, therefore it is expected to increase its role as a gateway port to promote the development of these regions.

(2) Port of Eregli

The Port of Eregli is located near Filyos on the Black Sea Coast and is composed of two different areas:one used exclusively by the Erdemir Steel Works and another reserved for public use operated by the local entity. Because of its geographical location and existing infrastructure, the port has a good deal of competitiveness vis-a-vis Filyos.

The port is connected with the AMA by road at the distance of about 300 kilometers, that is, 50 kilometers more compared with Filyos. It has a water area in the public harbor which is already protected from the outer sea and can be easily developed.

The available space at the port is, however, too limited to accommodate the future demand envisaged for Filyos. With the completion of the outer breakwaters by the Erdemir, the 1.2km-long water area, now unused, located between the Erdmir and the fishing harbour would become a calm area physically suitable for port development.

However, this waterfront is currently used for public amenities such as walkways and parks, and the development of port facilities there could possibly conflict with the existing land use.

It is appropriate to limit port development to an area about 600m long out of the 1.2Km coastline to achieve harmonious land use.

Thus, the scale of port development achievable there is not large and only amounts to 2 berths in terms of container terminals. As such, the Port of Eregli does not have enough space to accommodate the projected traffic demand for Filyos, much less the space required for a port industry complex. Although the Port of Eregli is thus not in a position to replace Filyos as a port that is expected to play the roles such as those analysed in "Development Strategy", it has a good deal of development potential as a port to meet the urgent traffic demand that might arise until the new port of Filyos is put into operation. Such "urgent" traffic demand for the Port of Eregli will arise with the suburbanisation of the industries of the Istanbul Area eastward as well as the location of new industries along E5 and the a new highway now under construction.

One example of such industries is a factory manufacturing Japanese cars which could possibly be located there. Importing car parts in containers at a nearby port such as the Port of Eregli could be one promising alternative.

Thus, the Port of Eregli can also be considered as a port complementary to the ports in the Istanbul Area and supporting the suburbanisation of the industries of the Istanbul Area because of its good accessibility, particularly to the west.

(3) Filyos

The new port to be developed is expected to play the following twin roles in helping to realise the development of the Turkish economy and to accomplish the tasks of the economy as analysed in "Development Strategy":

i) To provide efficient maritime transport links for the provinces of Ankara, Zonguldak, Kastamonu, Cankiri and Bolu, to cope with the increasing future traffic demand and to improve the international competitiveness of foreign-traded commodities through the minimisation of inland transport costs, and

ii) To provide the space and infrastructure required for industrialisation in the form of a port-industry complex in order to contribute to the development of Turkey's industries in such a way as to make them more diversified, efficient, outward-oriented and internationally competitive.

Filyos is the only one among the three possible alternatives in question that can efficiently play the above roles.

First, it is located nearest to the above hinterland, with the road distance to the AMA about 250 kilometers. This enables a remarkable reduction in the inland transport cost of sea-borne cargoes to/from the hinterland compared with the present transportation from Istanbul Ports. For example, 2 round trips per day are likely possible between Filyos and the AMA while only 1 round trip a day is possible between the Istanbul Ports and the AMA.

Next, only Filyos can provide sufficient space for future traffic demand from the hinterland as well as for the formation of a port-industry complex.

Furthermore, the existing valley found in the seabed off-shore from Filyos will provide the natural waterways for deep sea vessels and minimise both capital and maintenance dredging costs if and when the facility layout is properly designed.

The disadvantage of Filyos is that it will be a completely new port and thus require a huge initial investment, including the development of infrastructure. However, this is never a crucial disadvantage if a proper development plan is developed that is justifiable from the economic and financial viewpoints.

9-1-3 Allocation of Functions between the Neighboring Ports

Based upon the above analyses, the allocation of functions between the nlighbouring ports, viz, Samsun-Filyos-Eregli, is summarised as follows:

(1) Port of Samsun

It is not economically viable to develop the port for the purpose of serving the area which is supposed to be the hinterland of Filyos because Samsun, like the Istanbul Ports, is far from the hinterland. Instead, the port shall be a major gateway port for the central part of the Black Sea Coast and the Middle Anatolian Region based on the good road and rail systems linking those areas with Samsun.

(2) Port of Eregli

The development space available at the port is not sufficient to accommodate the traffic and space demand to Filyos. On the other hand, the good accessibility of the port westward via the E5 and a new motorway enables the port to efficiently meet the traffic demand arising from the suburbanisation of the industries of the Istanbul Area as well as new industrial locations along the said trunk roads. Therefore, the Port of Eregli should have two functions: one, to meet the "urgent" traffic demand, if any, until the Port of Filyos is fully put into operation, the other, as a port complementary to the ports in the Istanbul area and to support the industrialisation along the E5 and the new motorway.

(3) Port of Filyos

The port will become a major focal point catering to the hinterland of Ankara, Kastamonu, Zonguldak, Cankiri and Bolu, and a port-industry complex to be newly developed.

Table 9-1-1 Comparison between the Alternative Sites

Evaluation Items	Port of Samsun	Port of Eregli	Filyos
1. Proximity to Market	1. Road Distance to Ankara 420 Kilometers (No major saving in inland transport cost can be derived compared to the ports in the Istanbul Area, because the road distance between Hyderpasa and Ankara is 460 Kilometers.)	1. Road Distance to Ankara 300 Kilometers (65% of the distance between Ankara and Hyderpasa)	1. Road Distance to Ankara 250 Kilometers (55% of the distance between Ankara and Hyderpasa)
	2. Number of Round Trips by Trucks to Ankara 1 round trip/day (round trip=24hrs/2x(driving time + loading or unloading time + meal time) Assuming average driving speed of 55 km/hr, round trip = 24/(7.6)+1.5+1.0)x2 ≒ 1)	2. Number of Round Trips by Trucks to Ankara 1.7 round trip/day (round trip=24/(5.4+1.5)x2≒1.7)	2. Number of Round Trips by Trucks to Ankara 2 round trip/day (round trip=24/(4.5+1.5)x2=2)
	3. Required Size of Truck Fleet Same as the case of Istanbul Ports	3. Required Size of Truck Fleet 60% of the Istanbul Port case	3. Required Size of Truck Fleet Half of the Istanbul Port case

Evaluation Items	Port of Samsun	Port of Eregli	Filyos
	4. Hinterland based on least inland transport cost Central part of the Black Sea Coast and the Middle Anatolian Region	4. Hinterland based on least inland transport cost Western part of the Black Sea Coast and the AMA as well as the eastern part of the Istanbul Area	4. Hinterland based on least inland transport cost Western part of the Black Sea Coast and AMA
2. Conditions of Landward Access Links	1. Road Links Available but remote from the AMA	1. Road Links Presently, the best accessibility to E5. In the future congestion is envisaged due to the expansion of the Erdemir Steel Works to 3 million tons p.a. and finally to 6 million tons p.a.	1. Road Links Access to E5 is available although a little disandvantageous compared to Eregli.
	2. Rail Links Access to the hinterland area of Filyos is inconvenient. On the other hand, links are developed with the Middel Anatolian Region and the Mediterranean Coast	2. Rail Links Links via Zonguldak and Hisaronu are available, but the link between Karabuk-Zonguldak is approaching the capacity	2. Rail Links Direct link to the hinterland is available. Electrification works and the improvement of signalling system are planned and envisaged to double the capacity

Evaluation Items	Port of Samsun	Port of Eregli	Filyos
3. Maritime Access	1. Length of Sea Crossing From Istanbul Port, 360 miles From Filyos , 200 miles	1. Length of Sea Crossing Similar to Filyos	1. Length of Sea Crossing From Istanbul Port, 160 miles
	2. Navigation Cost From Piraeus (Hub-port), 30% higher cost as compared to Filyos	2. Navigation Cost Similar to Filyos	2. Navigation Cost From Piraeus, 60 ~ 70 $/TEU
	3. Navigability Poor navigability caused by rough seas in winter is likely detrimental to the reqularity of service.	3. Navigability Similar to Filyos	3. Navigability Not crucial
4. Availability of Space	1. Containers and other General Cargoes Possible to accommodate the projected demand up to the year 2010	1. Containrs and other G.C. Impossible to accommodate the demand up to 2010. Only two container terminals can be developed, No further demand nor G.C. can be accommodated	1. Containrs and other G.C. Possible to acommodate the projected demend up to the year 2010. Further expansion is possible.

Evaluation Items	Port of Samsun	Port of Eregli	Filyos
	2. Port-Industry Complex No space is available within the harbour for forming a Port-Industry Complex	2. Port-Industry Complex No space is available for forming a Port-Indnstry Complex	2. Port-Industry Complex Sufficient space is available
5. Other Obstacles to Development	None	The waterfront is prosently used for amenities such as walkway and parks. Caution is needed to mitigate the possible conflict with the present land use.	None
6. Development Effects	Gateway Port for the central port of the Black Sea Coast and the Middle Anatolian Region	1. Meet the "urgent" traffic demand until Filyos is fully operation 2. Support the suburabanisation of the industries in the Istanbul Area 3. Support the industrialisation and development along E5 and new motorway westword	1. Growth Core in the Black Sea Coast 2. Gateway Port for the AMA etc. 3. Industrial Development

9-2 Alternative Layouts

9-2-1 General

The following are the major natural conditions to be considered in formulating layouts for the Mater Plan.

(i) The predominant wave direction is NNW-NNE. The main breakwater will be located at the offshore(north) side to cover wharves.

(ii) There is a steep valley in the sea. The adequate depth for construction of marine structures, such as breakwaters, wharves, etc., are available on the eastern side of the sea.

The entrance channel(s) will be located at the north-west part.

(iii) The river is active. Realignment of the river is planned for avoiding disaster of flooding. The river will be straightened, and direction of the flow will not be toward the port basin so that the current or siltation will not influence the port activities.

(iv) There are deep soft soils in the center part of the delta, but there are stiff soils near the hills. Heavy structures will be located in the hard soil area whenever possible.

The following are the major criteria in formulating the layout plan:

(i) Safety and ease in terms of maneuvering vessels shall be assured.

(ii) The quay length compared to the breakwater length shall be maximized to optimize the benefit/cost ratio.

(iii) The layout plan must be suitable for construction in stages.

(iv) Enough space for mechanical cargo handling shall be reserved.

(v) Related infrastructure, such as river training, railway, roads, communications systems, etc., shall be supplied together with the port facilities.

The following (indicated in Table.9-2-1) are the berth requirements in the target year 2010 of the Master Plan.

Table 9-2-1 Berth Requirements in 2010

Name of Cargo	Cargo Throughput(T/Y)	Location	Wharf Dimension	Handling Machine	Yard Space
Ore	1,700,000				
	(In.Int. 700,000		-20x400m	18,000 t/day	1650000 m^2
	(In.Dom. 1,000,000	Hisarounu Pier			
Coal	1,600,000				
	(In.Int. 1,600,000				
Ore	3,000,000				
	(In.Int. 3,000,000	①	-20x400m	27,000 t/day	250,000 m^2
Coal	2,000,000				
	(In.Int. 2,000,000				
Iron & Steel	6,020,000				
	(In.Int. 1,570,000	②③④⑤	-10~-12x250m	8,000 ton/day/berth	75,000 m^2/berth
	(Out.Int. 1,000,000				
	(Out.Dom. 3,450,000				
Container	270,000 TEUs/Year	⑥⑦⑧⑨	-10x50m	600 TEUs/day/berth	75,000 m^2/berth
Gen. Cargo	1,210,000	#10#11#12#13#14#15	-10~-12x200m	1,300 tons/day/berth	15,000 m^2/berth
	(Gen. 800,000				
	(Wood.In.Int. 270,000				
	(Wood.Out.Dom.100,000				
	(Mach.In.Int. 40,000				
Grain	150,000				
	(In.Int. 120,000		-12	5,000 ton/day	
	(Out.Dom. 120,000				
Oil	8,100,000				
	(In.Int. 4,480,000	#20	-30 meter SPMB	45,000 ton/day	250,000 m^2
	(Out.Dom. 3,620,000	#21	-10 -15x400	20,000 ton/day	250,000 m^2
Solid Cargo Total	18,380,000		3,400m		
Liquid Cargo Total	8,100,000		400m		

9-2-2 Alternative Layouts

Considering the above, two alternative layouts for the Master Plan are formulated.

One is Master Plan-A, and the other is Master Plan-B.

(1) Plan A

Plan A is aimed at obtaining deep-water berths utilizing the natural valley in the sea.

Berths at the western side will be constructed as a starting project. They will handle general cargo, container, and steel products in an early stage.

However, the quays will remain semi-exposed to the open sea throughout the Master Plan period.

(2) Plan B

Plan B aims at locating most of the quays inside the port.

Some quays are constructed by excavating land, while the length of the main breakwater is unchanged.

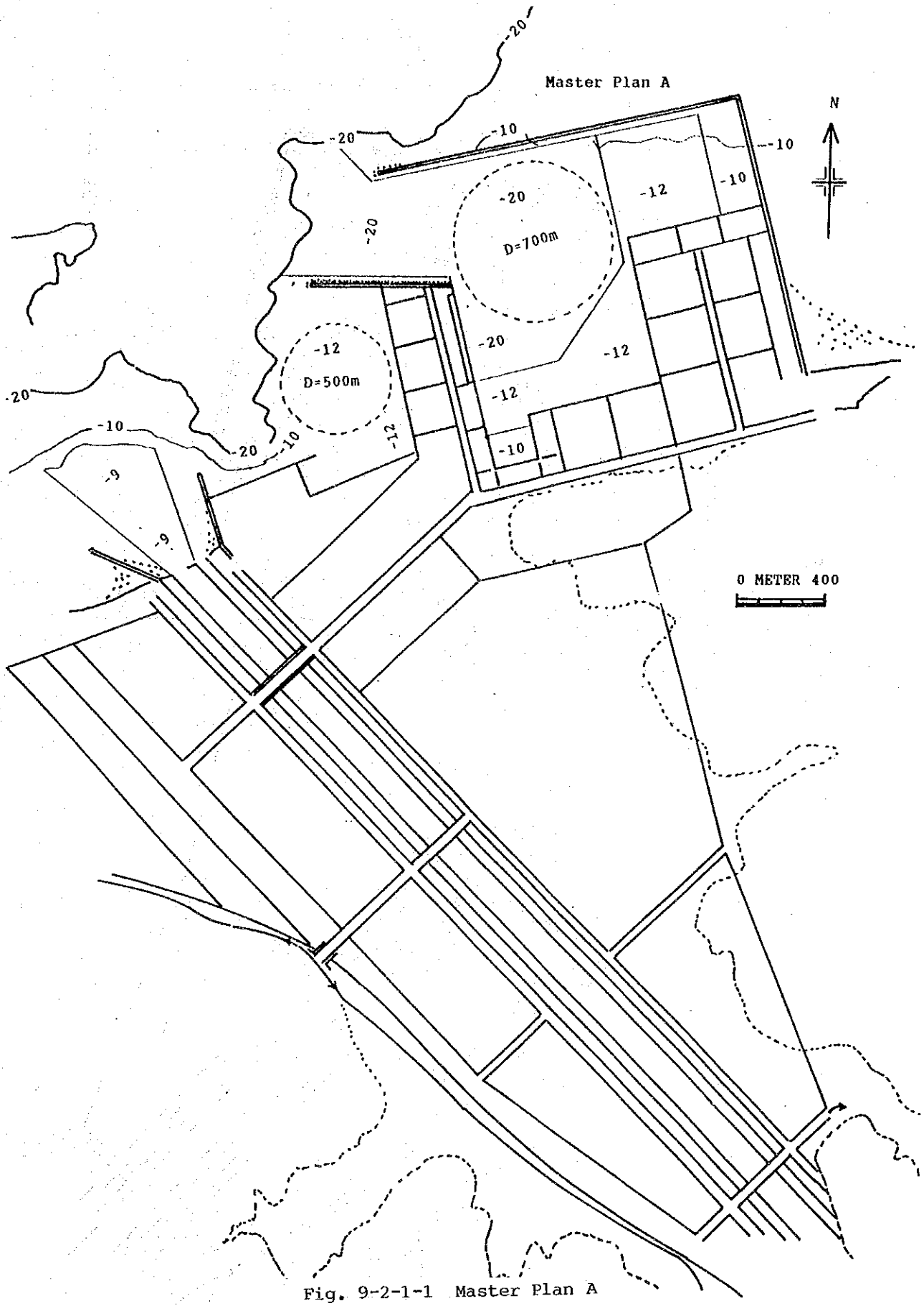


Fig. 9-2-1-1 Master Plan A

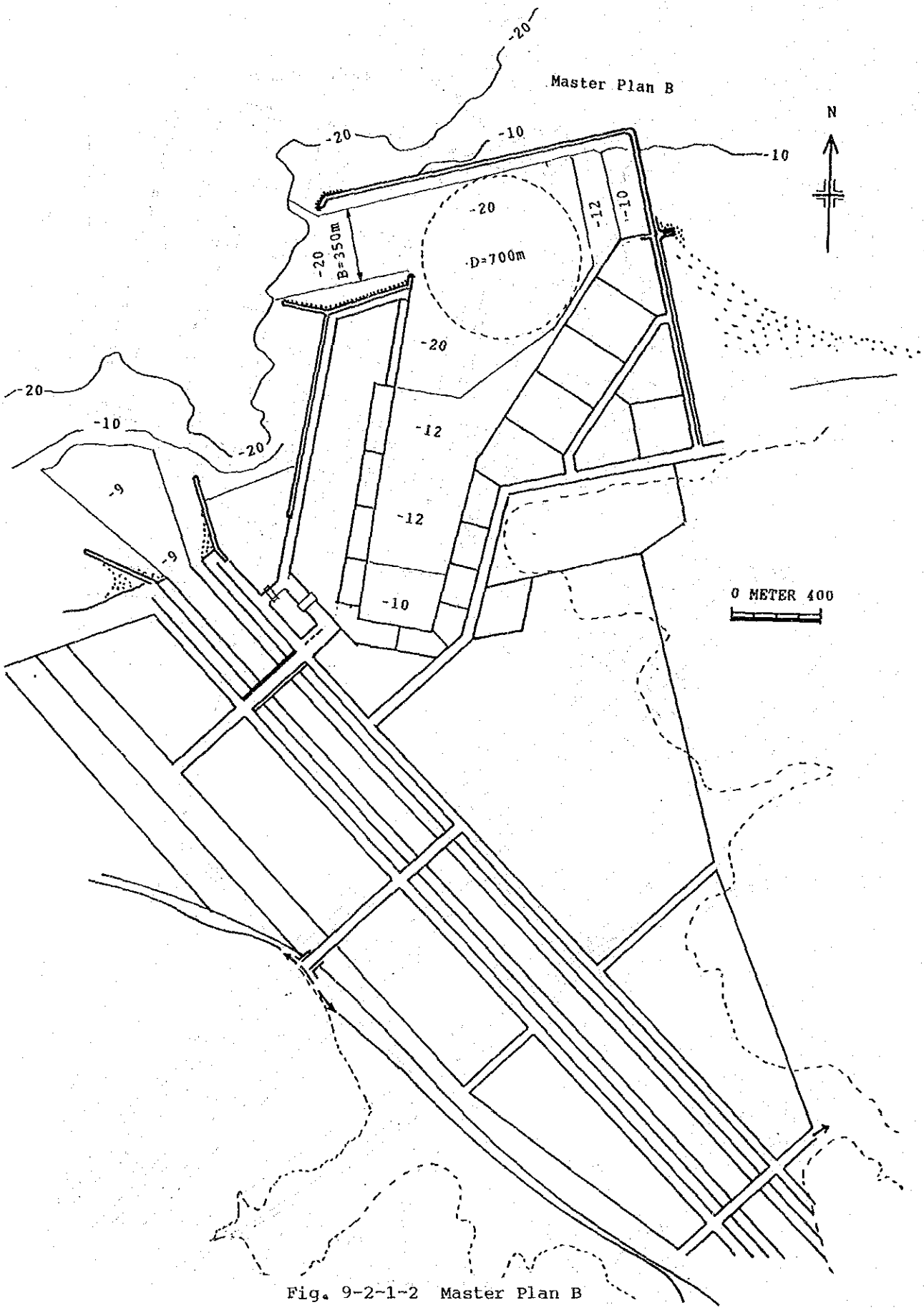


Fig. 9-2-1-2 Master Plan B