(3) Hub Port in the Persian Gulf

Though Dubai port is the major player in world trade, Abbas Port will hopefully perform as a major transhipment port in future.

(4) Core of the District Development

Chabarhar port has been improved following the district development plan for a long time and the port and city will continue to be developed.
The Persian coastal area is not an easy place to live, but considering the future of Iran it is necessary to develop the Persian Gulf coastal area. The port will act as the core in this area.

(5) For Civil Amusement

In future, green areas, amusement facilities and so on will be provided in the port area for workers and citizens.

3.4 Future Status of Inland Transport Network

In this section, we try to illustrate the future network concerning the general situation of Ifranian transportation in connection with the "Future Aspect of Transport Network" which is described in the 2nd Five Year Plan.

3.4.1 Road

(1) Present networks of freeways and expressways

Present freeways and expressways are arranged around the major cities-Tehran, Tabriz, Mashhad, Esfahan. Future plan of freeway and expressway is compatible with the present road network. Current projects of freeway and expressway are divided into two directions. One is in the west and east direction that correspons with Asian Highway the other is in the north and south direction, connecting the Caspian Sea and the Persian Gulf.

1) Freeway

Tehran-----Qazvin	150 km
Tehran----Qom	160 km
Esfahan----Zarrinshahr	40 km

2) Expressway

Tehran-Qazvin road

Tehran-----Vard Avard	70 km

Tehran-Mashhad road

Tehran-----Rudehen	60 km

Tehran-----Mamazan	40 km
Tehran-----Varamin	50 km
Sari-------Qaemshahr	50 km
Mashhad--Quchan	130 km
Tabriz-----Maragheh	30 km
Tehran-Arak road	
Tehran-----Robatkarim	50 km
Qom--Esfahan--Shiraz road	
Esfahan----Meymeh	120 km
Esfahan----Qomsheh	80 km
Esfahan----Mobarakeh	60 km
Shiraz-----Marvdasht	70 km
Other road	
Kerman---Baghin	25 km

(2) Future networks of Freeway and Expressway

1) Tehran-Arak freeway

This freeway is to be constructed between Tehran and Arak through Saveh. Tehran-Saveh section will be 115 kilometers long and completed by 1994. Total length of this section is 293 km.

2) Qazvin-Zanjan freeway

This freeway is to be constructed between Qazvin and Zanjan through Takistan. This section is 170 km. This route is a part of Asian Highway Route 1 and connects the Turkish border through Bazargan.

3) Tehran-Mashhad expressway

This project is the Tehran-Mashhad expressway, via Semnan, Shahrood, Sabzevar and Neishabur, which started in 1988. This expressway is planned as the access road between the Isfahan and Semnan provinces, which will be significant for establishing connections between the southern provinces and Mazandaran, Semnan and Khorasan provinces. This route is an alternative route to Asian Highway Route 1 and this network consists of about 894 km.

4) Qom-Esfahan expressway

Esfahan-Meymeh section (120km) is already completed and Qom-Meymeh section is to be constructed.

5) Esfahan-Shiraz expressway

Esfahan-Marvdasht section (70km) is already completed.

6) Ahwaz-Esfahan expressway

This is the line under study. This route is shorter to Tehran than the one from B.Khomeini. Tehran and Esfahan will be connected with PersianGulf(B.Khomeini).

(3) International Road Networks

1) Present network and future network

Iran is connected to Europe and Central Asia by road through Turkey, Azerbaijan, Turkmenistan, Afgahnistan, and Pakistan.
Present main transport routes are Turkey through Bazargan and Azerbaijan through Astara. Transport networks between Iran and Central Asia will be important in future.

Europe : Turkey, Azerbaijan	
Present network (Exsisting freeway, Qazvin-Tehran 150 km)	
Turkey : Bazargan--Tabriz--Zanjan--Qazvin---Tehran	879 km
Azerbaijan : Astara----Rasht----Qazvin------Tehran	514 km
Future network	
Asia Highway(A-1)	
(Ankara)-Bazargan-Tbriz-Tehran-Sari-Mashhad-Taybad-(Herat)	
Almatoi-Istanbul Highway	
(Ankara)-Razi-Tabriz-Tehran-Gorgan--(Ashkhabad)	
Central Asia : Turkmenistan, Afghanistan, Pakistan	
Present network	
Turkmenistan : Sarakhs--Mashhad---Semnan----Tehran	1,079 km
Afghanistan : Taybad----Mashhad---Semnan----Tehran	1,118 km
Pakistan : MirJaveh--zahedan--Kerman--Yazd--Tehran	1,651 km
Future network	
Asia Highway(A-1)	
(Ankara)-Bazargan-Tbriz-Tehran-Sari-Mashhad-Taybad-(Herat)	
Asia Highway(A-2)	
Tehran-Isfahan- Kerman-Zahedan-MirJaveh-(Quetta)	
Almatoi-Istanbul Highway	
(Ankara)-Razi-Tabriz-Tehran-Gorgan--(Ashkhabad)	
Tehran-Mashhad expressway	
Tehran-Semnan-Mashhad	
Persian Gulf	
Present network(Exsisting expressway, Esfahan-Tehran 280 km)	
B. Khomeini---Ahvaz-----Khorramabad--Arak---Tehran	1,024 km

B. Bushehr---Shiraz---Esfahan----------Tehran 1,228 km
B. Abbas-----Sirjan----Shahrebabak----------Tehran 1,334 km
Chahbahar-----Iranshahr----Kerman-----Yazd---Tehran 1,961 km

Future network
Asia Highway(A-2)
Tehran-Esfahan-Kerman-Zahedan-MirJaveh-(Quetta)
Ahwaz-Esfahan expressway
(Tehran)-Esfahan-Ahwaz-B.khomeini(Persian Gulf)
B.Abbas-Esfahan expressway
(Tehran)-Esfahan-B.Abbas(Persian Gulf)
B.Bushehr-Esfahan expressway
(Tehran)-Esfahan-B.Bushehr(Persian Gulf)

Caspian Sea

Present network(Existing expressway, (Qazvin-Tehran 150 km)
B. Anzali---Qazvin--Tehran 365 km
Nowshahr----Amol----Tehran 278 km

Future network
Anzali-Qazvin expressway
(Tehran)-Qazvin-B.Anzali(Caspian Sea)

Almatoi-Istanbul Highway :
This highway connects Almatoi(Kazakhstan), Bishkek(Kirghizistan), Tashkent(Uzubekistan), Ashkhabad(Turkmenistan), Tehran(Iran) and Istanbul(Turkey). Length of road is about 6,000 km ; part of this road is strategically important as it connects Far East Asia to Europe through Central Asia and Middle East.
Related Iranian road network is Tehran-Bazargan road(Turkey border).This route is a part of Asian Highway Route 1 ; Tehran-Qazvin section has already been constructed while Qazvin-Zanjan section is under construction.

Tehran-Mashhad expressway :
This is an alternative route to Asian Highway Route 1 and is located at the south area of the Asian Highway.

Asia Highway(A-1) :
This highway connects Istanbul(Terkey),Tehran(Iran), Kabul(Afghanistan), Delhi(India) and South East Asia.This road is strategically important as it connects South East Asia with Europe through South Asia and Middle East.

Asia Highway(A-2) :
This route runs south part of Asia Highway(A-1) and connects Iraq, Tehran(Iran), Lahore(Pakistan), Delhi(India) and South East Asia.

(4) Future Cargo Networks (Expressway)

1) B.Khomeini--Ahvaz--Esfahan--Tehran

Running north and south, this route connects the Caspian Sea and the Persian Gulf(B.Khomeini). There is a Steel Complex(Ahwaz,Esfahan,Mobarakeh),Petrochemical Complex,and Oil Refineries along this route.

2) B.Abbas--Yazd--Tehran

This is a route running in the north and south direction that will connect Tehran and Esfahan with the Persian Gulf(B.Abbas). Unloaded cargo of Caspian Sea port will be transported to the Persian Gulf through B.Abbas.

3) B.Busher--Shiraz--Esfahan--Tehran

Also running north and south, this route will connect Tehran and Shiraz with the Persian Gulf(B.Busher)

4) B.Anzali--Qazvin--Tehran

Tehran will be connected with Caspian Sea(B.Anzali)by this route. Freeway was already constructed in the Tehran-Qazvin section, but in the Qazvin-B.Anzali section, road condition is not good due to the Alborz mountain range.

5) Bazargan--Tabriz--Tehran--Mashhad--Sarakhs

This route corresponds to Asian Highway 1 and will connect Iran with Turkey and Azervijan.
This route a is very important section of the Asian Highway, connecting East Asia(Turkey, Iran) with Central Asia and East Asia.

(5) 2010 master plan of road network

We propose future road network in 2010 as shown Fig 3.4.1.1 Main routes of future road network are from major ports to tehran

Expressway
1) B.Khomeini---Ahvaz---Esfahan----Qom---Tehran
2) B.Abbas------Yazd----------Qom---Tehran
3) B.Busher---Shiraz----Esfahan----Qom---Tehran
4) B.Anzali----------Qazvin---------Tehran
5) Bazargan--Tabriz---Tehran---Mashhad---Sarakhs

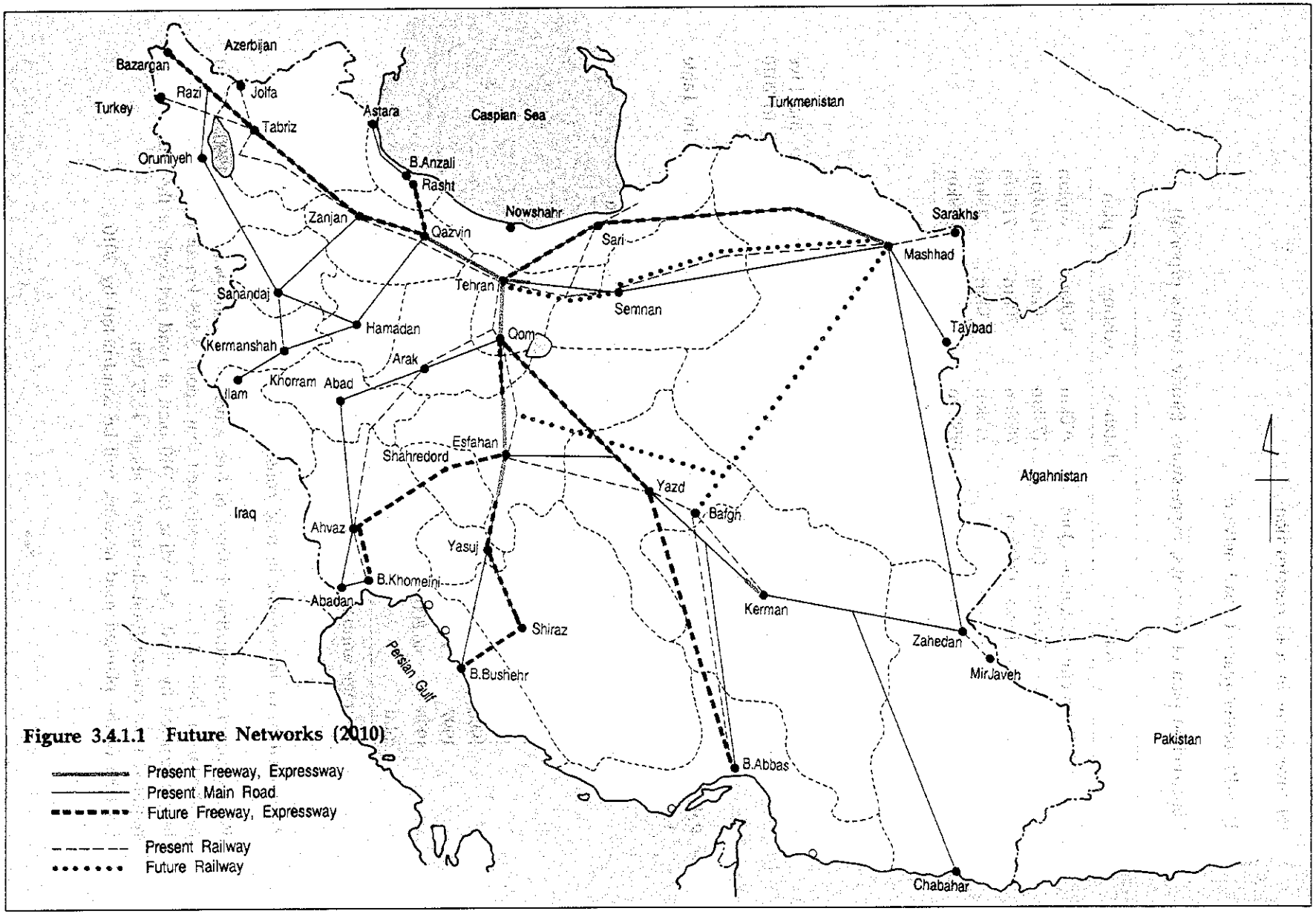

Figure 3.4.1.1 Future Networks (2010)

- Present Freeway, Expressway
- Present Main Road
- Future Freeway, Expressway
- Present Railway
- Future Railway

(6) Investment in road construction

1) 2010 master plan of road network

Construction plan of freeways, expressways (Study team's prporsal)

route	distance	existing	plan
1) B.Khomeini---Esfahan---Qom	790km	180km	610km
2) B.Abbas------Yazd------Qom	1174km	0km	1174km
3) B.Busher-----Shiraz--Esfahan	789km	70km	719km
4) B.Anzali----------Qazvin	215km	0km	215km
5) Bazargan---Tehran--Sarakhas	1958km	150km	1809km
Total construction plan	4,5272,466km		

2) Forecast of road construction

Base : Investment proposed for freeways and expressways construction in 2nd Five Year Plan 1994-1998, Study team estimated the investment from 1999 to 2010 based on the investment of 2nd Five Year Plan.

Relation between investment and distance of road construction is shown in Table 3.4.1.1.

Table 3.4.1.1 Freeways and Expressways Construction Plan

year	investment	distance km	
1994	21,300	62	344 million Rls/km
1995	26,000	76	
1996	32,100	93	
1997	37,600	109	
1998	46,800	136	
total		476	
average annual increase	21.8 %		

3) Evaluation of investment in road construction.

We estimated construction distance of free ways and expressways from 1990 to 2010 as shown in Table 3.4.1.1. We estimated that about 3,465 km of road network will be constructed by 2010, According to 2010 plan of road network of the study team, required road construction distance is about 4,527 km.
So, 80% of the planned road network will be constructed by 2010.

3.4.2 Railway Network

(1) Future networks of railways

1) Bafq-Bandar Abbas railway

This is the biggest project under construction and is expected to be completed by 1995. Hence the southernmost part of the country will be linked with the north and Bandar Abbas will be connected with Tehran by rail.
The line from Bander Abbas to Tezerj,(about 200 kilometers) is being constructed and there are plans to electrify the whole line later.

2) Mashhad-Bafgh railway

This line stretches 800 kilometers from Mashad to Bafgh, the construction of which was approved in early 1989.
A northward extension of the line (165km)is being conducted to link Mashad to Sarakhs. The line of Turkmenistan to Sarakhs (about 130 km) is being constructed.

3) Tehran-Mashhad railway

This is a one thousand kilometer double-truck railway line. Tehran-Garmsar line is being constructed and studies for a further 900 kilometers have been completed.

4) Bad-Meybud-ChadoorMine railway

This is the by-pass line from Esfahan to Bafg. From Bad to Meybud and from Meybud to ChadoorMine,lines of about 254 kilometers and 200 kilometers are being constructed respectively.

5) Bander Khomeini-Ahvaz railway

The foundation work for the double-truck railway was completed in early April in 1989.The by-pass line from Nezamieh to Miandasht is being constructed.

(6) High speed passenger cargo

There is a plan to introduce high speed passenger service. The maximum speed is 200 km/h to 250 km/h.

Tehran----------Mashhad
Tehran------Ishafan------Shiraz
Tehran------Zanjan------Tabriz

(2) International railway networks

1) Present network

In the present network, borders from where the goods are transported by railways are:

Azerbaijan - Julfa
Turkey - Razi
Turkmenistan - Sarakhs (Under construction)
Pakistan - Mirjaveh
Persian Gulf - B.Khomeini

Iran is linked by rail to three countries. The most active route at present is the one to Azerbaijan Repabulic through Julfa. Expansion of railway between Mashhad and Sarakhs straddles the Iran-Turkmenistan border.

2) Future network

Under Study Lines

Country		New Line	Purpose
Turkmenistan	:	Tehran--Mashhad	Turkmenistan is connected with Tehran by double-track line
	:	Bafgh---Mashhad	Turkmenistan is connected with B.Abbas
Pakistan	:	Kerman--Zahedan	Pakistan is connected with Tehran and B.Abbas
Azerbaijan	:	Astara---Qazvin	Azerbaijan is connected with Tehran by another route
			B.Anzali is connected with Tehran
Persian Gulf	:	B.Bushehr--Tehran	B.Bushehr is connected with Tehran through Esfahan
	:	Chabahar--Zahedan	Chabahar is connected with Pakistan and Mashhad and ehran

(3) Investment in railway construction

1) 2010 master plan of railway network

Construction plan of railways (Study team's proposal)

route	distance	existing	plan
1) Sarakhs---Mashhad---Bafgh	918km	0km	918km
2) B.Abbas----------Bafgh	582km	382km	200km
3) Bad---------ChadoorMine	454km	0km	454km
4) Mashhad----------Tehran	894km	0km	894km
	Total construction plan		2,466km

2) Forecast of railway construction

Base : Investment proposed for railway construction in 2nd Five Year Plan 1994-1999. Study team estimated the investment from 1999 to 2010 based on the investment of 2nd Five Year Plan.

Table 3.4.2.1 Railways Construction Plan

year	investment	distance km	
1994	*151,650	108	1,400 million Rls/km
1995	185,750	133	(4 times expressways)
1996	223,075	159	
1997	242,850	173	* total railway investment
1998	295,700	211	multiplied by 0.25
average annual increase	18.3 %		
2010	total	5,184 km > 2,466 km (2010 plan)	

Relation between investment and distance of railway construction is shown in Table 3.4.2.1.

(4) Future cargo networks (railways)

1) Bafgh--B.Abbas railway

From this railway route, Tehran and Esfahan will be connected with the Persian Gulf(B.Abbas). Now B.Khomeini is the only port that is connected with Tehran by railway.
There are several high-grade iron ore mines along Bafgh-B.Abbas railway. This railway will be used to transport iron ore to Mobarakeh Steel Complex(Esfahan) and steel products and iron ore will be exported from B.Abbas by train.

2) Tehran--Mashhad--Sarakhs railway

Mashhad-Sarakhs line(165km) and Tedzhen(Turkmenstan)-Sarakhs line(130 km) are currently being constructed. By this route,central Asian republics will be connected with Iran and the Persian Gulf by railway. This route is a very important section of Transasian railway, connecting East Asia(Turkey, Iran) with Central Asia and East Asia.

3) B.Khomeini--Ahvaz double-truck railway

This railway will be used to transport iron ore from B.Khomeini to Ahwaz Steel Complex and steel products will be exported from B.Khomeini by train

4) Sarakhs--Mashhad--Bafgh railway

This is a route running in the north and south direction that will connect Central Asia with Persian Gulf(B.Abbas) through Bafgh-B.Abbas railway.

(5) 2010 master plan for railway networks

Double track line	Single track line
Mashhad--------Tehran	Sarakhs--Mashhad--Bafgh
	Bafgh----------B.Abbas
	Bad--------ChadoorMine

3.4.3 Air Transport

(1) Expansion project

1) Imam Khomeini Airport

This is Tehran's second International airport, located 35 km southwest of Tehran.

1st phase :	1996	12 million passenger 200,000 tons cargo
2nd phase :	2011	18 million passenger 300,000 tons cargo

2) Other Airports Plans

Ilam, Tabas, Zanjan, Yasouj, Shar-e Kord, Arak

3.4.4 Rough Estimate of Transportation Capacity

Sea-borne cargo will be about 80 million tons in 2010, We checked the capacity of inland transportation networks

From the railway statistics, number of locomotives, passengers & net freight transport volumes are shown in Table 3.4.3. The km per tonnage, which is given by total ton-km divided by total cargo weights, is about 600 km. This ton-km value is so large due to the scale of land, and very close to the distance between Tehran and Ahvaz or Tabriz.

Road transportation route from major ports to Tehran or other cities is similar to the railway route.
The km per tonnage of road transportation is considered too close to that of railway transportation.
Flow chart of analysis method is shown as follows.

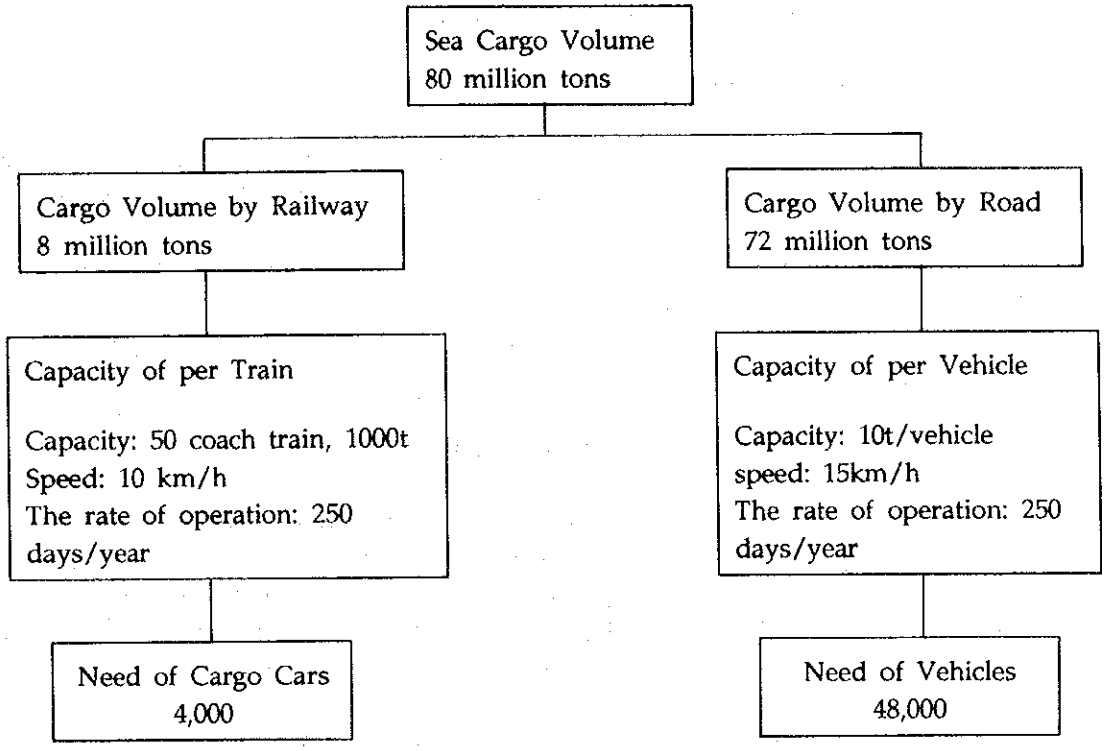

Figure 3.4.4.1 Rough Estimate of Transportation Capacity

We roughly estimated the number of vehicles and cargo cars for sea cargo, It is in need of 48,000 vehicles and 4,000 cargo cars by 2010.

3.5 Overall Cargo Flow Demand on Long Term Basis

3.5.1 Methodology for Demand Forecast

Two methods are used to forecast the commercial cargo volume handled at the Ports of Imam Khomeini, Bushehr, Rajaee, Bahonar, Chabahar, Anzali, Nowshahr port.

One is a macro forecast which is for estimation of total cargo volume without any detailed commodity-wise break-down.
The other is a micro forecast, which is for commodity-wise estimation of cargo volume.

For the macro forecast, two methods are used.

One is to grasp the trend of cargo handling volume on the basis of the past data and forecast the future volume by a time series analysis.
The other is to relate the past cargo handling volume to national social or economic indices such as population or GDP, and to forecast the future cargo volume using future estimates of these national figures.

For the micro forecast, the following two methods are mainly used:

A. Future volume of each major cargo, such as cereals, petroleum products,, fertilizers and metallic products, is forecasted independently.

First, the supply and demand of the entire nation are forecast for the target years. The deficit in volume between production and consumption is assumed to be equal to the total import volume.
Then, the cargo volume that will be handled at the ports is estimated based on the rate of population in the hinterland, previous data on the cargo handling rate and other relevant factors (for example, the capacity of silo or factory).

B. For other cargoes, the volume is forecasted based on the correlation between the volume handled at the ports and the previous and forecast national indices such as GDP and population. This is the same method as is used for the macro forecast.

The flow charts for cargo forecast are shown in Figure 3.5.1.1, 3.5.1.2 and 3.5.1.3.

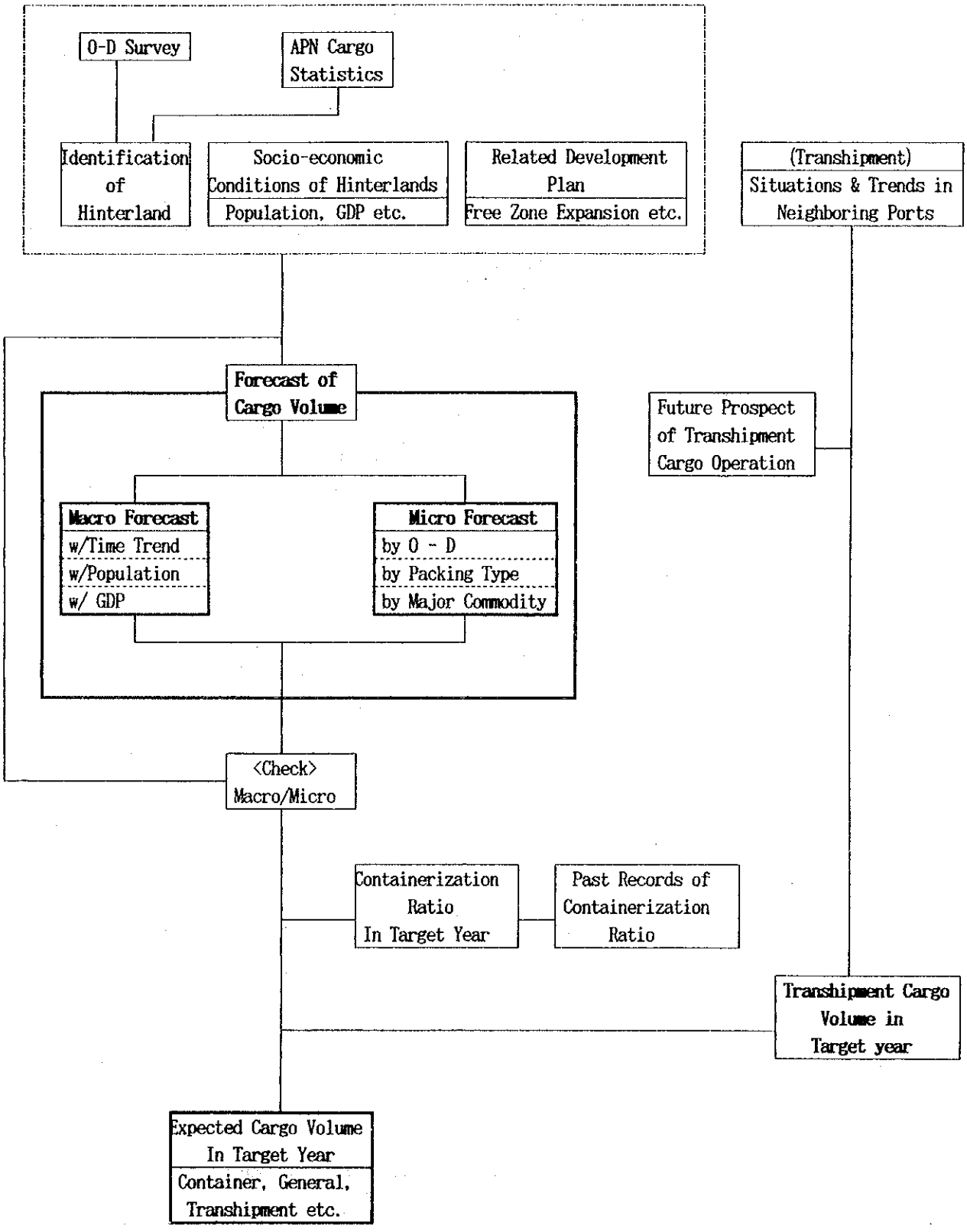

Figure 3.5.1.1 Flow Chart for Total Cargo Forecast

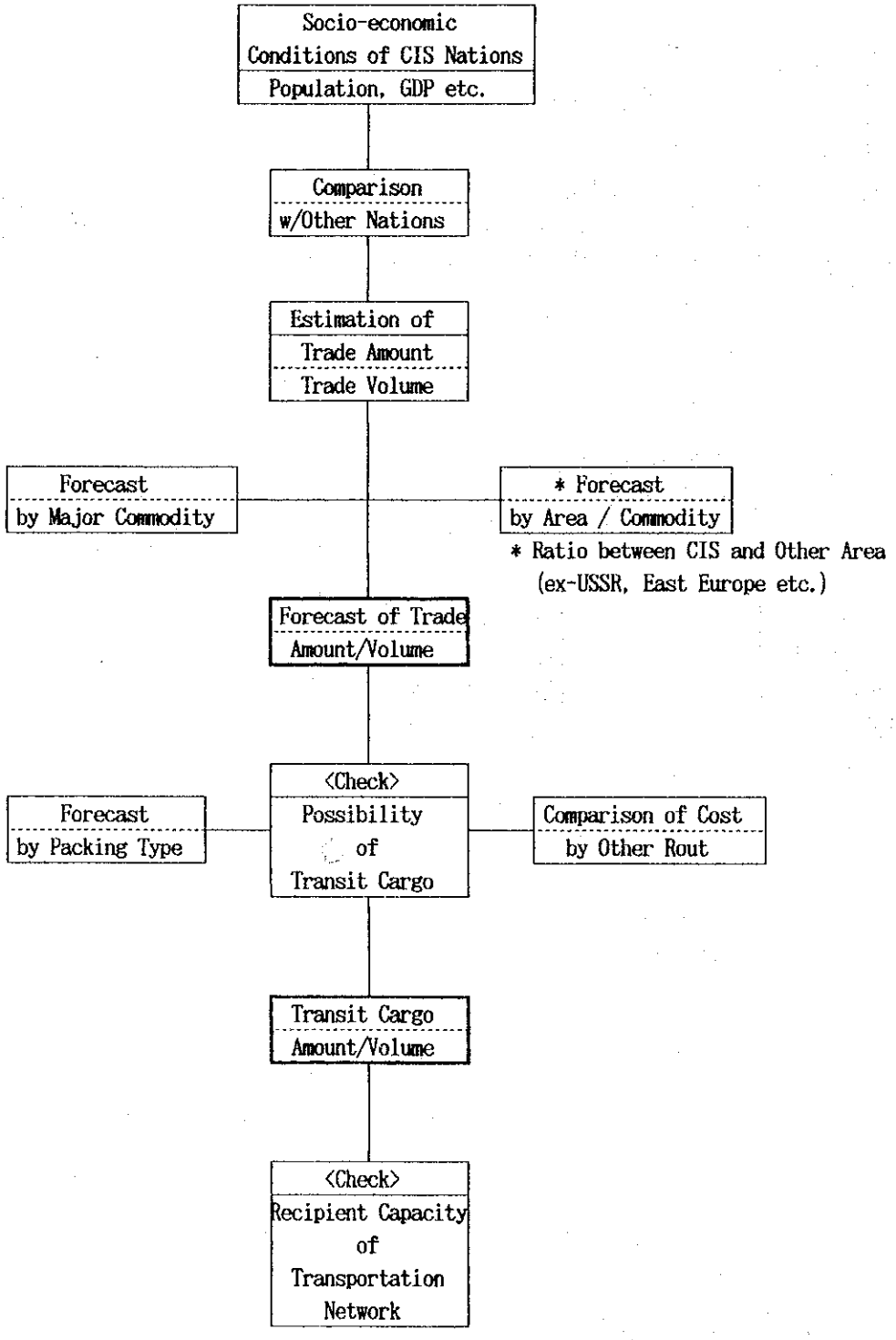

Figure 3.5.1.2 Cargo Demand Forecast from CIS Nations

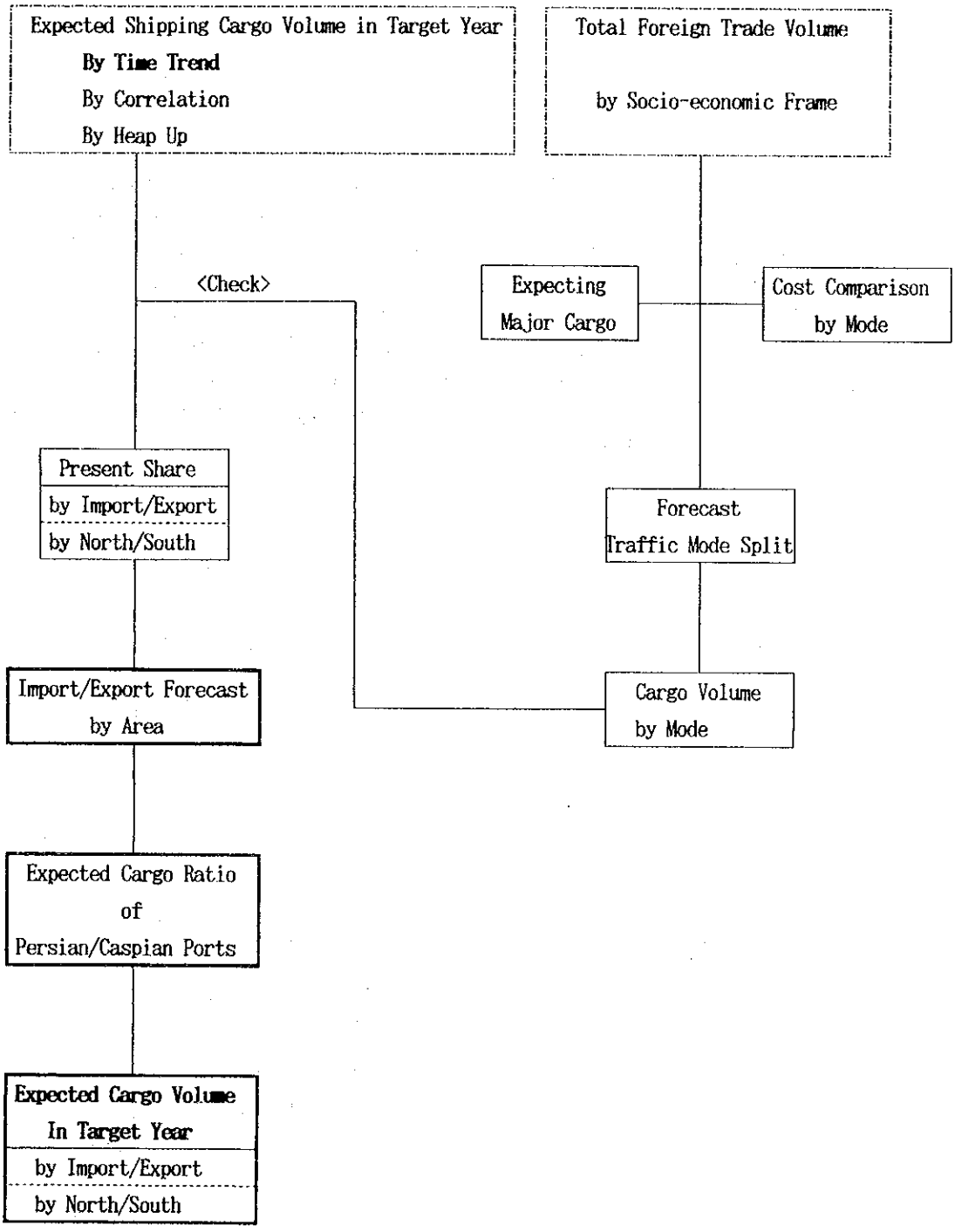

Figure 3.5.1.3 Forecast for Ratio of Import/Export and North/South Ports

3.5.2 Macro Forecast

(1) Time series analysis

1) Methodology

As shown in Table 3.5.2.1 and Table 3.5.2.2, the handling volume of each commodity at the seven ports varied greatly year by year showing no obvious trends. But as indicated in Figure 3.5.2.1, the total unloaded and loaded cargo volume by package type was relatively stable. So the cargo volume of each package type for the target years will be forecasted using a time series analysis. However, as shown in Table 3.5.2.3 and Figure 3.5.2.2, there was a significant drop in volume from 1983/84 - 88/89 in unloaded non-oil cargo which seems to have been caused by the fall in oil prices and the war. Thus data of cargo traffic from 1983/84 to 1987/88 are regarded as being irregular and therefore discarded.

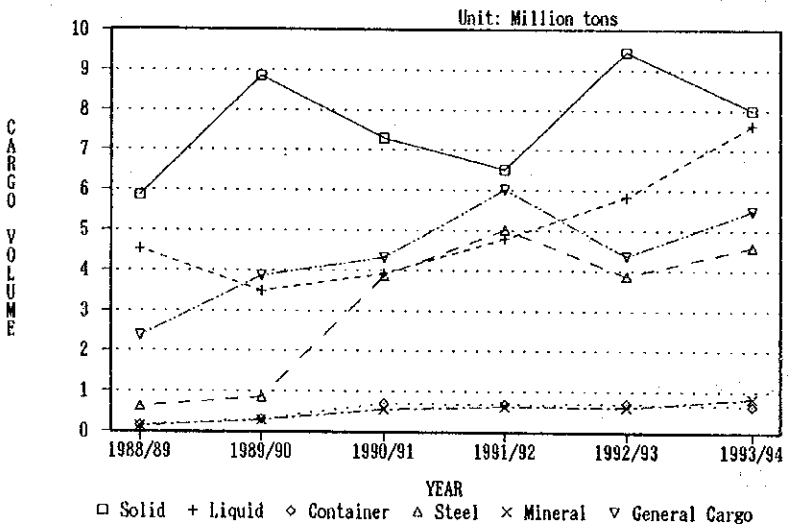

Figure 3.5.2.1 Cargo Traffic Movement
(total unloaded and loaded cargo volume)

Table 3.5.2.1 Total Handling Volume of Each Commodity

Import & Export — Unit: 1,000 tons

COMMODITY	1988/89		1989/90		1990/91		1991/92		1992/93		1993/94	
	tons	ratio	tons	ratio	tons	ratio	tons	ratio	tons	ratio	tons	ratio
DRY BULK	3,939	28.8%	5,932	33.7%	4,986	24.1%	4,494	19.0%	4,384	17.7%	3,940	14.5%
Barley	114	0.8%	600	3.4%	446	2.2%	198	0.8%	152	0.6%	264	1.0%
Wheat	2,998	21.9%	4,219	24.0%	3,438	16.7%	2,914	12.3%	2,923	11.8%	2,691	9.9%
Corn	536	3.9%	788	4.5%	845	4.1%	1,037	4.4%	1,190	4.8%	812	3.0%
Sulphur	291	2.1%	325	1.8%	257	1.2%	345	1.5%	0	0.0%	4	0.0%
Const. Material	0	0.0%	0	0.0%	0	0.0%	0	0.0%	79	0.3%	164	0.6%
Salt	0	0.0%	0	0.0%	0	0.0%	0	0.0%	40	0.2%	5	0.0%
LIQUID BULK	4,521	33.1%	3,485	19.8%	3,927	19.0%	4,786	20.2%	5,833	23.5%	7,605	28.0%
Molasses	0	0.0%	0	0.0%	0	0.0%	0	0.0%	43	0.2%	69	0.3%
Petroleum Products	4,204	30.7%	3,006	17.1%	3,478	16.8%	4,292	18.2%	5,211	21.0%	6,923	25.5%
Vegetable Oil	317	2.3%	479	2.7%	449	2.2%	494	2.1%	510	2.1%	613	2.3%
Liquid Gas	0	0.0%	0	0.0%	0	0.0%	0	0.0%	69	0.3%	0	0.0%
BAGGED CARGO	1,927	14.1%	2,910	16.5%	2,300	11.1%	2,022	8.6%	5,069	20.4%	4,059	15.0%
Fertilizers	1,090	8.0%	1,360	7.7%	662	3.2%	716	3.0%	1,239	5.0%	590	2.2%
Chemical Material	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1742	7.0%	1806	6.7%
Sugar	269	2.0%	502	2.9%	584	2.8%	487	2.1%	633	2.5%	344	1.3%
Rice	253	1.8%	772	4.4%	643	3.1%	498	2.1%	869	3.5%	786	2.9%
Soy Bean	315	2.3%	276	1.6%	411	2.0%	321	1.4%	586	2.4%	533	2.0%
CONTAINER												
Others	152	1.1%	296	1.7%	695	3.4%	672	2.8%	705	2.8%	648	2.4%
REFRIGERATED GOODS												
Meat	84	0.6%	62	0.4%	27	0.1%	65	0.3%	68	0.3%	83	0.3%
STEEL MATERIAL												
Metallic Product	624	4.6%	845	4.8%	3,861	18.7%	5,026	21.3%	3,863	15.6%	4,576	16.9%
MINERAL	140	1.0%	280	1.6%	551	2.7%	618	2.6%	614	2.5%	837	3.1%
Coal	140	1.0%	280	1.6%	551	2.7%	618	2.6%	587	2.4%	830	3.1%
Copper	0	0.0%	0	0.0%	0	0.0%	0	0.0%	27	0.1%	7	0.0%
GENERAL CARGO	2,291	16.7%	3,794	21.6%	4,299	20.8%	5,956	25.2%	4,294	17.3%	5,401	19.9%
Dried Fruits & Nuts	124	0.9%	155	0.9%	207	1.0%	35	0.1%	190	0.8%	207	0.8%
Others	2,167	15.8%	3,639	20.7%	4,092	19.8%	5,921	25.0%	4,104	16.5%	5,194	19.1%
T O T A L	13,678	100%	17,604	100%	20,646	100%	23,639	100%	24,830	100%	27,149	100%

Source: Ports & Shipping Organization

Note: the Seven Ports
Persian Ports ----- Imam Khomeini, Busher, Rajaee, Bahonar and Behesti
Caspian Ports ----- Anzali and Nowshahr

Table 3.5.2.2 Handling Import and Export Volume of Each Commodity

Import

Unit: 1,000 tons

COMMODITY	1988/89		1989/90		1990/91		1991/92		1992/93		1993/94	
	tons	ratio	tons	ratio	tons	ratio	tons	ratio	tons	ratio	tons	ratio
DRY BULK	3,648	29.4%	5,607	34.4%	4,729	24.5%	4,149	19.5%	4,265	19.6%	3,767	16.6%
Barley	114	0.9%	600	3.7%	446	2.3%	198	0.9%	152	0.7%	264	1.2%
Wheat	2,998	24.1%	4,219	25.9%	3,438	17.8%	2,914	13.7%	2,923	13.4%	2,691	11.9%
Corn	536	4.3%	788	4.8%	845	4.4%	1,037	4.9%	1,190	5.5%	812	3.6%
LIQUID BULK	4,521	36.4%	3,485	21.4%	3,927	20.3%	4,786	22.5%	5,524	25.4%	7,536	33.3%
Petroleum Products	4,204	33.8%	3,006	18.5%	3,478	18.0%	4,292	20.2%	5,014	23.1%	6,923	30.6%
Vegetable Oil	317	2.6%	479	2.9%	449	2.3%	494	2.3%	510	2.3%	613	2.7%
BAG CARGO	1,927	15.5%	2,910	17.9%	2,300	11.9%	2,022	9.5%	4,069	18.7%	2,702	11.9%
Fertilizers	1,090	8.8%	1,360	8.4%	662	3.4%	716	3.4%	1,239	5.7%	590	2.6%
Chemical Material	0		0		0		0		745	3.4%	449	2.0%
Sugar	269	2.2%	502	3.1%	584	3.0%	487	2.3%	633	2.9%	344	1.5%
Rice	253	2.0%	772	4.7%	643	3.3%	498	2.3%	866	4.0%	786	3.5%
Soy Bean	315	2.5%	276	1.7%	411	2.1%	321	1.5%	586	2.7%	533	2.4%
CONTAINER												
Others	101	0.8%	224	1.4%	616	3.2%	546	2.6%	658	3.0%	562	2.5%
REFRIGERATED GOODS												
Meat	84	0.7%	62	0.4%	27	0.1%	65	0.3%	68	0.3%	83	0.4%
STEEL MATERIAL												
Metalic Product	624	5.0%	845	5.2%	3,861	20.0%	5,026	23.6%	3,067	14.1%	3,057	13.5%
MINERAL												
Coal	140	1.1%	280	1.7%	551	2.9%	618	2.9%	587	2.7%	830	3.7%
GENERAL CARGO												
Others	1,384	11.1%	2,864	17.6%	3,292	17.1%	4,048	19.0%	3,510	16.1%	4,114	18.2%
T O T A L	12,429	100%	16,277	100%	19,303	100%	21,260	100%	21,748	100%	22,651	100.0%

Export

Unit: 1,000 tons

COMMODITY	1988/89		1989/90		1990/91		1991/92		1992/93		1993/94	
	tons	ratio	tons	ratio	tons	ratio	tons	ratio	tons	ratio	tons	ratio
DRY BULK	291	23.3%	325	24.5%	257	19.1%	345	14.5%	119	3.9%	173	3.8%
Sulphur	291	23.3%	325	24.5%	257	19.1%	345	14.5%	0	0.0%	4	0.1%
Const. Material	0	0.0%	0	0.0%	0	0.0%	0	0.0%	79	2.6%	164	3.6%
Salt	0	0.0%	0	0.0%	0	0.0%	0	0.0%	40	1.3%	5	0.1%
LIQUID BULK	0	0.0%	0	0.0%	0	0.0%	0	0.0%	309	10.0%	69	1.5%
Molasses	0	0.0%	0	0.0%	0	0.0%	0	0.0%	43	1.4%	69	1.5%
Petroleum Products	0	0.0%	0	0.0%	0	0.0%	0	0.0%	197	6.4%	0	0.0%
Liquid Gas	0	0.0%	0	0.0%	0	0.0%	0	0.0%	69	2.2%	0	0.0%
BAGGED CARGO	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1,000	32.4%	1,357	30.2%
Chemical Material	0	0.0%	0	0.0%	0	0.0%	0	0.0%	997	32.3%	1,357	30.2%
Rice	0	0.0%	0	0.0%	0	0.0%	0	0.0%	3	0.1%	0	0.0%
CONTAINER												
Others	51	4.1%	72	5.4%	79	5.9%	126	5.3%	47	1.5%	86	1.9%
REFRIGERATED GOODS												
Meat	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
STEEL MATERIAL												
Iron Product	0	0.0%	0	0.0%	0	0.0%	0	0.0%	796	25.8%	1,519	33.8%
MINERAL												
Copper	0	0.0%	0	0.0%	0	0.0%	0	0.0%	27	0.9%	7	0.2%
GENERAL CARGO	907	72.6%	930	70.1%	1,007	75.0%	1,908	80.2%	784	25.4%	1,287	28.6%
Dried Fruits & Nuts	124	9.9%	155	11.7%	207	15.4%	35	1.5%	190	6.2%	207	4.6%
Others	783	62.7%	775	58.4%	800	59.6%	1,873	78.7%	594	19.3%	1,080	24.0%
T O T A L	1,249	100%	1,327	100%	1,343	100%	2,379	100%	3,082	100%	4,498	100%

Source: Ports & Shipping Organization

Table 3.5.2.3 Unloading & Loading of Non-Oil Cargo in North & South Ports

Unit:1,000 Ton

YEAR	North Port				South Port				All Port		
	Unloading	Loading	Total	%	Unloading	Loading	Total	%	Unloading	Loading	Total
1983/84	1,142	5	1,147	8%	13,635	184	13,819	92%	14,777	189	14,966
1984/85	678	1	679	6%	10,616	220	10,836	94%	11,294	221	11,515
1985/86	743	1	744	7%	9,948	446	10,394	93%	10,691	447	11,138
1986/87	376	3	379	4%	9,054	535	9,589	96%	9,430	538	9,968
1987/88	354	9	363	3%	10,808	1,070	11,878	97%	11,162	1,079	12,241
1988/89	482	3	485	5%	7,743	1,246	8,989	95%	8,225	1,249	9,474
1989/90	507	5	512	4%	12,764	1,322	14,086	96%	13,271	1,327	14,598
1990/91	790	4	794	5%	15,035	1,339	16,374	95%	15,825	1,343	17,168
1991/92	591	1	592	3%	16,377	2,378	18,755	97%	16,968	2,379	19,347
1992/93	499	21	520	3%	16,038	2,864	18,902	97%	16,537	2,885	19,422
1993/94	615	50	665	3%	15,113	4,448	19,561	97%	15,728	4,498	20,226

Source: PSO ANNUAL REPORT

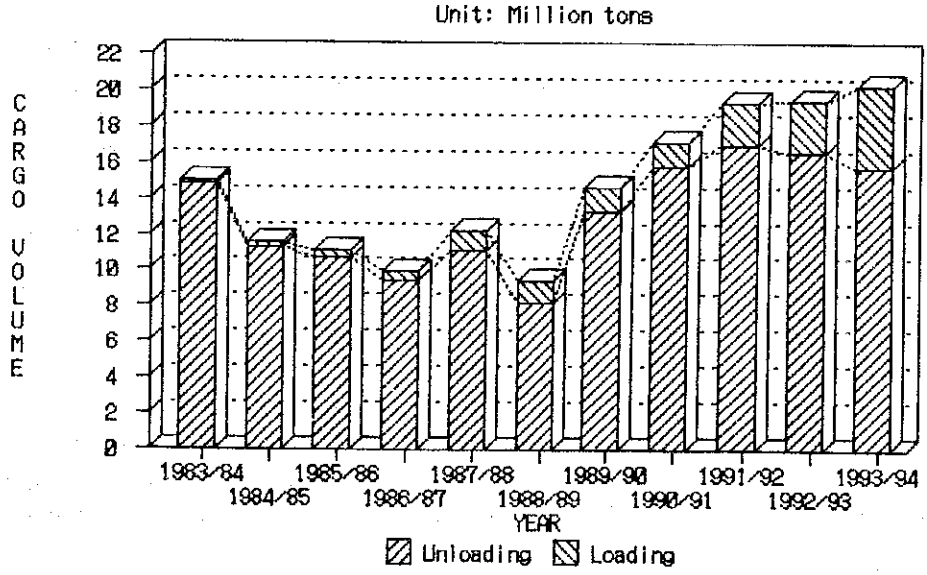

Figure 3.5.2.2 Non-Oil Cargo Traffic

2) Result of forecast

The cargo volume is assumed to be expressed as;

$V = aT + b$

where V ; Handling volume at the seven ports
a,b ; Constants
T ; Year

The constants are determined by the least fitting method. Import and export use the following equations.

Import; $V = 1985.1 \times Year - 3932482$ (r^2=0.8996642)

Export; $V = 644.2 \times Year - 1279910$ (r^2=0.8629387)

Note: r^2 is determination coefficient, r is correlation coefficient
(when number is close to 1.0, correlation with each other is considered very strong)

Under the above assumptions, the forecast cargo volume to be handled at the eleven ports is given as;

		2000/01	2010/11
Handling volume	Import	37,804	57,655
(thousand tons)	Export	8,433	14,874
	Total	46,237	72,529

The cargo volume forecasted by using time series analysis is shown in Appendix II-4.1.

(2) Correlation with social and economic indices

Generally speaking, the cargo handling volume of a port has a close relation with the social and economic indices of the country. In this section, the total cargo volume handled at the major ports will be forecasted based on the correlation between the past handling cargoes and total Iranian population or GDP(as shown in Table 3.5.2.4).

Table 3.5.2.4 Cargo Volume, Population and GDP

year	Cargo Volume (1,000 tons)		Population (1,000 persons)		GDP (Billion IRL)	
1987/88	16,591		51,073		10,368	
1988/89	13,678	-17.56%	52,779	3.34%	9,468	-8.68%
1989/90	17,604	28.70%	54,364	3.00%	9,782	3.32%
1990/91	20,646	17.28%	55,869	2.77%	10,930	11.74%
1991/92	23,639	14.50%	57,234	2.44%	12,181	11.45%
1992/93	24,830	5.04%			12,911	5.99%
1993/94	27,149	9.34%				
1994/95						
1995/96						
1996/97						
1997/98						
1998/99			* 67,300			

Source: Cargo volume ------ PSO (Ports & Shipping Organization)
Population -------- PBO (Statistical Center of Iran)
GDP ---------- Central Bank of IRI
* Population of 1998 is based on The Second Five-Year Plan of Iran

1) Correlation with population

Total cargo volume is forecasted by its relation with population. The correlation between cargo volume and population for 1988 through 1992 can be expressed by the following equation.

Import; $V = 1.4080835 \times Population - 60557.06$ ($r^2=0.9437131$)

Export; $V = 0.4463336 \times Population - 22887.42$ ($r^2=0.8019181$)

When population in target years mentioned in Chapter 3.2.1-(1) is inserted into this equation, the forecast of cargo volume to be handled at the study ports is given as;

		2000/01	2010/11
Handling volume (thousand tons)	Import	38,035	59,627
	Export	8,364	15,208
	Total	46,399	74,835

The cargo volume forecasted by correlation with population as mentioned in Chapter 3.2.1-(2) is shown in Appendix II-4.2.

2) Correlation with GDP

Total cargo volume is forecasted by its relation with GDP. In Chapter 3.2.1-(3), GDP in case of four scenarios depends on future economic conditions. GDP value in case-2

which is presumed to be most suitable for this Study will be used for forecasting the cargo volume in target years. The correlation between cargo volume and GDP for 1988 through 1992 can be expressed by the following equation.

Import; $V = 2.145266 \times GDP - 5701.367$ (r^2=0.8718841)

Export; $V = 0.706303 \times GDP - 5801.413$ (r^2=0.8609125)

When GDP(case-2) in target years mentioned in Chapter 3.2.1-(3) is inserted into this equation, the forecast of cargo volume to be handled at the study ports is given as;

		2000/01	2010/11
Handling volume (thousand tons)	Import	36,969	65,572
	Export	8,247	17,665
	Total	45,216	83,237

The cargo volume forecasted by correlation with the four cases of GDP as mentioned in Chapter 3.2.1-(3) is shown in Appendix II-4.3.

(3) Result of macro forecast

The result of macro forecast in target years is shown below.

		2000/01	2010/01
Handling volume (thousand tons)	Import	36,969 - 38,035	57,655 - 65,572
	Export	8,247 - 8,433	14,874 - 17,665
	Total	45,216 - 46,468	72,529 - 83,237

3.5.3 Micro Forecast

(1) Selection of Major Commodity Groups

Considering the present cargo volume, long term trend and package type by commodity, the cargo handled at the study ports is classified by packing type and divided into unloaded and loaded cargoes for the micro forecast.

1. <Unloaded(Import)>

(1) Dry Bulk

1) Barley
2) Wheat
3) Corn

(2) Liquid Bulk

1) Petroleum products

2) Vegetable oil

(3) Bag Cargo

1) Fertilizers
2) Sugar
3) Rice
4) Soy bean

(4) Refrigerated Goods

1) Meat

(5) Steel Material

1) Metallic product

(6) Mineral

1) Coal

(7) General Cargo

1) Container cargo
2) Others

2. < Loaded (Export) >

(1) Dry Bulk

1) Sulphur

(2) General Cargo

1) Dried fruits & nuts
2) Container cargo
3) Others

(3) Result of Micro Forecast

The micro forecast is conducted by the method explained above. The detailed process is described in Appendix II-5. The results of the micro forecast, showing import, export and total cargo volumes by major commodity groups, are shown in Tables 3.5.3.1, 3.5.3.2 and 3.5.3.3.

(4) Check by Macro Forecast

Table 3.5.3.4 and Figure 3.5.3.1 shows a comparison of cargo volumes obtained by the

Table 3.5.3.1 Result of Micro Forecast of Total Cargo

Unloading & Loading (Import & Export) Unit: 1,000 tons

year	DRY BULK		LIQUID BULK		BAG CARGO		CONTAINER		REFRIGERATED GOOD		STEEL MATERIAL		MINERAL		GENERAL CARGO		TOTAL
1988/89	3,939	28.8%	4,521	33.1%	1,927	14.1%	152	1.1%	84	0.6%	624	4.6%	140	1.0%	2,291	16.7%	13,678
1989/90	5,932	33.7%	3,485	19.8%	2,910	16.5%	296	1.7%	62	0.4%	845	4.8%	280	1.6%	3,794	21.6%	17,604
1990/91	4,986	24.1%	3,927	19.0%	2,300	11.1%	695	3.4%	27	0.1%	3,861	18.7%	551	2.7%	4,299	20.8%	20,646
1991/92	4,494	19.0%	4,786	20.2%	2,022	8.6%	672	2.8%	65	0.3%	5,026	21.3%	618	2.6%	5,956	25.2%	23,639
1992/93	4,384	17.7%	5,833	23.5%	5,069	20.4%	705	2.8%	68	0.3%	3,863	15.6%	614	2.5%	4,294	17.3%	24,830
1993/94	3,940	14.5%	7,605	28.0%	4,059	15.0%	648	2.4%	83	0.3%	4,576	16.9%	837	3.1%	5,399	19.9%	27,147
1994/95	5,984	20.7%	8,019	27.7%	3,855	13.3%	764	2.6%	106	0.4%	4,830	16.7%	883	3.1%	4,508	15.6%	28,949
1995/96	6,189	20.1%	8,183	26.6%	4,088	13.3%	902	2.9%	131	0.4%	5,098	16.6%	911	3.0%	5,251	17.1%	30,754
1996/97	6,400	19.6%	8,354	25.6%	4,335	13.3%	1,066	3.3%	157	0.5%	5,381	16.5%	939	2.9%	6,060	18.5%	32,693
1997/98	6,623	19.0%	8,530	24.5%	4,594	13.2%	1,265	3.6%	184	0.5%	5,679	16.3%	968	2.8%	6,922	19.9%	34,765
1998/99	6,856	18.5%	8,711	23.5%	4,865	13.2%	1,504	4.1%	212	0.6%	5,995	16.2%	997	2.7%	7,851	21.2%	36,991
1999/00	7,036	18.0%	8,898	22.8%	5,115	13.1%	1,798	4.6%	239	0.6%	6,327	16.2%	1,026	2.6%	8,672	22.2%	39,111
2000/01	7,223	17.5%	9,091	22.0%	5,376	13.0%	2,157	5.2%	268	0.6%	6,679	16.1%	1,053	2.5%	9,543	23.1%	41,391
2001/02	7,388	16.9%	9,287	21.2%	5,651	12.9%	2,598	5.9%	287	0.7%	7,031	16.0%	1,079	2.5%	10,523	24.0%	43,844
2002/03	7,559	16.3%	9,489	20.4%	5,938	12.8%	3,141	6.8%	308	0.7%	7,400	15.9%	1,105	2.4%	11,548	24.8%	46,487
2003/04	7,736	15.7%	9,696	19.7%	6,239	12.6%	3,815	7.7%	329	0.7%	7,790	15.8%	1,129	2.3%	12,602	25.5%	49,336
2004/05	7,920	15.1%	9,912	18.9%	6,554	12.5%	4,658	8.9%	351	0.7%	8,200	15.6%	1,153	2.2%	13,665	26.1%	52,412
2005/06	8,110	14.6%	10,134	18.2%	6,886	12.4%	5,723	10.3%	373	0.7%	8,632	15.5%	1,176	2.1%	14,704	26.4%	55,738
2006/07	8,311	14.0%	10,362	17.5%	7,233	12.2%	7,080	11.9%	397	0.7%	9,085	15.3%	1,197	2.0%	15,672	26.4%	59,337
2007/08	8,516	13.5%	10,599	16.8%	7,597	12.0%	8,834	14.0%	421	0.7%	9,564	15.1%	1,217	1.9%	16,491	26.1%	63,239
2008/09	8,732	12.9%	10,844	16.1%	7,981	11.8%	11,137	16.5%	445	0.7%	10,067	14.9%	1,235	1.8%	17,032	25.2%	67,473
2009/10	8,954	12.4%	11,097	15.4%	8,382	11.6%	14,221	19.7%	471	0.7%	10,597	14.7%	1,251	1.7%	17,102	23.7%	72,075
2010/11	9,188	11.9%	11,359	14.7%	8,803	11.4%	18,461	23.9%	497	0.6%	11,155	14.5%	1,265	1.6%	16,355	21.2%	77,083

Table 3.5.3.2 Result of Micro Forecast of Import Cargo

Unloading

Unit: 1,000 tons

year	DRY BULK		LIQUID BULK		BAG CARGO		CONTAINER		REFRIGERATED GOODS		STEEL MATERIAL		MINERAL		GENERAL CARGO		TOTAL
1988/89	3,648	29.4%	4,521	36.4%	1,927	15.5%	101	0.8%	84	0.7%	624	5.0%	140	1.1%	1,384	11.1%	12,429
1989/90	5,607	34.4%	3,485	21.4%	2,910	17.9%	224	1.4%	62	0.4%	845	5.2%	280	1.7%	2,864	17.6%	16,277
1990/91	4,729	24.5%	3,927	20.3%	2,300	11.9%	616	3.2%	27	0.1%	3,861	20.0%	551	2.9%	3,292	17.1%	19,303
1991/92	4,149	19.5%	4,786	22.5%	2,022	9.5%	546	2.6%	65	0.3%	5,026	23.6%	618	2.9%	4,048	19.0%	21,260
1992/93	4,265	19.6%	5,524	25.4%	4,072	18.7%	657	3.0%	68	0.3%	3,067	14.1%	587	2.7%	3,508	16.1%	21,748
1993/94	3,767	16.6%	7,536	33.3%	2,702	11.9%	561	2.5%	83	0.4%	3,057	13.5%	830	3.7%	4,115	18.2%	22,651
1994/95	5,471	22.8%	7,678	32.0%	2,370	9.9%	661	2.8%	106	0.4%	3,227	13.5%	856	3.6%	3,591	15.0%	23,960
1995/96	5,663	22.4%	7,822	31.0%	2,454	9.7%	780	3.1%	131	0.5%	3,406	13.5%	882	3.5%	4,107	16.3%	25,245
1996/97	5,861	22.0%	7,971	30.0%	2,544	9.6%	919	3.5%	157	0.6%	3,595	13.5%	907	3.4%	4,653	17.5%	26,607
1997/98	6,069	21.6%	8,124	29.0%	2,639	9.4%	1,084	3.9%	184	0.7%	3,794	13.5%	933	3.3%	5,214	18.6%	28,041
1998/99	6,287	21.3%	8,280	28.0%	2,738	9.3%	1,278	4.3%	212	0.7%	4,005	13.5%	959	3.2%	5,799	19.6%	29,558
1999/00	6,451	20.8%	8,441	27.3%	2,819	9.1%	1,507	4.9%	239	0.8%	4,227	13.7%	984	3.2%	6,297	20.3%	30,965
2000/01	6,621	20.4%	8,606	26.5%	2,903	8.9%	1,777	5.5%	268	0.8%	4,462	13.7%	1,008	3.1%	6,810	21.0%	32,455
2001/02	6,768	19.9%	8,773	25.8%	2,993	8.8%	2,095	6.2%	287	0.8%	4,697	13.8%	1,030	3.0%	7,390	21.7%	34,033
2002/03	6,919	19.4%	8,944	25.0%	3,087	8.6%	2,470	6.9%	308	0.9%	4,944	13.8%	1,051	2.9%	7,982	22.4%	35,705
2003/04	7,076	18.9%	9,119	24.3%	3,186	8.5%	2,913	7.8%	329	0.9%	5,204	13.9%	1,070	2.9%	8,578	22.9%	37,475
2004/05	7,238	18.4%	9,300	23.7%	3,289	8.4%	3,435	8.7%	351	0.9%	5,478	13.9%	1,089	2.8%	9,124	23.2%	39,304
2005/06	7,405	17.9%	9,486	22.9%	3,400	8.2%	4,050	9.8%	373	0.9%	5,767	13.9%	1,106	2.7%	9,760	23.6%	41,347
2006/07	7,581	17.4%	9,675	22.3%	3,515	8.1%	4,775	11.0%	397	0.9%	6,070	14.0%	1,121	2.6%	10,326	23.8%	43,460
2007/08	7,760	17.0%	9,871	21.6%	3,638	8.0%	5,630	12.3%	421	0.9%	6,390	14.0%	1,134	2.5%	10,861	23.8%	45,705
2008/09	7,948	16.5%	10,072	20.9%	3,769	7.8%	6,639	13.8%	445	0.9%	6,726	14.0%	1,145	2.4%	11,345	23.6%	48,089
2009/10	8,141	16.1%	10,278	20.3%	3,905	7.7%	7,828	15.5%	471	0.9%	7,080	14.0%	1,153	2.3%	11,766	23.2%	50,622
2010/11	8,343	15.6%	10,491	19.7%	4,050	7.6%	9,230	17.3%	497	0.9%	7,453	14.0%	1,158	2.2%	12,093	22.7%	53,315

Table 3.5.3.3 Result of Micro Forecast of Export Cargo

Loaded

Unit: 1,000 tons

year	DRY BULK		LIQUID BULK		BAG CARGO		CONTAINER		REFRIGERATED GOOD		STEEL MATERIAL		MINERAL		GENERAL CARGO		TOTAL
1988/89	291	23.3%	0	0.0%	0	0.0%	51	4.1%	0	0.0%	0	0.0%	0	0.0%	907	72.6%	1,249
1989/90	325	24.5%	0	0.0%	0	0.0%	72	5.4%	0	0.0%	0	0.0%	0	0.0%	930	70.1%	1,327
1990/91	257	19.1%	0	0.0%	0	0.0%	79	5.9%	0	0.0%	0	0.0%	0	0.0%	1,007	75.0%	1,343
1991/92	345	14.5%	0	0.0%	0	0.0%	126	5.3%	0	0.0%	0	0.0%	0	0.0%	1,908	80.2%	2,379
1992/93	119	3.9%	309	10.0%	997	32.3%	48	1.6%	0	0.0%	796	25.8%	27	0.9%	786	25.5%	3,082
1993/94	173	3.8%	69	1.5%	1,357	30.2%	87	1.9%	0	0.0%	1,519	33.8%	7	0.2%	1,284	28.6%	4,496
1994/95	513	10.3%	341	6.8%	1,485	29.8%	103	2.1%	0	0.0%	1,603	32.1%	27	0.5%	917	18.4%	4,989
1995/96	526	9.5%	361	6.6%	1,634	29.7%	122	2.2%	0	0.0%	1,692	30.7%	29	0.5%	1,144	20.8%	5,509
1996/97	539	8.9%	383	6.3%	1,791	29.4%	147	2.4%	0	0.0%	1,786	29.3%	32	0.5%	1,407	23.1%	6,086
1997/98	554	8.2%	406	6.0%	1,955	29.1%	181	2.7%	0	0.0%	1,885	28.0%	35	0.5%	1,708	25.4%	6,724
1998/99	569	7.7%	431	5.8%	2,127	28.6%	226	3.0%	0	0.0%	1,990	26.8%	38	0.5%	2,052	27.6%	7,433
1999/00	585	7.2%	457	5.6%	2,296	28.2%	291	3.6%	0	0.0%	2,100	25.8%	42	0.5%	2,375	29.2%	8,146
2000/01	602	6.7%	485	5.4%	2,473	27.7%	380	4.3%	0	0.0%	2,217	24.8%	45	0.5%	2,733	30.6%	8,936
2001/02	620	6.3%	514	5.2%	2,658	27.1%	503	5.1%	0	0.0%	2,334	23.8%	49	0.5%	3,133	31.9%	9,811
2002/03	640	5.9%	545	5.1%	2,851	26.4%	671	6.2%	0	0.0%	2,456	22.8%	54	0.5%	3,566	33.1%	10,782
2003/04	660	5.6%	577	4.9%	3,053	25.7%	902	7.6%	0	0.0%	2,586	21.8%	59	0.5%	4,024	33.9%	11,861
2004/05	682	5.2%	612	4.7%	3,265	24.9%	1,223	9.3%	0	0.0%	2,722	20.8%	64	0.5%	4,541	34.6%	13,108
2005/06	705	4.9%	648	4.5%	3,486	24.2%	1,673	11.6%	0	0.0%	2,865	19.9%	70	0.5%	4,944	34.4%	14,391
2006/07	730	4.6%	687	4.3%	3,718	23.4%	2,305	14.5%	0	0.0%	3,015	19.0%	76	0.5%	5,346	33.7%	15,877
2007/08	756	4.3%	728	4.2%	3,959	22.6%	3,204	18.3%	0	0.0%	3,174	18.1%	83	0.5%	5,630	32.1%	17,534
2008/09	784	4.0%	772	4.0%	4,212	21.7%	4,498	23.2%	0	0.0%	3,341	17.2%	90	0.5%	5,687	29.3%	19,384
2009/10	813	3.8%	819	3.8%	4,477	20.9%	6,393	29.8%	0	0.0%	3,517	16.4%	98	0.5%	5,336	24.9%	21,453
2010/11	845	3.6%	868	3.7%	4,753	20.0%	9,231	38.8%	0	0.0%	3,702	15.6%	107	0.5%	4,262	17.9%	23,768

macro and micro forecast methods described in Chapter 3.5.1.

Table 3.5.3.4 Comparison of Forecasted Cargo Volume

		2000/01	2010/11
Import	Macro Method	36,969 - 38,035	57,655 - 65,572
	Micro Method	32,455	53,315
Export	Macro Method	8,247 - 8,433	14,874 - 17,665
	Micro Method	8,936	23,768
Total	Macro Method	45,216 - 46,468	72,529 - 83,237
	Micro Method	41,391	77,083

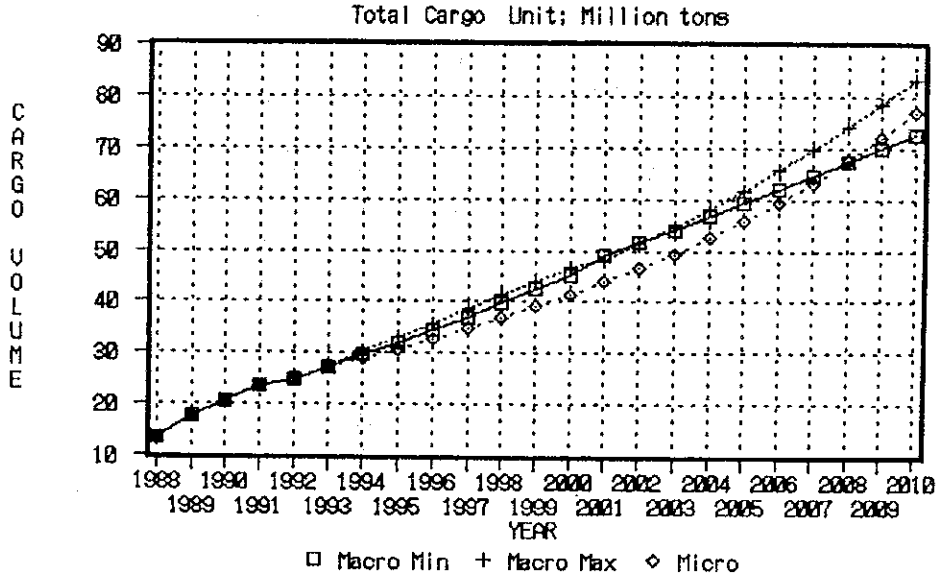

Figure 3.5.3.1 Comparison of Forecasted Cargo Volume

Only the result of the micro forecast corresponds with total cargo volume of target year 2010/11 in the macro forecast. The other results, import and export cargo volumes of each target year do not correspond with that of the macro forecast.
Further, considering the trade ratio of import and export cargo volume from the viewpoint of the future economic frame as mentioned in chapter 3.3, the trade ratio of import and export cargo volume as shown in the macro forecast will not be realistic and also trade of import and export cargo will continue to be controlled by the government policy. Therefore, import cargo volume will not increase at the same rate as that of 1988/89 to 1992/93, while export cargo volume will increase at a greater pace than past records would suggest. Accordingly, macro forecast results will not be adopted in this study.
In conclusion, results obtained by the micro forecast method are adopted as the final estimation of cargo volume for the study ports.

(5) Check by trade frame

To calculate the export & import cargo weights, the export & import values were divided by the average values for each price per weight ($/ton). Mean values for export and import for each $/ton can be calculated from the data of the recent years as $814/ton and $1,099/ton, respectively.
During the period of 1999/00 to 2010/11, we predict that the average export commodity's price will increase and import commodity's price will decrease due to industrialization. Thus to calculate the export & import weights, the export & import trade values can be divided by each $/ton; export price is $908/ton and import price is $815/ton. Other cases are given in Appendix II-2.2, II-2.3.

FUTURE TRACARGO VOLUME (1,000 TONS)
(CASE-2)

YEAR	EXPORT VOLUME	IMPORT VOLUME	TOTAL VOLUME
1987/88	1,132	15,348	16,480
1988/89	1,224	13,376	14,600
1989/90	1,455	19,240	20,695
1990/91	1,242	20,540	21,782
1991/92	2,831	21,500	24,331
1992/93	3,438	21,113	24,551
1993/94	3,279	19,738	23,016
1994/95	4,719	25,481	30,200
1995/96	5,552	26,551	32,103
1996/97	6,452	27,667	34,119
1997/98	7,424	28,828	36,252
1998/99	8,471	30,039	38,510
1999/00	9,600	31,181	40,781
2000/01	10,816	32,366	43,181
2001/02	11,712	34,015	45,727
2002/03	12,683	35,748	48,431
2003/04	13,734	37,570	51,304
2004/05	14,873	39,484	54,357
2005/06	16,105	41,496	57,602
2006/07	17,440	43,611	61,051
2007/08	18,886	45,833	64,719
2008/09	20,451	48,169	68,620
2009/10	22,146	50,623	72,769
2010/11	23,982	53,203	77,184
2010/2000	8.3%	5.1%	6.0%
NON-OIL / TO	31.1%	68.9%	

* TRADE VALUEEXCLUDING OIL.OIL PRODUCTS

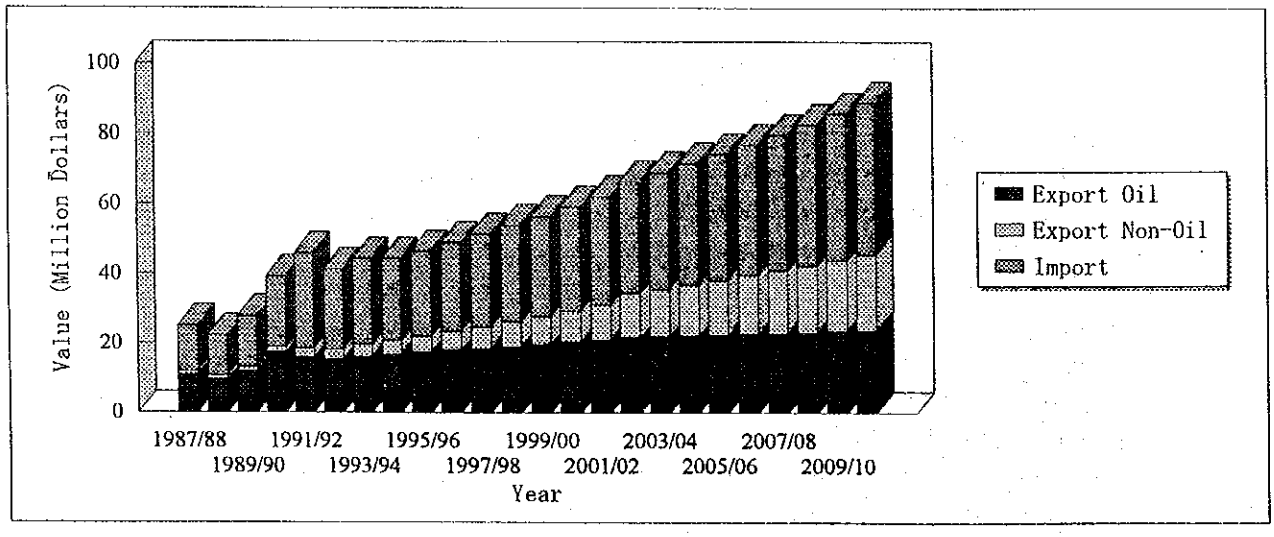

Figure 3.5.3.2 Future Trade Value

3.5.4 Forecast of Regional Cargo Traffic Distribution

The data of actual situation is available in Chapter 1, Section 1.4 based on which the target proportion of the cargo volume in future foreign trade is assumed. Before the calculation some conditions are presumed as follows to decide the basic share of the cargo volume by region.

- Basically the regional cargo volume is estimated by the time series analysis.
- In the case of unavailable or shortage of cargo data, the acceptable proportion of the cargo volume by region will be preferred considering the maximum share in the past five years.
- The trial is for the Case-2 only.
- Land bridge cargo, the world transhipment cargo,oil-product and oil are excluded.

(1) The proportion of the world cargo volume to/from by region is estimated by using the forecasting methods shown in Table 3.5.4.1.

Table 3.5.4.1 Forecasting Methods of World Cargo

Region	Import	Export
Free trade zone	Annualgrowth ratio of 7.2%*	Equal to import
Afgan/pakistan	Time series analysis	Considering the past shares
Turkey	Time series analysis	Considering the past share
CIS republic	Annual growth ratio by import cargo	Annual growth ratio of export cargo
Arabic countries	Annual growth ratio by import cargo	Considering the past share
Persian Gulf		Considering the past share
Oceania	Time series analysis	Considering the past share
North America	Average of the past five years	Considering the past share
Far East Asia	Time series analysis	Considering the past share
South East Asia	Time series analysis	Considering the past share
Mediterranean	Time series analysis	Considering the past share
Western Europe	Time series analysis	Considering the past share
Eastern Europe	Time series analysis	Considering the past share
South America	Time series analysis	
Africa		

[annual average growth rate of the total cargo volume between 1993-2010]*

Resulting cargo volumes and proportions are shown in Table 3.5.4.2 and 3.5.4.3.

Table 3.5.4.2 Estimated World Cargo Volume by Region in 2000, 2010

(In Case 2) [Unit; 1,000 tons]

	IMPORT FROM			EXPORT TO			TOTAL		
	1992/93	2000/01	2010/11	1992/93	2000/01	2010/11	1992/93	2000/01	2010/11
FREETRAD	4	774	1,361	0	568	1,027	4	1,342	2,389
AFG. PAKI.	167	194	342	103	184	441	270	379	783
TURKEY	596	836	1,218	219	387	926	815	1,223	2,145
CIS	750	873	1,535	33	641	1,158	783	1,513	2,694
ARAB	359	619	650	9	454	490	368	1,074	1,140
PER-GULF	1,032	1,026	1,394	982	993	1,784	2,014	2,019	3,179
OCEANIA	952	1,742	2,031	2	246	588	954	1,988	2,619
N-AMERIC	2,527	4,205	7,524	10	307	735	2,537	4,512	8,259
FE-ASIA	1,690	2,759	4,730	964	1,714	4,101	2,654	4,473	8,832
SE-ASIA	2,028	3,143	5,538	197	1,536	3,675	2,226	4,679	9,213
MEDITERR.	702	1,634	2,830	119	578	1,382	820	2,212	4,212
W-EUROPE	5,624	8,467	14,503	617	1,094	2,617	6,241	9,561	17,119
E-EUROPE	1,417	1,503	2,644	70	879	2,102	1,488	2,382	4,746
S-AMERIC	2,891	3,980	5,862	2	246	588	2,893	4,226	6,450
AFRICA	374	610	1,040	111	989	2,367	485	1,599	3,406
TOTAL	21,113	32,366	53,203	3,438	10,816	23,982	24,551	43,182	77,185

Table 3.5.4.3 Estimated World Cargo Proportion by Region in 2000, 2010

(In Case-2)

	IMPORT FROM			EXPORT TO		
	1992	2000	2010	1992	2000	2010
FREETRAD	0.0%	2.4%	2.6%	0.0%	5.3%	4.3%
AFG. PAKI.	0.8%	0.6%	0.6%	3.0%	1.7%	1.8%
TURKEY	2.8%	2.6%	2.3%	6.4%	3.6%	3.9%
CIS	3.6%	2.7%	2.9%	1.0%	5.9%	4.8%
ARAB	1.7%	1.9%	1.2%	0.3%	4.2%	2.0%
PER-GULF	4.9%	3.2%	2.6%	28.6%	9.2%	7.4%
OCEANIA	4.5%	5.4%	3.8%	0.1%	2.3%	2.5%
N-AMERIC	12.0%	13.0%	14.1%	0.3%	2.8%	3.1%
FE-ASIA	8.0%	8.5%	8.9%	28.0%	15.9%	17.1%
SE-ASIA	9.6%	9.7%	10.4%	5.7%	14.2%	15.3%
MEDITERR.	3.3%	5.0%	5.3%	3.5%	5.3%	5.8%
W-EUROPE	26.6%	26.2%	27.3%	17.9%	10.1%	10.9%
E-EUROPE	6.7%	4.6%	5.0%	2.0%	8.1%	8.8%
S-AMERIC	13.7%	12.3%	11.0%	0.1%	2.3%	2.5%
AFRICA	1.8%	1.9%	2.0%	3.2%	9.1%	9.9%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

(2) Forecast of cargo flow by transport mode

In the Table 3.5.4.3, the import cargo volume share from Afganistan and Pakistan is 0.9% in 2010 and this cargo will be transported on land presumably. Turkey's share is 2.9% and this cargo will be also transported on land presumably.

The cargo volume share from Western Europe to Iran is 28.1% and this cargo will be transported on two routes and by different transport modes. One route is on land and the other is by ship through the Suez Canal. The cost of each transport mode was estimated in Chapter 1. A summary of which is as shown in Table 3.5.4.4.

Table 3.5.4.4 Cost of Transport from Western Europe per TEU

Route by ship	2,700 US$,	32Days (Persian Gulf)
Route by ship	3,040 US$,	20Days (Caspian Sea)
Route on land	4,332 US$,	12Days

To roughly estimate the cargo volume, it is assumed that the cargo will be transported by the cheapest mode, therefore the cargo volume is proportionate with a reciprocal number of the cost. That is to say;

By ship : Persian Gulf	By ship Caspian Sea	: On land =	$\frac{1}{2,700}$	:	$\frac{1}{9,120}$	:	$\frac{1}{4,332}$
		=	52%	:	15%	:	32%

In above calculation, the transport cost ($9,120) through the Caspian Sea, which cannot be used for four months in winter, is assumed as three times higher than normal cost. The cost of on land route is average cost of rail way and trucks.

Therefore the import cargo volume share on land from Western Europe will be estimated by multiplying 27.3% (See the Table 3.3.5.3) and 32%. As the result about 9% of total cargo will come to Iran on land.

Using the same method, the cargo volume share from Eastern Europe is estimated as follows.

By ship : Persian Gulf	By ship Caspian Sea	: On land =	$\frac{1}{2,700}$	:	$\frac{1}{2,630}$	:	$\frac{1}{2,715}$
		=	33%	:	34%	:	33%

On the other hand, it is assumed that the import/export cargo from CIS countries will be divided equally between sea and land because the rail way network will be improved in 2010/11.

Estimated cargo volume by transport mode in 2000/01 and 2010/11 is summarized as shown in Table 3.5.4.5.

Table 3.5.4.5 Estimated Cargo Volume

(Unit; 1,000 tons)

		Import (2010/11)	Export (2010/11)	TOTAL (2010/11)	TOTAL (2000/01)
On land	Afg, Pks, CIS	1,109	1,020		
	Turkey	1,218	926		
	W-Euro	4,718	851		
	E-EURO	881	701		
	TOTAL	7,927	3,498	11,426	6,262
				(14.8%)	(14.5%)
By Ship	E-Euro	881	701		
Caspian	CIS	768	579		
Sea	W-Euro	2,214	400		
	TOTAL	3,863	1,679	5,543	3,010
				(7.2%)	(7.0%)
By Ship	W-Euro	7,570	1,366		
Per-Gulf	E-Euro	881	701		
	Other	32,961	16,738		
	TOTAL	41,412	18,804		
				60,217	33,909
				(78.0%)	(78.5%)

3.5.5 Forecast Volume of Caspian (north) and Persian (south) Ports

Iranian ports (PSO's ports) are spread out roughly in two areas. One group of ports is located in the north part of Iran, and faces the Caspian Sea, while the other ports face the Persian Gulf, and are located in the south of Iran. In view of the functional allotment of port activities between the northern and southern ports, handling cargoes in the aforesaid areas will not interfere with each other. Hereinafter, the future cargo handling volume forecasted in preceding chapters will be distributed to north and south ports.

(1) Present ratio of cargo volume handled between north and south ports

Tables 3.5.5.1, 3.5.5.2 and 3.5.5.3 indicate the total, import and export cargo handled in north and south ports from 1988/89 to 1993/94. Recently, the weight of port activities in the north ports shows a tendency to decrease. Among all commodities unloaded(import) at the north ports, petroleum product is the largest cargo in terms of volume as shown in Table 3.5.5.4. As shown in Figure 3.5.5.1, handling volume

of petroleum product at the north port shows a stable tendency up to 1992/93.

Table 3.5.5.1 Total Cargo Handled in All Ports

Unit: 1,000 tons

YEAR	North Ports		South Ports		TOTAL
	Cargo Vol.	Share Ratio	Cargo Vol.	Share Ratio	Cargo Vol.
1983/84					
1984/85					
1985/86					
1986/87					
1987/88					
1988/89	1,359	9.9%	12,319	90.1%	13,678
1989/90	1,263	7.2%	16,341	92.8%	17,604
1990/91	1,928	9.3%	18,718	90.7%	20,646
1991/92	1,892	8.0%	21,755	92.0%	23,647
1992/93	1,669	6.7%	23,161	93.3%	24,830
1993/94	1,474	5.4%	25,675	94.6%	27,149

Table 3.5.5.2 Import Cargo Handled in All Ports

Unit: 1,000 tons

YEAR	North Ports		South Ports		TOTAL
	Cargo Vol.	Share Ratio	Cargo Vol.	Share Ratio	Cargo Vol.
1983/84					
1984/85					
1985/86					
1986/87					
1987/88					
1988/89	1,356	10.9%	11,073	89.1%	12,429
1989/90	1,258	7.7%	15,019	92.3%	16,277
1990/91	1,924	10.0%	17,379	90.0%	19,303
1991/92	1,883	8.9%	19,377	91.1%	21,260
1992/93	1,648	7.6%	20,100	92.4%	21,748
1993/94	1,424	6.3%	21,227	93.7%	22,651

Table 3.5.5.3 Export Cargo Handled in All Ports

Unit: 1,000 tons

YEAR	North Ports		South Ports		TOTAL
	Cargo Vol.	Share Ratio	Cargo Vol.	Share Ratio	Cargo Vol.
1983/84					
1984/85					
1985/86					
1986/87					
1987/88					
1988/89	3	0.2%	1,246	99.8%	1,249
1989/90	5	0.4%	1,322	99.6%	1,327
1990/91	4	0.3%	1,339	99.7%	1,343
1991/92	9	0.4%	2,378	99.6%	2,387
1992/93	21	0.7%	3,061	99.3%	3,082
1993/94	50	1.1%	4,448	98.9%	4,498

Table 3.5.5.4 Unloading Volume of Petroleum Products

Unit: 1,000 tons

YEAR	North Ports		South Ports		TOTAL
	Cargo Vol.	Share Ratio	Cargo Vol.	Share Ratio	Cargo Vol.
1983/84					
1984/85					
1985/86					
1986/87					
1987/88					
1988/89	874	20.8%	3,330	79.2%	4,204
1989/90	751	25.0%	2,255	75.0%	3,006
1990/91	1,134	32.6%	2,344	67.4%	3,478
1991/92	1,292	30.1%	3,000	69.9%	4,292
1992/93	1,149	22.0%	3,865	74.2%	5,211
1993/94	809	11.7%	6,114	88.3%	6,923

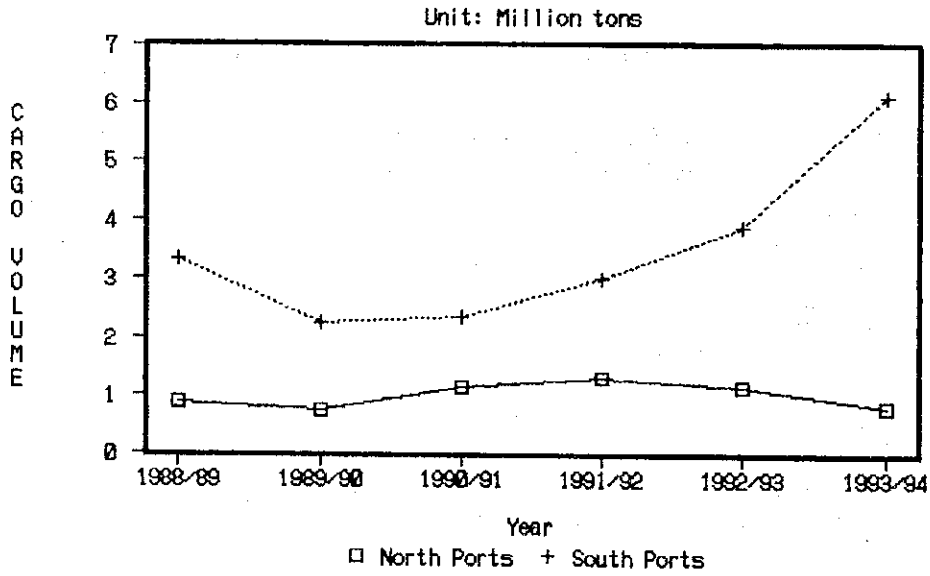

Figure 3.5.5.1 Unloading Volume of Petroleum Products

(2) Forecast ratio of cargo volume in the target years

The difference between handling ratio of petroleum product and other cargo (non-oil) cannot be ignored. Therefore, the forecast handling ratio of each cargo will be examined.

A. Forecast ratio of petroleum product (Import)

It is assumed that the handling ratio of petroleum product for import at the north/south ports in 2010/11 will be the same as the average ratio from 1988/89-1993/94 and import volume at the north/south will increase at the same rate every year from 1994/95 to 2010/11. Forecast of handling ratio and volume for the target years is as shown below.

	1993/94		2000/01		2010/11	
	North	South	North	South	North	South
Handling ratio	11.7%	88.3%	15.7%	84.3%	24%	76%
Handling Volume (thousand tons)	809	6,114	1,212	6,501	2,160	6,840

B. Forecast ratio of non-oil cargo (Import)

It is assumed that the handling ratio of non-oil cargo for import at the north/south ports in 2010/11 will be 9.5% for north and 90.5% for south and import volume at the north/south will increase at the same rate every year from 1994/95 to 2010/11. Forecast of handling ratio and volume for the target years is as shown below.

	1993/94		2000/01		2010/11	
	North	South	North	South	North	South
Handling ratio	3.9%	96.1%	5.5%	94.5%	9.5%	90.5%
Handling Volume (thousand tons)	615	15,113	1,357	23,385	4,205	40,110

C. Forecast ratio of total cargo (Export)

The handling ratio of total cargo for export at the north/south ports in future is estimated at 3.3% for north and 96.7% for south and forecast of handling ratio for the target years is as shown below.

	1993/94		2000/01		2010/11	
	North	South	North	South	North	South
Handling ratio	1.1%	98.9%	1.7%	98.3%	3.3%	96.7%
Handling Volume (thousand tons)	50	4,446	155	8,781	781	22,987

D. Forecast ratio of total cargo (Import & Export)

From A, B and C, the expected ratio and volume of total cargo in the target years is shown below.

	1993/94		2000/01		2010/11	
	North	South	North	South	North	South
Handling ratio	5.4%	94.6%	6.6%	93.4%	9.3%	90.7%
Handling Volume (thousand tons)	1,474	25,675	2,724	38,667	7,146	69,937

Finally, forecast volume in each year at the north/south ports from 1994/95 to target year 2010/11 is as shown in Tables 3.5.5.5, 3.5.5.6 and 3.5.5.7.

3.5.6 Transit Cargo

(1) Cargo to/from free trade zone

In the Qeshm Free Trade Zone many companies are supposed to import and export substantial amount of cargoes. Repackaging and labeling will also be conducted here. Volume of the future trading cargoes in/out of free trade zone depends mainly on the number of companies and their activities.

If the future condition of the development area in Qeshm Island can be ascertained, the volume of cargo generated/attracted can be obtained by multiplying the basic cargo volume per area and square meter.

But both sets of data are difficult to obtain. Therefore the future cargo handling volume of this area is assumed on the basis of the value predicted by relevant organization at about 2 million tons which is considered to be the minimum level.

Cargo to/from the Kish Free Trade Zone will be estimated with the actual data and that will be included in the total cargo demand forecast.

(2) Land-bridge cargo

Economic conditions in four countries, Kazakhistan, Uzbekistan, Kirghisiztan and Turkmenistan, is expected to recover in the short term and import and export more actively. The trade frame is 27.3 billion rubles of export value, 68.7 billion rubles of import value in 1990 as shown in Table 1.1.3.2.

In 1990, the value of Russian imports totalled 120.651 billion dollars while that of Russian exports was 104.177 billion dollars (Overseas Economic Cooperation Hand Book 1993, p.466). From another source, the value of Russian imports is given as 446.6 billion rubles and that of exports is 642.4 billion rubles. From the two sets of data, the exchange rate is estimated; 3.7 rubles is equal to 1 dollar for imports and 6.2 rubles is equal to 1 dollar for exports. The average exchange rate is about 4.9 rubles for a dollar.

Table 3.5.5.5 Micro Forecast Cargo Volume at All Ports

Unloading & Loading (Import & Export)

Unit: 1,000 tons

year	DRY BULK		LIQUID BULK		BAG CARGO		CONTAINER		REFRIGERATED GOOD		STEEL MATERIAL		MINERAL		GENERAL CARGO		TOTAL
1988/89	3,939	28.8%	4,521	33.1%	1,927	14.1%	152	1.1%	84	0.6%	624	4.6%	140	1.0%	2,291	16.7%	13,678
1989/90	5,932	33.7%	3,485	19.8%	2,910	16.5%	296	1.7%	62	0.4%	845	4.8%	280	1.6%	3,794	21.6%	17,604
1990/91	4,986	24.1%	3,927	19.0%	2,300	11.1%	695	3.4%	27	0.1%	3,861	18.7%	551	2.7%	4,299	20.8%	20,646
1991/92	4,494	19.0%	4,786	20.2%	2,022	8.6%	672	2.8%	65	0.3%	5,026	21.3%	618	2.6%	5,956	25.2%	23,639
1992/93	4,384	17.7%	5,833	23.5%	5,069	20.4%	705	2.8%	68	0.3%	3,863	15.6%	614	2.5%	4,294	17.3%	24,830
1993/94	3,940	14.5%	7,605	28.0%	4,059	15.0%	648	2.4%	83	0.3%	4,576	16.9%	837	3.1%	5,399	19.9%	27,147
1994/95	5,984	20.7%	8,019	27.7%	3,855	13.3%	764	2.6%	106	0.4%	4,830	16.7%	883	3.1%	4,508	15.6%	28,949
1995/96	6,189	20.1%	8,183	26.6%	4,088	13.3%	902	2.9%	131	0.4%	5,098	16.6%	911	3.0%	5,251	17.1%	30,754
1996/97	6,400	19.6%	8,354	25.6%	4,335	13.3%	1,066	3.3%	157	0.5%	5,381	16.5%	939	2.9%	6,060	18.5%	32,693
1997/98	6,623	19.0%	8,530	24.5%	4,594	13.2%	1,265	3.6%	184	0.5%	5,679	16.3%	968	2.8%	6,922	19.9%	34,765
1998/99	6,856	18.5%	8,711	23.5%	4,865	13.2%	1,504	4.1%	212	0.6%	5,995	16.2%	997	2.7%	7,851	21.2%	36,991
1999/00	7,036	18.0%	8,898	22.8%	5,115	13.1%	1,798	4.6%	239	0.6%	6,327	16.2%	1,026	2.6%	8,672	22.2%	39,111
2000/01	7,223	17.5%	9,091	22.0%	5,376	13.0%	2,157	5.2%	268	0.6%	6,679	16.1%	1,053	2.5%	9,543	23.1%	41,391
2001/02	7,388	16.9%	9,287	21.2%	5,651	12.9%	2,598	5.9%	287	0.7%	7,031	16.0%	1,079	2.5%	10,523	24.0%	43,844
2002/03	7,559	16.3%	9,489	20.4%	5,938	12.8%	3,141	6.8%	308	0.7%	7,400	15.9%	1,105	2.4%	11,548	24.8%	46,487
2003/04	7,736	15.7%	9,696	19.7%	6,239	12.6%	3,815	7.7%	329	0.7%	7,790	15.8%	1,129	2.3%	12,602	25.5%	49,336
2004/05	7,920	15.1%	9,912	18.9%	6,554	12.5%	4,658	8.9%	351	0.7%	8,200	15.6%	1,153	2.2%	13,665	26.1%	52,412
2005/06	8,110	14.6%	10,134	18.2%	6,886	12.4%	5,723	10.3%	373	0.7%	8,632	15.5%	1,176	2.1%	14,704	26.4%	55,738
2006/07	8,311	14.0%	10,362	17.5%	7,233	12.2%	7,080	11.9%	397	0.7%	9,085	15.3%	1,197	2.0%	15,672	26.4%	59,337
2007/08	8,516	13.5%	10,599	16.8%	7,597	12.0%	8,834	14.0%	421	0.7%	9,564	15.1%	1,217	1.9%	16,491	26.1%	63,239
2008/09	8,732	12.9%	10,844	16.1%	7,981	11.8%	11,137	16.5%	445	0.7%	10,067	14.9%	1,235	1.8%	17,032	25.2%	67,473
2009/10	8,954	12.4%	11,097	15.4%	8,382	11.6%	14,221	19.7%	471	0.7%	10,597	14.7%	1,251	1.7%	17,102	23.7%	72,075
2010/11	9,188	11.9%	11,359	14.7%	8,803	11.4%	18,461	23.9%	497	0.6%	11,155	14.5%	1,265	1.6%	16,355	21.2%	77,083

Table 3.5.5.6 Forecast Cargo Volume at North(Caspian) Ports

unit: 1,000 tons

year	DRY BULK		LIQUID BULK		BAG CARGO		CONTAINER		REFRIG. GOODS		STEEL MATERIAL		MINERAL		GENERAL CARGO		TOTAL
1988/89	135	9.9%	874	64.3%	153	11.3%	3	0.2%	0	0.0%	73	5.4%	0	0.0%	121	8.9%	1,359
1989/90	213	16.9%	751	59.5%	124	9.8%	11	0.9%	0	0.0%	60	4.8%	0	0.0%	104	8.2%	1,263
1990/91	235	12.2%	1,134	58.8%	26	1.3%	10	0.5%	0	0.0%	287	14.9%	0	0.0%	236	12.2%	1,928
1991/92	131	7.0%	1,292	68.6%	64	3.4%	4	0.2%	0	0.0%	320	17.0%	0	0.0%	73	3.9%	1,884
1992/93	0	0.0%	1,149	68.8%	52	3.1%	15	0.9%	0	0.0%	286	17.1%	0	0.0%	167	10.0%	1,669
1993/94	0	0.0%	809	54.9%	65	4.4%	50	3.4%	0	0.0%	328	22.3%	0	0.0%	222	15.1%	1,474
1994/95	197	12.3%	978	61.0%	127	7.9%	25	1.6%	0	0.0%	159	9.9%	0	0.0%	117	7.3%	1,605
1995/96	217	12.4%	1,039	59.5%	143	8.2%	32	1.8%	0	0.0%	178	10.2%	0	0.0%	139	8.0%	1,748
1996/97	237	12.4%	1,111	58.3%	160	8.4%	39	2.1%	0	0.0%	199	10.4%	0	0.0%	160	8.4%	1,907
1997/98	258	12.4%	1,177	56.5%	179	8.6%	49	2.4%	0	0.0%	221	10.6%	0	0.0%	197	9.4%	2,082
1998/99	288	12.7%	1,254	55.1%	204	9.0%	63	2.8%	0	0.0%	252	11.1%	0	0.0%	213	9.4%	2,275
1999/00	310	12.4%	1,344	54.0%	225	9.0%	79	3.2%	0	0.0%	278	11.2%	0	0.0%	252	10.1%	2,488
2000/01	339	12.5%	1,427	52.4%	253	9.3%	101	3.7%	0	0.0%	314	11.5%	0	0.0%	289	10.6%	2,724
2001/02	369	12.4%	1,523	51.0%	283	9.5%	130	4.4%	0	0.0%	352	11.8%	0	0.0%	330	11.0%	2,986
2002/03	401	12.2%	1,623	49.5%	315	9.6%	166	5.1%	0	0.0%	392	12.0%	0	0.0%	380	11.6%	3,277
2003/04	433	12.0%	1,726	48.0%	349	9.7%	214	5.9%	0	0.0%	436	12.1%	0	0.0%	441	12.2%	3,599
2004/05	467	11.8%	1,844	46.6%	387	9.8%	275	6.9%	0	0.0%	484	12.2%	0	0.0%	501	12.7%	3,957
2005/06	503	11.5%	1,966	45.1%	427	9.8%	355	8.1%	0	0.0%	535	12.3%	0	0.0%	569	13.1%	4,355
2006/07	540	11.3%	2,104	43.8%	470	9.8%	460	9.6%	0	0.0%	591	12.3%	0	0.0%	633	13.2%	4,798
2007/08	579	10.9%	2,236	42.3%	517	9.8%	601	11.4%	0	0.0%	650	12.3%	0	0.0%	709	13.4%	5,292
2008/09	620	10.6%	2,397	41.0%	567	9.7%	791	13.5%	0	0.0%	715	12.2%	0	0.0%	754	12.9%	5,843
2009/10	654	10.1%	2,552	39.5%	612	9.5%	1,038	16.1%	0	0.0%	774	12.0%	0	0.0%	829	12.8%	6,459
2010/11	680	9.5%	2,726	38.2%	651	9.1%	1,366	19.1%	0	0.0%	825	11.6%	0	0.0%	897	12.6%	7,146

Table 3.5.5.7 Forecast Cargo Volume at South(Persian) Ports

unit: 1,000 tons

year	DRY BULK		LIQUID BULK		BAG CARGO		CONTAINER		REFRIG. GOODS		STEEL MATERIAL		MINERAL		GENERAL CARGO		TOTAL
1988/89	3,804	30.9%	3,647	29.6%	1,774	14.4%	149	1.2%	84	0.7%	551	4.5%	140	1.1%	2,170	17.6%	12,319
1989/90	5,719	35.0%	2,734	16.7%	2,786	17.0%	285	1.7%	62	0.4%	785	4.8%	280	1.7%	3,690	22.6%	16,341
1990/91	4,751	25.4%	2,793	14.9%	2,274	12.1%	685	3.7%	27	0.1%	3,574	19.1%	551	2.9%	4,063	21.7%	18,718
1991/92	4,363	20.1%	3,494	16.1%	1,958	9.0%	668	3.1%	65	0.3%	4,706	21.6%	618	2.8%	5,883	27.0%	21,755
1992/93	4,384	18.9%	4,684	20.2%	5,017	21.7%	690	3.0%	68	0.3%	3,577	15.4%	614	2.7%	4,127	17.8%	23,161
1993/94	3,940	15.3%	6,796	26.5%	3,994	15.6%	598	2.3%	83	0.3%	4,248	16.5%	837	3.3%	5,177	20.2%	25,673
1994/95	5,787	21.2%	7,040	25.7%	3,728	13.6%	739	2.7%	106	0.4%	4,671	17.1%	883	3.2%	4,391	16.1%	27,344
1995/96	5,972	20.6%	7,144	24.6%	3,945	13.6%	870	3.0%	131	0.5%	4,920	17.0%	911	3.1%	5,112	17.6%	29,006
1996/97	6,163	20.0%	7,243	23.5%	4,175	13.6%	1,027	3.3%	157	0.5%	5,182	16.8%	939	3.1%	5,900	19.2%	30,786
1997/98	6,364	19.5%	7,353	22.5%	4,415	13.5%	1,216	3.7%	184	0.6%	5,458	16.7%	968	3.0%	6,725	20.6%	32,683
1998/99	6,568	18.9%	7,457	21.5%	4,661	13.4%	1,441	4.2%	212	0.6%	5,743	16.5%	997	2.9%	7,638	22.0%	34,716
1999/00	6,726	18.4%	7,555	20.6%	4,890	13.4%	1,719	4.7%	239	0.7%	6,049	16.5%	1,026	2.8%	8,419	23.0%	36,623
2000/01	6,884	17.8%	7,664	19.8%	5,123	13.2%	2,056	5.3%	268	0.7%	6,365	16.5%	1,053	2.7%	9,254	23.9%	38,667
2001/02	7,019	17.2%	7,764	19.0%	5,368	13.1%	2,468	6.0%	287	0.7%	6,679	16.3%	1,079	2.6%	10,193	24.9%	40,858
2002/03	7,158	16.6%	7,866	18.2%	5,623	13.0%	2,975	6.9%	308	0.7%	7,008	16.2%	1,105	2.6%	11,167	25.8%	43,210
2003/04	7,303	16.0%	7,970	17.4%	5,890	12.9%	3,601	7.9%	329	0.7%	7,353	16.1%	1,129	2.5%	12,162	26.6%	45,737
2004/05	7,453	15.4%	8,068	16.7%	6,167	12.7%	4,383	9.0%	351	0.7%	7,716	15.9%	1,153	2.4%	13,164	27.2%	48,455
2005/06	7,607	14.8%	8,168	15.9%	6,459	12.6%	5,368	10.4%	373	0.7%	8,097	15.8%	1,176	2.3%	14,135	27.5%	51,383
2006/07	7,770	14.2%	8,259	15.1%	6,763	12.4%	6,620	12.1%	397	0.7%	8,495	15.6%	1,197	2.2%	15,038	27.6%	54,539
2007/08	7,937	13.7%	8,363	14.4%	7,080	12.2%	8,233	14.2%	421	0.7%	8,914	15.4%	1,217	2.1%	15,782	27.2%	57,947
2008/09	8,112	13.2%	8,448	13.7%	7,414	12.0%	10,346	16.8%	445	0.7%	9,352	15.2%	1,235	2.0%	16,278	26.4%	61,630
2009/10	8,300	12.7%	8,545	13.0%	7,770	11.8%	13,183	20.1%	471	0.7%	9,823	15.0%	1,251	1.9%	16,272	24.8%	65,616
2010/11	8,508	12.2%	8,633	12.3%	8,152	11.7%	17,095	24.4%	497	0.7%	10,329	14.8%	1,265	1.8%	15,458	22.1%	69,937

It should be noted that Russia's import and export value showed a negative growth ratio of 45.6% and 29.4% from the previous year.(The Trade between Japan and Foreign Countries, JETRO, 1993)

Using the above exchange rate the total export and import value in 1990 of four CIS countries is 5.5 billion dollars and 14 billion dollars respectively.
On the basis of the above rate, the total future trade frame of the four CIS countries can be estimated.

In the four CIS countries the export value will reach 7.932 billion dollars in 2000, up from 5.5 billion dollars in 1990. Similarly, the import value will reach 18.813 billion dollars in 2010, up from 14 billion dollars in 1990. In 2010, the export and import values will be 9.933 billion dollars and 25.286 billion dollars respectively, based on an annual growth rate of 3.0%(See Table 3.3.3.2. Indicator of World trade volume, low case).

For the future trade frame, the average value of import and export are applied under the concept that the future value of imports and exports should be balanced in CIS countries.

The target of foreign trade share with other republic countries for the four CIS countries is about 28% in 2010, and 15% in 2000 based on the in/out trade ratio of former U.S.S.R.(See Table 1.1.3.2). The 28% is the outer republic trade ratio of all U.S.S.R and the 15% is the highest ratio among four CIS countries at present.

The trade value which moves from four CIS countries to other countries is to be estimated by multiplying this rate and future trade value.

As seen in Table 3.3.6.1, cargo that will occasionally use the land bridge mainly originates from Eastern Europe and the U.S.S.R and is destined for Africa, Middle East and Asia, or vice versa.

As the results of calculation based on the Table 3.5.6.1, 12% of the cargo originates from Eastern Europe and the USSR while 9.2% is destined for Eastern Europe and so on.

It is acceptable to use the above rates for the future condition for the CIS countries because they want to trade with outer republic countries at a greater rate than now. These rates will be targets for the CIS countries in future foreign trade.

Table 3.5.6.1 Network of World Merchandise Trade by Region. 1988

(Unit: Billion U.S.dollars)

Destination / origin	North America	Latain America	Western Eurupe	Eastern Europe	Africa	Middle East	Asia	n.e.s*	World
North America	150.0	46.6	99.3	4.9	8.2	11.9	112.5	3.6	437.5
Latain America	54.5	16.4	26.7	8.1	1.8	1.9	12.2	0.5	122.0
Western Europe	113.4	24.1	903.7	38.9	46.5	38.3	91.7	11.3	1267.8
E.Europe & USSR	3.0	8.6	50.4	128.2	4.1	4.9	18.3	8.9	226.4
Africa	9.8	1.5	39.0	2.8	4.6	0.9	6.0	9.4	73.9
Middle East	11.5	6.4	23.8	3.5	1.2	5.5	31.0	1.2	85.0
Asia	197.4	12.6	124.5	11.9	13.2	20.6	283.1	6.5	669.8
world	540.1	116.1	1267.3	198.3	80.5	83.9	554.8	41.4	2282.3

Source: Review of Maritime Transport 1989 (UNCTAD).p.3

** not elesewhere specified*

To obtain the cargo volume, the unit values per ton shown in Table 3.5.6.2 are used.

Table 3.5.6.2 World Trade Growth 1970-1988

	World trade volume	
Year	US$ Bn.	tonnes Mn.
1970	312	2,561
1975	873	3,039
1980	2,009	3,645
1982	1,856	3,259
1984	1,991	3,312
1986	2,119	3,366
1988	2,076	3,529

From the Table 3.5.6.2, the average unit value is about 767 dollars per ton. The import and export value can be converted to volume as shown in Table 3.5.6.3.

Table 3.5.6.3 Land-Bridge Cargo Volume

(Unit: Mn. Tons)

Year	Total value(Bn.$)	Total volume	trade with out countries	land-bridge cargo of four CIS countries	
				From	To
2000	26.21	34.172	5.126	0.62	0.47
2010	35.22	45.919	12.857	1.54	1.18

3.5.7 Forecast Volume of Study Ports

In the preceding Chapter 3.5.4 and 3.5.5, the future cargo handling volume was distributed to north and south ports. Hereinafter, aforesaid cargo volume in the target years will be distributed to each study port under consideration of transportation mode.

Study Ports are as follows.

North ports (four ports) --------	Anzali, Noshahr, Amir Abad and Fereydunkener
South ports (seven ports) ------	Imam Khomeini, Rajaee, Bahonar, Bushehr, Behesti, Khorramshahr and Abadan

(1) Cargo handling volume of study ports

Cargo volume in the target years will be distributed to each study port. It is assumed that the present share of cargo volume among the study ports will be maintained generally in future. Moreover the study team has made careful consideration based on port development plans of the PSO on the cargo to be handled at the new ports (Amir Abad, Fereydunkener, Khorramshahr and Abadan). Forecast of cargo handling volume in target years 2000/01 and 2010/11 at each port is as shown in Table 3.5.7.1 and 3.5.7.2.

(2) Commodity-wise cargo volume of study ports

Cargo volume of each study port in the target years will be broken down by commodity. Present commodity shares at each study port are basically expected to be maintained.
In the previous chapter, total volume of each commodity to be handled at the study ports in the target year was determined. Then, using the Fratar growth-factor method[1], we have made a series of fine adjustments to determine the volume to be handled at each port in the years leading up to the target year. Forecast of commodity-wise cargo handling volume in the target years 2000/01 and 2010/11 at each port is as shown in Table 3.5.7.3 and 3.5.7.4.

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(1) The total volume of each commodity is known, as is the total cargo volume at each port. What remains to be determined is the commodity share at each port, and this is done using the Fratar growth-factor method: the X-axis (cargo volume of each port) and Y-axis (total volume of each commodity) are alternately calculated until agreement is reached.

Table 3.5.7.1 Import/Export Forecast Cargo Volume at Each Study Port of North (Caspian) Ports

Imports

Unit: 1,000 tons

Year	North																											
	Total			Transit	Imp.+Trans	Anzali					Nowshahr					Amir Abad						Fereydunkener			Torkaman		
	Imp.+Exp.	Import	Ratio	Cargo	Total	Import	Ratio	Transit	Imp.+Trans.	Ratio	Import	Ratio	Transit	Imp.+Trans.	Ratio	Imp.+Exp.	Import	Ratio	Transit	Imp.+Trans.	Ratio	Imp.+Exp.	Import	Ratio	Transit	T. Ratio	Ratio
1988	1,359	1,356	99.8%		1,356	333	24.6%		333	24.6%	1,023	75.4%		1,023	75.4%												
1989	1,263	1,258	99.6%		1,258	801	63.7%		801	63.7%	457	36.3%		457	36.3%												
1990	1,928	1,924	99.8%		1,924	1,225	63.7%		1,225	63.7%	699	36.3%		699	36.3%												
1991	1,884	1,883	99.9%		1,883	1,192	63.3%		1,192	63.3%	691	36.7%		691	36.7%												
1992	1,669	1,648	98.7%		1,648	1,055	64.0%		1,055	64.0%	593	36.0%		593	36.0%												
1993	1,474	1,424	96.6%		1,424	1,036	72.8%		1,036	72.8%	388	27.2%		388	27.2%												
1994	1,605	1,546	96.3%		1,546	1,125	72.8%		1,125	72.8%	421	27.2%		421	27.2%												
1995	1,748	1,679	96.1%		1,679	1,222	72.8%		1,222	72.8%	457	27.2%		457	27.2%												
1996	1,907	1,825	95.7%		1,825	1,189	65.2%		1,189	65.2%	444	24.3%		444	24.3%								200	191	10.5%			
1997	2,082	1,986	95.4%		1,986	1,145	57.6%		1,145	57.6%	428	21.5%		428	21.5%	200	191	9.6%		191	9.6%	233	223	11.2%			
1998	2,275	2,162	95.0%		2,162	1,235	57.1%		1,235	57.1%	461	21.3%		461	21.3%	218	207	9.6%		207	9.6%	272	259	12.0%			
1999	2,488	2,356	94.7%		2,356	1,332	56.6%		1,332	56.6%	498	21.1%		498	21.1%	238	225	9.6%		225	9.6%	317	301	12.8%			
2000	2,724	2,569	94.3%	620	3,189	1,438	56.0%	155	1,593	49.9%	537	20.9%	155	692	21.7%	259	245	7.7%	240	485	15.2%	370	349	11.0%	70	11.3%	2.2%
2001	2,986	2,804	93.9%	679	3,483	1,553	55.4%	170	1,722	49.5%	580	20.7%	170	750	21.5%	283	266	7.6%	263	529	15.2%	432	406	11.6%	77	11.3%	2.2%
2002	3,277	3,062	93.4%	744	3,806	1,677	54.8%	186	1,862	48.9%	626	20.5%	186	812	21.3%	308	288	7.6%	288	576	15.1%	504	471	12.4%	84	11.3%	2.2%
2003	3,599	3,347	93.0%	815	4,162	1,811	54.1%	204	2,015	48.4%	677	20.2%	204	880	21.2%	336	313	7.5%	316	629	15.1%	588	547	13.1%	91	11.2%	2.2%
2004	3,957	3,611	91.3%	892	4,503	1,930	53.4%	223	2,153	47.8%	721	20.0%	223	944	21.0%	367	335	7.4%	346	681	15.1%	686	626	13.9%	100	11.2%	2.2%
2005	4,355	4,007	92.0%	977	4,984	2,113	52.7%	244	2,358	47.3%	790	19.7%	244	1,034	20.7%	400	368	7.4%	379	748	15.0%	800	736	14.8%	110	11.2%	2.2%
2006	4,798	4,389	91.5%	1,070	5,459	2,396	54.6%	268	2,664	48.8%	895	20.4%	268	1,163	21.3%	400	366	6.7%	416	782	14.3%	800	732	13.4%	119	11.1%	2.2%
2007	5,292	4,811	90.9%	1,172	5,983	2,708	56.3%	293	3,001	50.2%	1,012	21.0%	293	1,305	21.8%	400	364	6.1%	456	819	13.7%	800	727	12.2%	130	11.1%	2.2%
2008	5,843	5,278	90.3%	1,284	6,562	3,053	57.8%	321	3,374	51.4%	1,141	21.6%	321	1,462	22.3%	400	361	5.5%	500	861	13.1%	800	723	11.0%	142	11.1%	2.2%
2009	6,459	5,794	89.7%	1,406	7,200	3,434	59.3%	352	3,786	52.6%	1,283	22.1%	352	1,635	22.7%	400	359	5.0%	547	906	12.6%	800	718	10.0%	156	11.1%	2.2%
2010	7,146	6,365	89.1%	1,540	7,905	3,856	60.6%	385	4,241	53.6%	1,441	22.6%	385	1,826	23.1%	400	356	4.5%	600	956	12.1%	800	713	9.0%	170	11.0%	2.2%

0.095249 0.090508 0.096 0.166529

Exports

Unit: 1,000 tons

Year	North																											
	Total			Transit	Exp.+Trans	Anzali					Nowshahr					Amir Abad						Fereydunkener			Torkaman		
	Imp.+Exp.	Export	Ratio	Cargo	Total	Export	Ratio	Transit	Exp.+Trans.	Ratio	Export	Ratio	Transit	Exp.+Trans.	Ratio	Imp.+Exp.	Export	Ratio	Transit	Imp.+Trans.	Ratio	Imp.+Exp.	Export	Ratio	Transit	T. Ratio	Ratio
1988	1,359	3	0.2%		3	1	33.3%		1	33.3%	2	66.7%		2	66.7%												
1989	1,263	5	0.4%		5	2	40.0%		2	40.0%	3	60.0%		3	60.0%												
1990	1,928	4	0.2%		4	1	25.0%		1	25.0%	3	75.0%		3	75.0%												
1991	1,884	1	0.1%		1	1	100.0%		1	100.0%	0	0.0%		0	0.0%												
1992	1,669	21	1.3%		21	13	61.9%		13	61.9%	8	38.1%		8	38.1%												
1993	1,474	50	3.4%		50	42	84.0%		42	84.0%	8	16.0%		8	16.0%												
1994	1,605	59	3.7%		59	50	84.0%		50	84.0%	9	16.0%		9	16.0%												
1995	1,748	69	3.9%		69	58	84.0%		58	84.0%	11	16.0%		11	16.0%												
1996	1,907	82	4.3%		82	62	75.2%		62	75.2%	12	14.3%		12	14.3%								200	9	10.5%			
1997	2,082	96	4.6%		96	64	66.5%		64	66.5%	12	12.7%		12	12.7%	200	9	9.6%		9	9.6%	233	11	11.2%			
1998	2,275	113	5.0%		113	74	65.9%		74	65.9%	14	12.6%		14	12.6%	218	11	9.6%		11	9.6%	272	14	12.0%			
1999	2,488	132	5.3%		132	86	65.3%		86	65.3%	16	12.4%		16	12.4%	238	13	9.6%		13	9.6%	317	17	12.8%			
2000	2,724	155	5.7%	470	625	100	64.6%	118	218	34.8%	19	12.3%	118	137	21.9%	259	15	2.4%	160	175	28.0%	370	21	3.4%	75	16.0%	12.0%
2001	2,986	182	6.1%	515	697	116	63.9%	128	245	35.1%	22	12.2%	129	151	21.7%	283	17	2.5%	175	193	27.6%	432	26	3.8%	83	16.0%	11.9%
2002	3,277	215	6.6%	565	780	136	63.2%	141	277	35.5%	26	12.0%	141	167	21.4%	308	20	2.6%	192	212	27.2%	504	33	4.2%	91	16.1%	11.6%
2003	3,599	252	7.0%	619	871	157	62.4%	155	312	35.8%	30	11.9%	155	185	21.2%	336	24	2.7%	211	234	26.9%	588	41	4.7%	99	16.0%	11.4%
2004	3,957	346	8.7%	679	1,025	213	61.7%	169	383	37.3%	41	11.7%	170	210	20.5%	367	32	3.1%	231	263	25.6%	686	60	5.8%	109	16.1%	10.6%
2005	4,355	348	8.0%	745	1,093	212	60.9%	187	398	36.5%	40	11.6%	186	227	20.7%	400	32	2.9%	253	285	26.1%	800	64	5.9%	119	16.0%	10.9%
2006	4,798	409	8.5%	817	1,226	258	63.0%	204	462	37.7%	49	12.0%	204	253	20.7%	400	34	2.8%	277	311	25.4%	800	68	5.6%	131	16.0%	10.7%
2007	5,292	481	9.1%	895	1,376	312	65.0%	223	536	38.9%	60	12.4%	224	283	20.6%	400	36	2.6%	304	340	24.7%	800	73	5.3%	144	16.1%	10.5%
2008	5,843	565	9.7%	982	1,547	377	66.7%	245	622	40.2%	72	12.7%	245	317	20.5%	400	39	2.5%	333	372	24.0%	800	77	5.0%	158	16.1%	10.2%
2009	6,459	665	10.3%	1,076	1,741	455	68.4%	269	724	41.6%	87	13.0%	269	356	20.4%	400	41	2.4%	365	406	23.3%	800	82	4.7%	173	16.1%	9.9%
2010	7,146	781	10.9%	1,180	1,961	546	69.9%	295	841	42.9%	104	13.3%	295	399	20.3%	400	44	2.2%	400	444	22.6%	800	87	4.5%	190	16.1%	9.7%

0.096424 0.096

Table 3.5.7.2 Import/Export Forecast Cargo Volume at Each Study Port of South (Persian) Ports

Imports

Unit: 1,000 tons

Year	South Ports																											
	Total			Transit	Imp.+Trans	Imam					Rajaee					Bahonar		Bushehr		Beheshti					Khorramshahr			Abadan		
	Imp.+Exp	Import	Ratio	Cargo	Total	Import	Ratio	Transit	Imp.+Trans	Ratio	Import	Ratio	Transit	Imp.+Trans	Ratio	Import	Ratio	Import	Ratio	Import	Ratio	Transit	Imp.+Trans	Ratio	Imp.+Exp	Import	Ratio	Imp.+Exp	Import	Ratio
1988	12,319	11,073	89.9%		11,073	1,688	15.2%		1,688	15.2%	4,262	38.5%		4,262	38.5%	2,343	21.2%	2,149	19.4%	631	5.7%		631	5.7%						
1989	16,341	15,019	91.9%		15,019	5,161	34.4%		5,161	34.4%	5,418	36.1%		5,418	36.1%	1,813	12.1%	1,729	11.5%	898	6.0%		898	6.0%						
1990	18,718	17,379	92.8%		17,379	5,866	33.8%		5,866	33.8%	6,389	36.8%		6,389	36.8%	2,134	12.3%	1,966	11.3%	1,024	5.9%		1,024	5.9%						
1991	21,755	19,377	89.1%		19,377	7,930	40.9%		7,930	40.9%	5,462	28.2%		5,462	28.2%	3,172	16.4%	1,796	9.3%	1,017	5.2%		1,017	5.2%						
1992	23,161	20,100	86.8%		20,100	7,368	36.7%		7,368	36.7%	6,616	32.9%		6,616	32.9%	3,082	15.3%	1,774	8.8%	1,260	6.3%		1,260	6.3%						
1993	25,673	21,227	82.7%		21,227	7,259	34.2%		7,259	34.2%	8,410	39.6%		8,410	39.6%	3,330	15.7%	1,412	6.7%	816	3.8%		816	3.8%						
1994	27,344	22,414	82.0%		22,414	7,685	34.3%		7,685	34.3%	8,812	39.3%		8,812	39.3%	3,361	15.0%	1,464	6.5%	858	3.8%		858	3.8%	200	157	0.7%	100	78	0.3%
1995	29,006	23,566	81.2%		23,566	8,135	34.5%		8,135	34.5%	9,234	39.2%		9,234	39.2%	3,392	14.4%	1,517	6.4%	902	3.8%		902	3.8%	400	309	1.3%	100	77	0.3%
1996	30,786	24,782	80.5%		24,782	8,612	34.8%		8,612	34.8%	9,676	39.0%		9,676	39.0%	3,424	13.8%	1,573	6.3%	948	3.8%		948	3.8%	600	458	1.8%	120	92	0.4%
1997	32,683	26,055	79.7%		26,055	9,117	35.0%		9,117	35.0%	10,139	38.9%		10,139	38.9%	3,455	13.3%	1,630	6.3%	997	3.8%		997	3.8%	800	604	2.3%	150	113	0.4%
1998	34,716	27,396	78.9%		27,396	9,652	35.2%		9,652	35.2%	10,624	38.8%		10,624	38.8%	3,487	12.7%	1,690	6.2%	1,048	3.8%		1,048	3.8%	1000	746	2.7%	200	149	0.5%
1999	36,623	28,609	78.1%		28,609	10,218	35.7%		10,218	35.7%	11,133	38.9%		11,133	38.9%	3,520	12.3%	1,751	6.1%	1,101	3.8%		1,101	3.8%	1000	739	2.6%	200	148	0.5%
2000	38,667	29,886	77.3%	470	30,356	10,817	36.2%	235	11,052	36.4%	11,666	39.0%	235	11,901	39.2%	3,552	11.7%	1,815	6.0%	1,158	3.8%		1,158	3.8%	1000	732	2.4%	200	146	0.5%
2001	40,858	31,229	76.4%	515	31,744	11,451	36.7%	258	11,709	36.9%	12,224	39.1%	258	12,482	39.3%	3,585	11.3%	1,882	5.9%	1,217	3.8%		1,217	3.8%	1000	725	2.3%	200	145	0.5%
2002	43,210	32,643	75.5%	565	33,208	12,122	37.1%	283	12,405	37.4%	12,809	39.2%	283	13,091	39.4%	3,619	10.9%	1,950	5.9%	1,279	3.9%		1,279	3.9%	1000	719	2.2%	200	144	0.4%
2003	45,737	34,128	74.6%	619	34,748	12,833	37.6%	310	13,143	37.8%	13,422	39.3%	310	13,732	39.5%	3,652	10.5%	2,022	5.8%	1,345	3.9%		1,345	3.9%	1000	712	2.0%	200	142	0.4%
2004	48,455	35,693	73.7%	679	36,372	13,586	38.1%	340	13,925	38.3%	14,064	39.4%	340	14,404	39.6%	3,686	10.1%	2,096	5.8%	1,414	3.9%		1,414	3.9%	1000	707	1.9%	200	141	0.4%
2005	51,383	37,340	72.7%	745	38,084	14,382	38.5%	347	14,729	38.7%	14,737	39.5%	347	15,085	39.6%	3,720	9.8%	2,172	5.7%	1,486	3.9%	50	1,536	4.0%	1000	701	1.8%	200	140	0.4%
2006	54,539	39,071	71.6%	817	39,887	15,225	39.0%	378	15,604	39.1%	15,443	39.5%	378	15,821	39.7%	3,755	9.4%	2,251	5.6%	1,563	3.9%	60	1,623	4.1%	1000	695	1.7%	200	139	0.3%
2007	57,947	40,894	70.6%	895	41,789	16,118	39.4%	413	16,531	39.6%	16,182	39.6%	413	16,594	39.7%	3,790	9.1%	2,334	5.6%	1,643	3.9%	70	1,713	4.1%	1000	690	1.7%	200	138	0.3%
2008	61,630	42,811	69.5%	982	43,793	17,063	39.9%	451	17,514	40.0%	16,956	39.6%	451	17,407	39.7%	3,825	8.7%	2,419	5.5%	1,727	3.9%	80	1,807	4.1%	1000	684	1.6%	200	137	0.3%
2009	65,616	44,828	68.3%	1,076	45,904	18,064	40.3%	493	18,557	40.4%	17,767	39.6%	493	18,260	39.8%	3,861	8.4%	2,507	5.5%	1,815	4.0%	90	1,905	4.2%	1000	678	1.5%	200	136	0.3%
2010	69,937	46,950	67.1%	1,180	48,130	19,123	40.7%	540	19,663	40.9%	18,618	39.7%	540	19,158	39.8%	3,896	8.1%	2,599	5.4%	1,908	4.0%	100	2,008	4.2%	1000	671	1.4%	200	134	0.3%
						0.05863					0.04786					0.00928		0.03654		0.05124										
		67.1%		0.096424		1342.64		0.08676			335.659					1342.64		469.923		134.264										

Exports

Unit: 1,000 tons

Year	South Ports																											
	Total			Transit	Exp.+Trans	Imam					Rajaee					Bahonar		Bushehr		Beheshti					Khorramshahr			Abadan		
	Imp.+Exp	Export	Ratio	Cargo	Total	Export	Ratio	Transit	Exp.+Trans	Ratio	Export	Ratio	Transit	Exp.+Trans	Ratio	Export	Ratio	Export	Ratio	Export	Ratio	Transit	Exp.+Trans	Ratio	Imp.+Exp	Export	Ratio	Imp.+Exp	Export	Ratio
1988	12,319	1,246	10.1%		1,246	127	10.2%		127	10.2%	464	37.2%		464	37.2%	607	48.7%	47	3.8%	1	0.1%		1	0.1%						
1989	16,341	1,322	8.1%		1,322	470	35.6%		470	35.6%	416	31.5%		416	31.5%	364	27.5%	70	5.3%	2	0.2%		2	0.2%						
1990	18,718	1,339	7.2%		1,339	427	31.9%		427	31.9%	299	22.3%		299	22.3%	484	36.1%	128	9.6%	1	0.1%		1	0.1%						
1991	21,755	2,378	10.9%		2,378	1,052	44.2%		1,052	44.2%	487	20.5%		487	20.5%	614	25.8%	221	9.3%	4	0.2%		4	0.2%						
1992	23,161	3,061	13.2%		3,061	1,556	50.8%		1,556	50.8%	665	21.7%		665	21.7%	645	21.1%	193	6.3%	2	0.1%		2	0.1%						
1993	25,673	4,446	17.3%		4,446	2,787	62.7%		2,787	62.7%	931	20.9%		931	20.9%	553	12.4%	174	3.9%	2	0.0%		2	0.0%						
1994	27,344	4,930	18.0%		4,930	3,018	61.2%		3,018	61.2%	1,066	21.6%		1,066	21.6%	590	12.0%	188	3.8%	2	0.1%		2	0.1%	200	43	0.9%	100	22	0.4%
1995	29,006	5,440	18.8%		5,440	3,269	60.1%		3,269	60.1%	1,222	22.5%		1,222	22.5%	629	11.6%	203	3.7%	3	0.1%		3	0.1%	400	91	1.7%	100	23	0.4%
1996	30,786	6,004	19.5%		6,004	3,541	59.0%		3,541	59.0%	1,399	23.3%		1,399	23.3%	671	11.2%	220	3.7%	4	0.1%		4	0.1%	600	142	2.4%	120	28	0.5%
1997	32,683	6,628	20.3%		6,628	3,835	57.9%		3,835	57.9%	1,603	24.2%		1,603	24.2%	715	10.8%	238	3.6%	5	0.1%		5	0.1%	800	196	3.0%	150	37	0.6%
1998	34,716	7,320	21.1%		7,320	4,153	56.7%		4,153	56.7%	1,837	25.1%		1,837	25.1%	763	10.4%	257	3.5%	6	0.1%		6	0.1%	1000	254	3.5%	200	51	0.7%
1999	36,623	8,014	21.9%		8,014	4,498	56.1%		4,498	56.1%	2,104	26.3%		2,104	26.3%	813	10.2%	278	3.5%	7	0.1%		7	0.1%	1000	261	3.3%	200	52	0.6%
2000	38,667	8,781	22.7%	620	9,401	4,872	55.5%	310	5,182	55.1%	2,411	27.5%	310	2,721	28.9%	868	9.2%	300	3.2%	9	0.1%		9	0.1%	1000	268	2.9%	200	54	0.6%
2001	40,858	9,629	23.6%	679	10,308	5,276	54.8%	340	5,616	54.5%	2,762	28.7%	340	3,102	30.1%	925	9.0%	324	3.1%	11	0.1%		11	0.1%	1000	275	2.7%	200	55	0.5%
2002	43,210	10,567	24.5%	744	11,311	5,714	54.1%	372	6,086	53.8%	3,165	29.9%	372	3,537	31.3%	987	8.7%	351	3.1%	14	0.1%		14	0.1%	1000	281	2.5%	200	56	0.5%
2003	45,737	11,609	25.4%	815	12,423	6,189	53.3%	407	6,596	53.1%	3,626	31.2%	407	4,033	32.5%	1,052	8.5%	379	3.1%	17	0.1%		17	0.1%	1000	288	2.3%	200	58	0.5%
2004	48,455	12,762	26.3%	892	13,654	6,703	52.5%	446	7,149	52.4%	4,154	32.5%	446	4,600	33.7%	1,122	8.2%	410	3.0%	21	0.2%		21	0.2%	1000	293	2.1%	200	59	0.4%
2005	51,383	14,043	27.3%	977	15,021	7,260	51.7%	439	7,698	51.3%	4,759	33.9%	439	5,197	34.6%	1,197	8.0%	443	2.9%	26	0.2%	100	126	0.8%	1000	299	2.0%	200	60	0.4%
2006	54,539	15,468	28.4%	1,070	16,538	7,863	50.8%	480	8,343	50.4%	5,452	35.2%	480	5,932	35.9%	1,277	7.7%	479	2.9%	32	0.2%	110	142	0.9%	1000	305	1.8%	200	61	0.4%
2007	57,947	17,053	29.4%	1,172	18,225	8,516	49.9%	526	9,042	49.6%	6,246	36.6%	526	6,772	37.2%	1,361	7.5%	518	2.8%	40	0.2%	120	160	0.9%	1000	310	1.7%	200	62	0.3%
2008	61,630	18,819	30.5%	1,284	20,103	9,223	49.0%	577	9,800	48.7%	7,156	38.0%	577	7,733	38.5%	1,452	7.2%	559	2.8%	49	0.2%	130	179	0.9%	1000	316	1.6%	200	63	0.3%
2009	65,616	20,788	31.7%	1,406	22,194	9,989	48.1%	633	10,622	47.9%	8,199	39.4%	633	8,832	39.8%	1,549	7.0%	605	2.7%	61	0.3%	140	201	0.9%	1000	322	1.5%	200	64	0.3%
2010	69,937	22,987	32.9%	1,540	24,527	10,818	47.1%	695	11,513	46.9%	9,393	40.9%	695	10,088	41.1%	1,651	6.7%	654	2.7%	76	0.3%	150	226	0.9%	1000	329	1.3%	200	66	0.3%
						0.08305					0.14567					0.0665		0.081		0.23849										
		32.9%				657.363					164.341					657.363		230.077		65.7363										

Table 3.5.7.3 Import/Export Forecast Commodity-wise Cargo Volume at Each Study Ports

Import Cargo of North Ports

Unit: 1,000 tons

	Anzali				Nowshahr				Amir Abad				Fereydunkener					
	2000/01		2010/11		2000/01		2010/11		2000/01		2010/11		2000/01		2010/11		2000/01	2010/11
Dry Bulk	222	15.4%	444	11.5%	56	10.4%	136	9.4%	25	10.4%	33	9.4%	36	10.4%	67	9.4%	339	680
Liquid Bulk	798	55.5%	1,518	39.4%	297	55.3%	686	47.6%	135	55.3%	169	47.6%	193	55.3%	339	47.6%	1,423	2,712
Bag Cargo	44	3.0%	111	2.9%	97	18.1%	299	20.7%	44	18.1%	74	20.7%	63	18.1%	148	20.7%	248	631
Container	84	5.8%	1,120	29.1%	7	1.3%	117	8.1%	3	1.3%	29	8.1%	5	1.3%	58	8.1%	99	1,324
Refrigerated	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0
Steel	212	14.7%	549	14.3%	46	8.5%	144	10.0%	21	8.5%	36	10.0%	30	8.5%	71	10.0%	308	800
Mineral	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0
General Cargo	79	5.5%	113	2.9%	35	6.4%	60	4.2%	16	6.4%	15	4.2%	22	6.4%	30	4.2%	152	218
Total	1,438		3,856		537		1,441		245		356		349		713		2,569	6,366

Import Cargo of South Ports

Unit: 1,000 tons

	Imam				Rajaee				Bahonar				Bushehr				Beheshti				Khorramshahr				Abadan					
	2000/01		2010/11		2000/01		2010/11		2000/01		2010/11		2000/01		2010/11		2000/01		2010/11		2000/01		2010/11		2000/01		2010/11		2000/01	2010/11
Dry Bulk	3,531	32.6%	4,342	22.7%	2,212	19.0%	2,567	13.8%	0	0.0%	0	0.0%	132	7.3%	164	6.3%	407	35.1%	591	30.9%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	6,282	7,663
Liquid Bulk	47	0.4%	55	0.3%	4,547	39.0%	4,984	26.8%	1,517	42.7%	1,402	36.0%	686	37.8%	801	30.8%	382	33.0%	523	27.4%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	7,179	7,765
Bag Cargo	1,501	13.9%	1,780	9.3%	907	7.8%	1,016	5.5%	210	5.9%	199	5.1%	144	8.0%	172	6.6%	157	13.5%	219	11.5%	22	3.0%	10	1.4%	6	4.3%	4	3.0%	2,948	3,399
Container	793	7.3%	4,786	25.0%	917	7.9%	5,226	28.1%	0	0.0%	0	0.0%	6	0.3%	35	1.3%	30	2.6%	214	11.2%	130	17.8%	293	43.6%	0	0.0%	0	0.0%	1,876	10,554
Refrigerated	219	2.0%	410	2.1%	49	0.4%	87	0.5%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	268	497
Steel	2,986	27.6%	4,810	25.2%	784	6.7%	1,192	6.4%	15	0.4%	19	0.5%	291	16.1%	472	18.2%	71	6.1%	135	7.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	4,148	6,628
Mineral	99	0.9%	133	0.7%	260	2.2%	330	1.8%	649	18.3%	695	17.8%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1,008	1,158
General Cargo	1,640	15.2%	2,807	14.7%	1,991	17.1%	3,217	17.3%	1,161	32.7%	1,582	40.6%	555	30.6%	956	36.8%	112	9.7%	226	11.9%	580	79.2%	369	55.0%	140	95.7%	130	97.0%	6,178	9,287
Total	10,816		19,122		11,667		18,620		3,553		3,897		1,815		2,599		1,158		1,908		732		671		146		134		29,887	46,951

Export Cargo of North Ports

Unit: 1,000 tons

	Anzali				Nowshahr				Amir Abad				Fereydunkener					
	2000/01		2010/11		2000/01		2010/11		2000/01		2010/11		2000/01		2010/11		2000/01	2010/11
Dry Bulk	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0
Liquid Bulk	4	4.1%	11	2.1%	1	4.7%	3	2.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	5	14
Bag Cargo	5	5.0%	20	3.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	5	20
Container	2	1.9%	39	7.2%	0	0.7%	3	2.9%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	42
Refrigerated	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0
Steel	6	6.0%	26	4.8%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	6	26
Mineral	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0
General Cargo	83	83.1%	449	82.3%	18	94.6%	99	100.0%	15	100.0%	44	100.0%	21	100.0%	87	100.0%	137	679
Total	100		546		19		104		15		44		21		87		155	781

Export Cargo of South Ports

Unit: 1,000 tons

	Imam				Rajaee				Bahonar				Bushehr				Beheshti				Khorramshahr				Abadan					
	2000/01		2010/11		2000/01		2010/11		2000/01		2010/11		2000/01		2010/11		2000/01		2010/11		2000/01		2010/11		2000/01		2010/11		2000/01	2010/11
Dry Bulk	179	3.7%	163	1.5%	266	11.0%	470	5.0%	16	1.9%	20	1.2%	61	20.4%	88	13.5%	0	0.0%	0	0.0%	79	29.5%	103	31.4%	0	0.0%	0	0.0%	602	845
Liquid Bulk	126	2.6%	142	1.3%	275	11.4%	601	6.4%	84	9.6%	125	7.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	485	868
Bag Cargo	1,874	38.5%	3,625	33.5%	294	12.2%	1,105	11.8%	3	0.3%	8	0.5%	5	1.7%	15	2.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2,176	4,753
Container	121	2.5%	3,381	31.3%	58	2.4%	3,160	33.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	179	6,541
Refrigerated	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0
Steel	1,448	29.7%	1,840	17.0%	723	30.0%	1,783	19.0%	46	5.4%	79	4.8%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2,217	3,702
Mineral	0	0.0%	0	0.0%	42	1.7%	102	1.1%	3	0.4%	5	0.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	45	107
General Cargo	1,122	23.0%	1,666	15.4%	753	31.2%	2,172	23.1%	715	82.4%	1,414	85.7%	234	78.0%	550	84.2%	9	100.0%	76	100.0%	189	70.5%	226	68.6%	54	100.0%	66	100.0%	3,076	6,171
Total	4,871		10,818		2,411		9,393		867		1,651		300		654		9		76		268		329		54		66		8,780	22,987

Table 3.5.7.4 Total Forecast Commodity-wise Volume at Each Study Ports

Import & Export Cargo of North Ports

Unit: 1,000 tons

	Anzali				Nowshahr				Amir Abad				Fereydunkener				Total	
	2000/01		2010/11		2000/01		2010/11		2000/01		2010/11		2000/01		2010/11		2000/01	2010/11
Dry Bulk	222	14.4%	444	10.1%	56	10.0%	136	8.8%	25	9.8%	33	8.4%	36	9.8%	67	8.4%	339	680
Liquid Bulk	802	52.1%	1,530	34.7%	298	53.5%	688	44.5%	135	52.1%	169	42.3%	193	52.1%	339	42.4%	1,428	2,726
Bag Cargo	49	3.2%	131	3.0%	97	17.5%	299	19.3%	44	17.0%	74	18.5%	63	17.0%	148	18.5%	253	651
Container	86	5.6%	1,159	26.3%	7	1.3%	120	7.8%	3	1.3%	29	7.2%	5	1.3%	58	7.2%	101	1,366
Refrigerated	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0
Steel	218	14.2%	575	13.1%	46	8.2%	144	9.3%	21	8.0%	36	8.9%	30	8.0%	71	8.9%	314	826
Mineral	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0
General Cargo	162	10.6%	563	12.8%	53	9.5%	159	10.3%	31	11.8%	59	14.7%	43	11.8%	117	14.6%	289	897
Total	1,538		4,402		556		1,545		260		400		370		800		2,724	7,147

Import & Export Cargo of South Ports

Unit: 1,000 tons

	Imam				Rajaee				Bahonar				Bushehr				Beheshti				Khorramshahr				Abadan				Total	
	2000/01		2010/11		2000/01		2010/11		2000/01		2010/11		2000/01		2010/11		2000/01		2010/11		2000/01		2010/11		2000/01		2010/11		2000/01	2010/11
Dry Bulk	3,711	23.7%	4,505	15.0%	2,478	17.6%	3,037	10.8%	16	0.4%	20	0.4%	194	9.2%	252	7.7%	407	34.9%	591	29.8%	79	7.9%	103	10.3%	0	0.0%	0	0.0%	6,884	8,508
Liquid Bulk	174	1.1%	197	0.7%	4,822	34.3%	5,585	19.9%	1,601	36.2%	1,527	27.5%	686	32.4%	801	24.6%	382	32.7%	523	26.4%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	7,664	8,633
Bag Cargo	3,375	21.5%	5,405	18.1%	1,202	8.5%	2,121	7.6%	213	4.8%	206	3.7%	149	7.1%	187	5.8%	157	13.4%	219	11.1%	22	2.2%	10	1.0%	6	3.2%	4	2.0%	5,124	8,152
Container	914	5.8%	8,167	27.3%	975	6.9%	8,386	29.9%	0	0.0%	0	0.0%	6	0.3%	35	1.1%	30	2.6%	214	10.8%	130	13.0%	293	29.3%	0	0.0%	0	0.0%	2,055	17,095
Refrigerated	219	1.4%	410	1.4%	49	0.4%	87	0.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	268	497
Steel	4,434	28.3%	6,650	22.2%	1,507	10.7%	2,975	10.6%	61	1.4%	98	1.8%	291	13.8%	472	14.5%	71	6.1%	135	6.8%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	6,365	10,330
Mineral	99	0.6%	133	0.4%	302	2.1%	432	1.5%	653	14.8%	701	12.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1,053	1,265
General Cargo	2,762	17.6%	4,473	14.9%	2,744	19.5%	5,389	19.2%	1,876	42.4%	2,996	54.0%	789	37.3%	1,506	46.3%	121	10.4%	302	15.2%	769	76.9%	595	59.5%	194	96.8%	196	98.0%	9,254	15,458
Total	15,686		29,940		14,078		28,013		4,420		5,548		2,115		3,253		1,167		1,984		1,000		1,000		200		200		38,667	69,938

	Anzali Port						Imam Khomeini					
	1993/94		2000/01		2010/11		1993/94		2000/01		2010/11	
Dry Bulk	0	0.0%	222	14.4%	444	10.1%	2,071	20.6%	3,711	23.7%	4,505	15.0%
Liquid Bulk	577	53.5%	802	52.1%	1,530	34.7%	69	0.7%	174	1.1%	197	0.7%
Bag Cargo	41	3.8%	49	3.2%	131	3.0%	2,661	26.5%	3,375	21.5%	5,405	18.1%
Container	46	4.3%	86	5.6%	1,159	26.3%	38	0.4%	914	5.8%	8,167	27.3%
Refrigerated	0	0.0%	0	0.0%	0	0.0%	66	0.7%	219	1.4%	410	1.4%
Steel	266	24.7%	218	14.2%	575	13.1%	3,679	36.6%	4,434	28.3%	6,650	22.2%
Mineral	0	0.0%	0	0.0%	0	0.0%	0	0.0%	99	0.6%	133	0.4%
General Cargo	148	13.7%	162	10.6%	563	12.8%	1,463	14.6%	2,762	17.6%	4,473	14.9%
Total	1,078		1,538		4,402		10,047		15,686		29,940	

(3) Check by cost analysis

We check the distributed cargo volume share by lough cost analysis among the Persian Gulf Port.

1) Hinterland

Considering the transport network and distribution of industries, we set the hinterlands by each port.

Ports and their hinterland are shown in Table 3.5.7.5 and Figure 3.5.7.1.

Table 3.5.7.5 Ports and their Hinterlands

Hinterland (Province)	Core City	Port
Tehran, Zanjan, Semnan, Gilan Mazandaran, East Azarbayejan West Azarbayejan	Tehran	Khomeini port Rajaee port
Esfahan	Esfahan	Khomeini port Rajaee port
Khuzestan, Kohgiluye & Boyer-Ahmad, Chaharmahal & Bakhtiyari	Ahvaz	Khomeini port Rajaee port Bushehr port
Markazi, Bakhtaran, Kordestan Hamadan, Lorestan, Ilam	Arak	Khomeini port Rajaee port
Fars, Bushehr	Shiraz	Khomeini port Rajaee port Bushehr port
Yazd	Yazd	Khomeini port Rajaee port Bushehr port
Kerman, Sistan & Baluche tan Hormozgan	Kerman	Rajaee port Bushehr port Behesti port
Khorasan	Mashhad	Khomeini port Rajaee port Behesti port
Tehran	Tehran	Anzali port

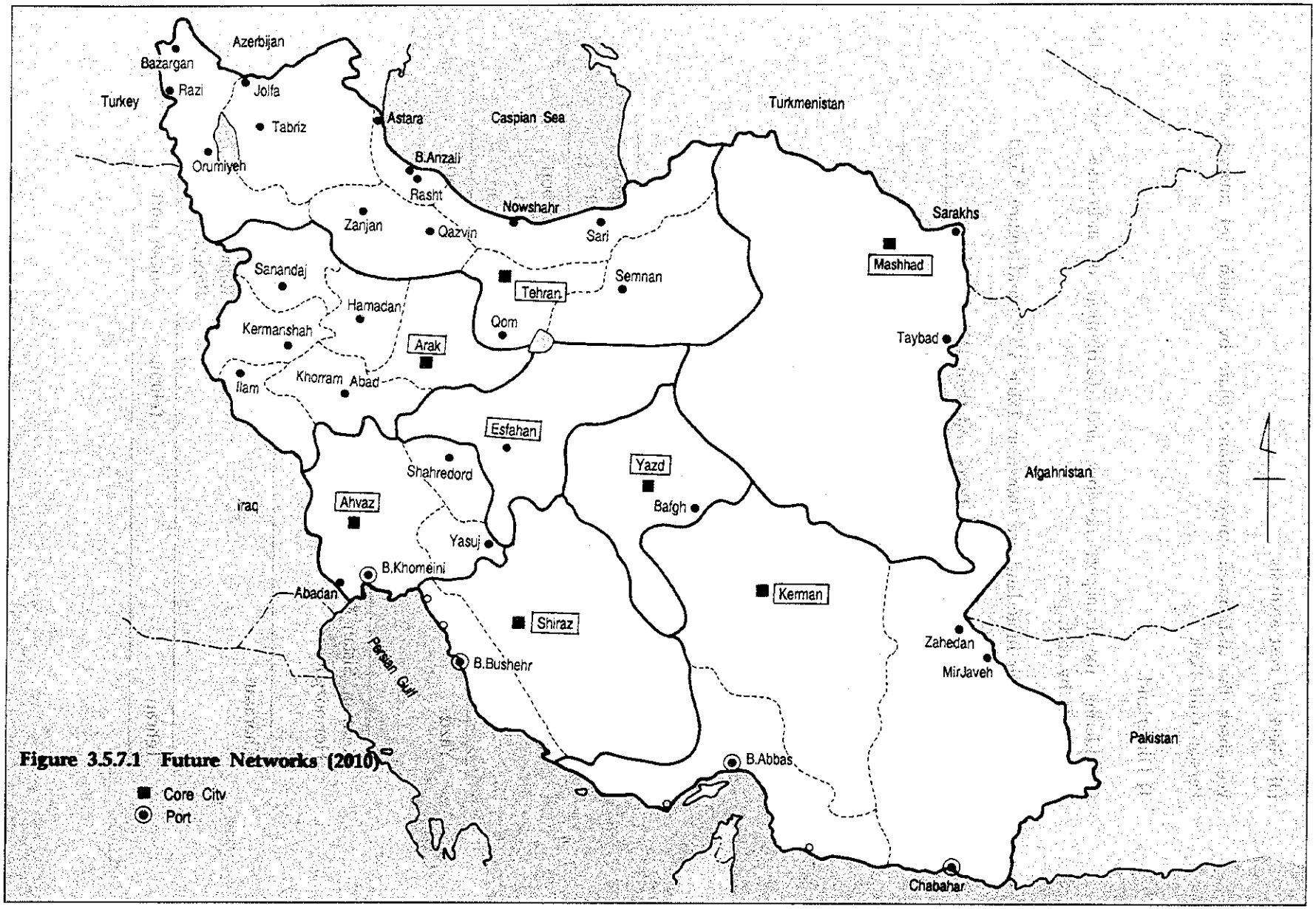

Figure 3.5.7.1 Future Networks (2010)

2) The share of four ports at the Persian Gulf

Vessels calling to the Persian Gulf ports come from all over the world. Main sea routes are though the Suez Channel for vessels from Europe and America and through the Indian Sea via Singapore for vessels from Asia.

Imam Khomeini port is located in the bottom of the Persian Gulf, has disadvantages in terms of ship cost and transport time, however, Imam Khomeini port is near to Teheran comparing with other major ports along the Persian Gulf coast. The two gateway ports, Imam Khomeini and Abbas, will compete with one another once the railway is completed at Abbas port. The share is estimated by cost analysis.
For the hinterland of each port in the Persian Gulf, the surrounding land is separated into eight areas considering transportation infrastructure, road and railway.

The area of consumption and production in Iran is closely related to the population distribution. The volume of cargo that flows to/from ports is related to the regional population.

Considering actual port activities, Imam Khomeini port should be the center of foreign trade. Future cargo share of each port in the Persian Gulf is forecasted based on micro forecast and checked by transportation cost analysis as shown in Table 3.1.1.1.

Table 3.5.7.6 Share of Cargo Volume among Four Ports (2010/11)

Port	1993	2010 By Micro Forecast	Case 1 By Cost Analysis	Case 2 By Cost Analysis	Case 3 By Cost Analysis
Khomeini	53%	50%	45%	48%	61%
Abbas	41%	44%	45%	42%	30%
Bushehr	3%	4%	4%	4%	4%
Chabahar	3%	2%	6%	6%	6%

Note: Import/Export cargo volume is equal to 100% with four ports at The Persian gulf ports in Iran. In this report, share is set by the "Micro Forecast".
Case 1; Cost is $5.0 per ton between Abbas and Imam Khomeini with sea lane.
Case 2; Cost is $2.5 per ton between Abbas and Imam Khomeini with sea lane.
Case 3; Cost is $5.0, railway will not connect from Abbas to existing railway.

3.6 Functional Allotment Among Major Iranian Ports

In this section, the functional allotment among major Iranian Ports is proposed as follows.

3.6.1 Commodity Wise Movement of Sea Born Cargo

Imam Khomeini port and Abbas port are the two major ports in Iran and each is expected to handle more than ten million tons of foreign trade cargo. In particular, Imam Khomeini and Abbas port will handle many commodities in Iran because of its advantageous location near the high population density area. Raw materials, aluminum powder, rice, wheat, general cargo and so on will also be handled at these ports.

These two ports are the main ports in Iran while Bushehr, Abadan, Khoramshahr and Chabahar port are sub ports of which roles are to serve mainly their respective districts.

Anzali port is the main port in the Caspian Sea and Now shahr, Amir Abad and Fereydunkenar will be sub ports.

Other ports will have relatively minor though nonetheless important roles.

(1) Bulk cargo

Since the maximum available depth of entrance channel at Imam Khomeini port is only 12.2 m, which cannot accept recent grain ship, the ships larger than Panamax type normally light their draft at Abbas port.
The liquid bulk, chemical product, oil product also are handled at Abbas port, Bushehr port and Chabahar port. But the facilities are inadequate and will need to be improved as soon as possible.

Raw material cargo, including iron ore, aluminum powder and so on are handled at Imam Khomeini port. Iron ore will come from the steel company jetty near Bandar Abbas.

Grain is handled at Bushehr, Chabahar port to the inland silos for the district and this role will be retained in future but the quantity is not very large.

Grain and liquid bulk cargo are handled at Anzali, Now Shar port. The cargo volume will increase in the future from CIS countries and so on.

Amir Abad port is under construction, however, it is near the CIS countries and the railway sidings. Bulky cargo from Central Asia will increase.

(2) Heavy cargo

Heavy cargo such as materials for the project needs to be handled at the two major ports, as well as at Chabahar and Anzali port, which countries handle heavy cargo. The capacity of equipment for heavy cargo handling at their ports, however, needs to be improved, accordingly. Bushehr port handles the material for the oil project and Chabahar port handle the material for the development projects on going in the hinterland.

(3) Ro-Ro cargo

Ro-Ro ships will increase both in the Caspian Sea and the Persian Gulf. In the Caspian Sea there is a ferry line between Baku and Krasnovotuk; ferry ships are useful for ports which do not have sufficient port facilities. Since CIS countries want to transport cargo to/from Europe through the Caspian Sea by road and rail. It is recommended in this case that containerization be introduced extensively, since the container is suitable style of transportation for transhipment operation in particular.

The port facility for the Ro-Ro ship needs to be prepared by Imam Khomeini port and Anzali port.

In the Persian Gulf, trade between the Arab coastal countries and Iran will increase with variety of ship types including Ro-Ro ship, lighter, rush ship.

(4) Transit and transhipment Cargo

Cargo to/from the CIS countries going through Iran by rail and truck will use Anzali port , Amir Abad port, Nowshahr port (the Caspian Sea side) Imam Khomeini port and Abbas port (the Persian Gulf side).

The transit cargo volume cannot be estimated precisely because of the limited data; however, the port facility shall be prepared for handling a cargo volume of about two million tons.

The cargo to/from Kish Island and Qeshm Island will be handled by near port for a while because of shortage of port facility in their Islands Lengeh port should respond this requirement.

(5) Container cargo

Imam Khomeini and Abbas port will handle mainly container cargo with target volume in 2010/11 is 18.3 million tons. Considering the prevailing cargo style at the Caspian Sea, container cargo will increase. Anzali port will handle the container cargo regularly. Bushehr and Chabahar port will handle the container as the sub port and for the district.

3.6.2 Industry and Commerce

Traffic demand for industrial and commercial oriented cargo will be increased in each major port. From the view point of regional development, the port should support the manufacturing activity more than now, through timely provision of convenient space for local industrial or commercial enterprises with various related port services.

Imam Khomeini and Abbas port will prepare the land for that purpose and the facilities shall be improve to support for nation of new industrial/commercial complex.

3.6.3 Storage

The port is required to prepare storage facilities in its area for the transhipment cargo, container cargo, general cargo, bulk cargo, liquid bulk cargo, heavy cargo, frozen cargo, bagged cargo. The current shortage of warehouses seems to hamper the Iranian transport system. It often happens that shippers don't act in moving their cargo from the port area, therefore the shed becomes filled soon to capacity.

3.6.4 Others

(1) Passengers and domestic cargo

Passenger ships will call at Abbas, Bushehr and Imam Khomeini port in the Persian Gulf.
Passenger ship will call Anzali and Now Shahr port in the Caspian Sea.

Abadan and Khoram Shar port will be reconstructed and handle the cargo, passengers between Kuwait and so on.

Domestic cargo will increase for the reason that the port network will be constructed sufficiently and the cargo will be loaded and unloaded at main port, the cargo will be transported to other ports by coastal ship, in particular at Genaveh and Lengeh port.

(2) Fishery

Requirements of total capacity of fishery port function will increase at all PSO ports. Fereydunkenar and Amir Abad port (the Caspion Sea), Jask and Deylam port (the Persian Gulf) should response for the requirement in 2010/2011.

(3) Refuge

Requirements of total capacity of refuge port function will increase.
Anzali, Now Shahr Fereydunkenar and Amir Abad (the Caspian Sea), Chabahar port (the Persian Gulf) should response for the requirement.

3.6.5 Results

Based on the above, the functions of major ports in 2010/11 are summarized as follows.

Table 3.6.1 Functions of Major Ports

Ports / Function	Imam Khomeini	Abbas	Bushehr	Chabahar	Anzali	Now Shahr
Foreign Trade	AA	AA	A	A	A	B
Domestic Trade	A	A	A	C	B	C
Commercial	AA	AA	A	A	A	B
Industrial	AA	AA	B	B	B	B
Container Cargo	AA	AA	A	B	A	B
Bulk Cargo	A	A	B	A	B	C
Heavy Cargo	A	A	B	B	A	B
Ro-Ro Cargo	A	A	-	-	A	-
Transhipment Cargo	A	AA	-	-	A	-
Liquid Cargo	C	AA	AA	A	A	B
Fishery	C	A	A	A	A	C
Passenger	B	A	A	-	A	A
Refuge	-	-	-	B	A	A

Allotment Degree
- AA: High
- A: Medium High
- B: Medium Low
- C: Minimal
- -: Not Handled

Function

Foreign Trade
- 'AA'- total foreign cargo volume is more than 10 million tons
- 'A'- total foreign cargo volume is more than 2 million tons
- 'C'- total foreign cargo volume is less than 1 million tons

Domestic trade
- 'A'- domestic cargo volume is more than 1 million tons
- 'C'- domestic cargo volume is more than 100,000 tons

Commercial	'AA'- cargo volume more than 5 million tons 'A'- cargo volume more than 0.5 million tons 'C'- cargo volume less than 50,000 tons
Industrial	'AA'- cargo volume for industry is more than 3 million tons 'A'- more than 0.5 million tons 'C'- less than 50,000 tons
Container cargo	'AA'- cargo volume is more than 1 million tons 'A' - more than 100,000 tons 'C' - less than 50,000 tons
Bulk cargo	'A' - cargo volume is more than 0.5 million tons 'C' - less than 50,000 tons
Heavy cargo	'A'- constantly handling heavy cargo mainly for projects 'C'- occasionally handling heavy cargo
Ro-Ro cargo	'A'- existence of Ro-Ro ship line or frequent calls by Ro-Ro ships 'C' - a Ro-Ro ships call infrequently
Transit cargo	'AA'- transit cargo volume is more than 0.5 million tons 'A'- transit cargo volume is more than 100,000 tons 'C' - transit cargo volume is less than 50,000 tons
Liquid Cargo	'AA'- cargo volume is more than 2 million tons 'A'- more than 1 million tons 'C'- less than 50,000 tons
Fishery	'A' - authorized as main fishery port by SHIRAT 'C' - port being used by fishing boat
Passenger	'A' - existence of foreign passenger line
Refuge	'A' - calmness level is less than 50 cm in the port

3.7 General Development Strategy of Each Major Port

(1) Function of Each Major Port

The packing style of each item in Table 3.6.1 can be envisioned in Table 3.7.1. The cargo allotment degree of each major Iranian port by packing style and by kind of ship is shown from Table 3.7.2 to Table 3.7.4 which was made using Table 3.6.1 and 3.7.1.

The definition of the allotment degree is the same as in Table 3.6.1.

Table 3.7.1 Exchange Items to Packing Style

Items in Table 3.6.1	Items by packing style
Commercial	Break bulk cargo and Container cargo
Industrial	Dry bulk cargo,Break bulk cargo and Heavy cargo
Container cargo	Container cargo
Bulk cargo	Dry bulk cargo
Heavy cargo	Heavy cargo(majority in case) and Break bulk cargo
Ro-Ro cargo	Ro-Ro cargo
Transhipment Cargo	Container cargo
Passenger	Passenger
Domestic trade	Break bulk cargo
	Dry bulk cargo
Fishery	Fishing

Table 3.7.2 Cargo Allotment Degree of Imam Khomeini Port and Abbas Port by Packing Style

Port	Trade	Kind of ship	Kind of cargo	Cargo allotment degree
Imam Khomaini	Foreign	Break bulk ship	Break bulk cargo	AA
		Heavy cargo vessel	Heavy cargo	A
		Container vessel	Container cargo	AA
		Dry bulk carrier	Dry bulk cargo	A
		Ro/Ro vessel	Ro/Ro cargo	A
		Liquid bulk carrier	Liquid bulk cargo	C
		Passenger ship	Passenger	B
	Domestic	Dry bulk carrier	Dry bulk cargo	A
	Fishery	Fishing boat	Fishing	C
Abbas	Foreign	Break bulk ship	Break bulk cargo	AA
		Heavy cargo vessel	Heavy cargo	A
		Container vessel	Container cargo	AA
		Dry bulk carrier	Dry bulk cargo	A
		Ro/Ro vessel	Ro/Ro cargo	A
		Liquid bulk carrier	Liquid bulk cargo	AA
		Passenger ship	Passenger	A
	Domestic	Dry bulk carrier	Dry bulk cargo	A
	Fishery	Fishing boat	Fishing	A

Table 3.7.3 Cargo Allotment Degree of Bushehr Port and Chabahar Port by Packing Style

Name	Function	Kind of ship	Kind of cargo	Cargo allotment degree
Busher	Foreign	Break bulk ship	Break bulk cargo	A
		Heavy cargo vessel	Heavy cargo	B
		Semi container ship	Container cargo	A
		Dry bulk carrier	Dry bulk cargo	A
		Liquid bulk carrier	Liquid bulk cargo	AA
		Passenger ship	Passenger	A
	Domestic	Break bulk ship	Break bulk cargo	A
		Dry bulk carrier	Dry bulk cargo	A
	Fishery	Fishing boat	Fishing	A
Chabahar	Foreign	Break bulk ship	Break bulk cargo	A
		Heavy cargo vessel	Heavy cargo	B
		Semi container ship	Container cargo	B
		Liquid bulk carrier	Liquid bulk cargo	A
		Dry bulk carrier	Dry bulk cargo	A
	Domestic	Break bulk ship	Break bulk cargo	C
		Dry bulk carrier	Dry bulk cargo	C
	Fishery	Fishing boat	Fishing	C

Table 3.7.4 Cargo Allotment Degree of Anzali Port and Now Shar Port

Name	Function	Kind of ship	Kind of cargo	Cargo allotment degree
Anzali	Foreign	Break bulk ship	Break bulk cargo	A
		Heavy cargo vessel	Heavy cargo	A
		Semi container ship	Container cargo	A
		Dry bulk carrier	Dry bulk cargo	A
		Ro/Ro vessel	Ro/Ro cargo	A
		Liquid bulk carrier	Liquid bulk cargo	A
		Passenger ship	Passenger	A
	Domestic	Break bulk ship	Break bulk cargo	B
		Dry bulk carrier	Dry bulk cargo	B
	Fishery	Fishing boat	Fishing	A
Now Shahr	Foreign	Break bulk ship	Break bulk cargo	B
		Heavy cargo vessel	Heavy cargo	B
		Break bulk ship	Container cargo	B
		Dry bulk carrier	Dry bulk cargo	B
		Liquid bulk carrier	Liquid bulk cargo	B
		Passenger ship	Passenger	A
	Domestic	Break bulk ship	Break bulk cargo	C
		Dry bulk carrier	Dry bulk cargo	C
	Fishery	Fishing boat	Fishing	C

(2) Basic Cargo Flow at Each Major Port by Packing Style

The required port facilities at each major port are suggested based on Tables 3.7.2-3.7.4 and Tables 3.5.7.3. An outline is provided below.

1) Imam Khomaini Port

Basic cargo flow between shipper/consignee and berth by packing style at Imam Khomaini port is assumed based on Table 3.7.2 and Table 3.5.7.3 to Figure 3.7.1.1.

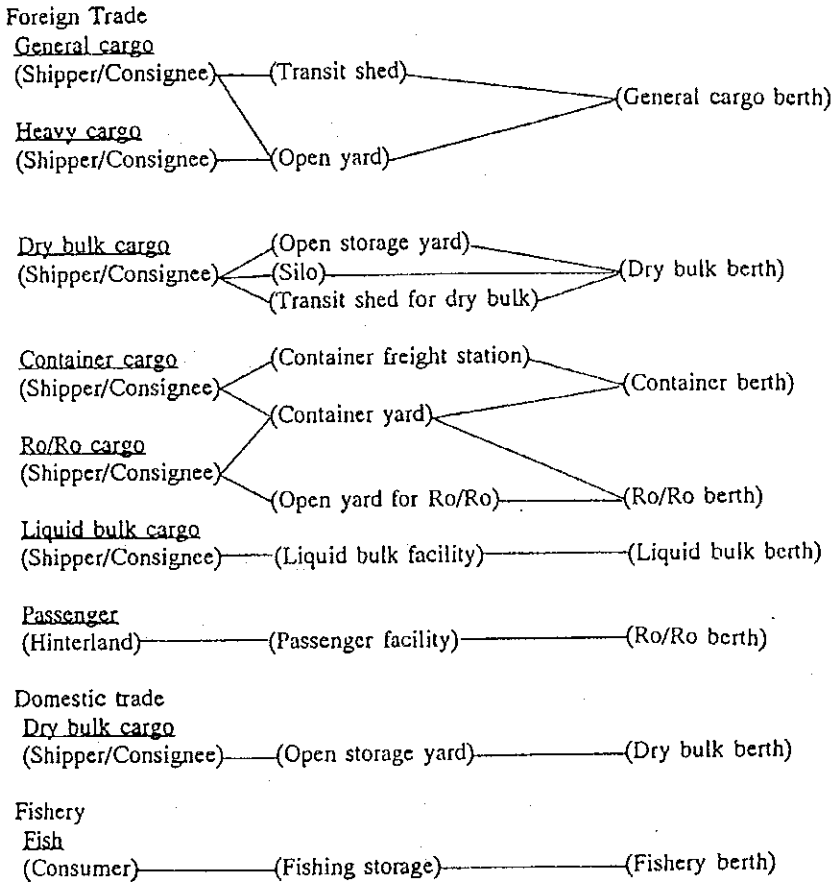

Figure 3.7.1.1 Basic Cargo Flow at Imam Khomeini Port

At Imam Khomaini port, the major commodities of heavy cargo are plants (apparatus) and large machinery. These cargoes will be handled at the general cargo berth which will be used as multipurpose berths.

Many ferry boats play between Iranian major ports and Arabic countries on the coast of the Persian Gulf and Iranian islands. The center of the major Iranian ports for ferry transportation is Abbas port and Bushehr port. Passengers for above routes use not only passenger ships but also ferry boats because the ferry boats offer liner service and passengers can transport large baggage easily. At Imam Khomaini port, passengers have been using ferry transportation recently. Therefore the passenger facilities at Imam Khomaini port will also function as a passenger berth after the completion of the ferry berth.

2) Abbas Port

The basic cargo flow by packing style at Abbas port is envisioned in Figure 3.7.1.2 based on Table 3.7.2 and Table 3.5.7.3.

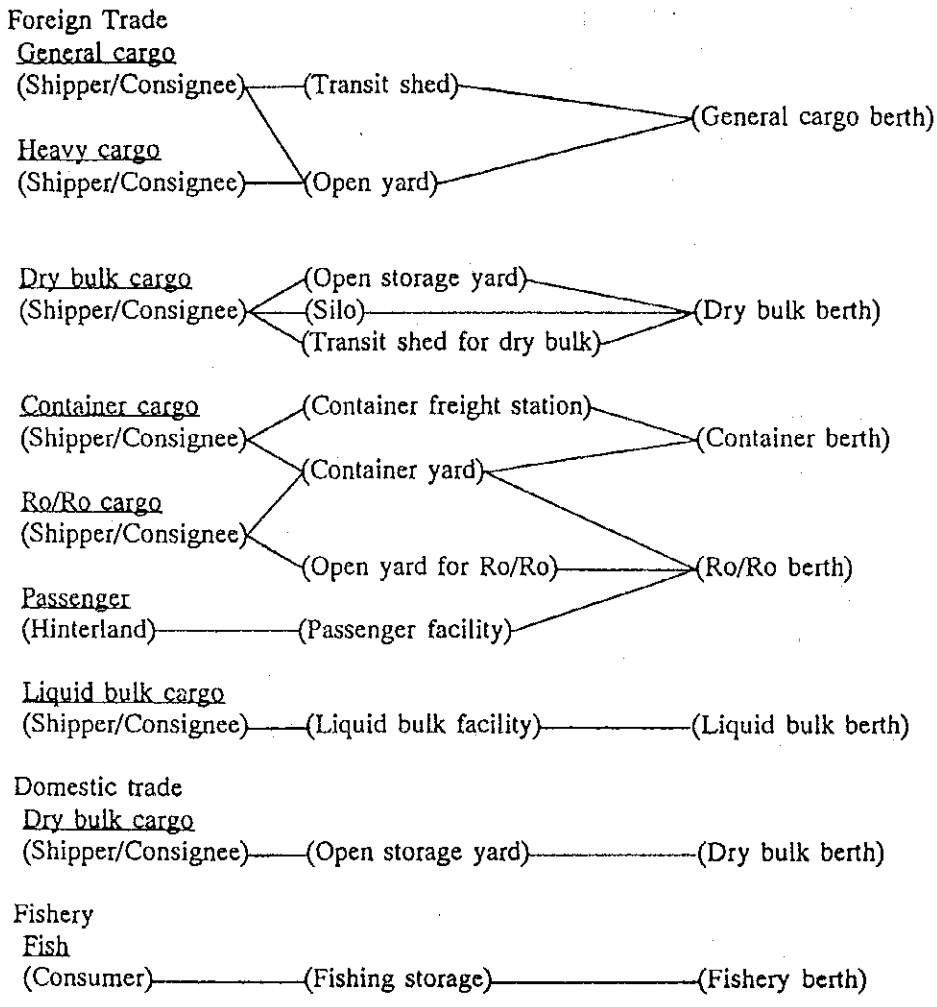

Figure 3.7.1.2 Basic Cargo Flow at Abbas Port

The basic cargo flow by packing style at Abbas port is similar to Imam Khomaini port.

3) Bushehr Port

Figure 3.7.1.3 shows the basic cargo flow by packing style at Bushehr Port.

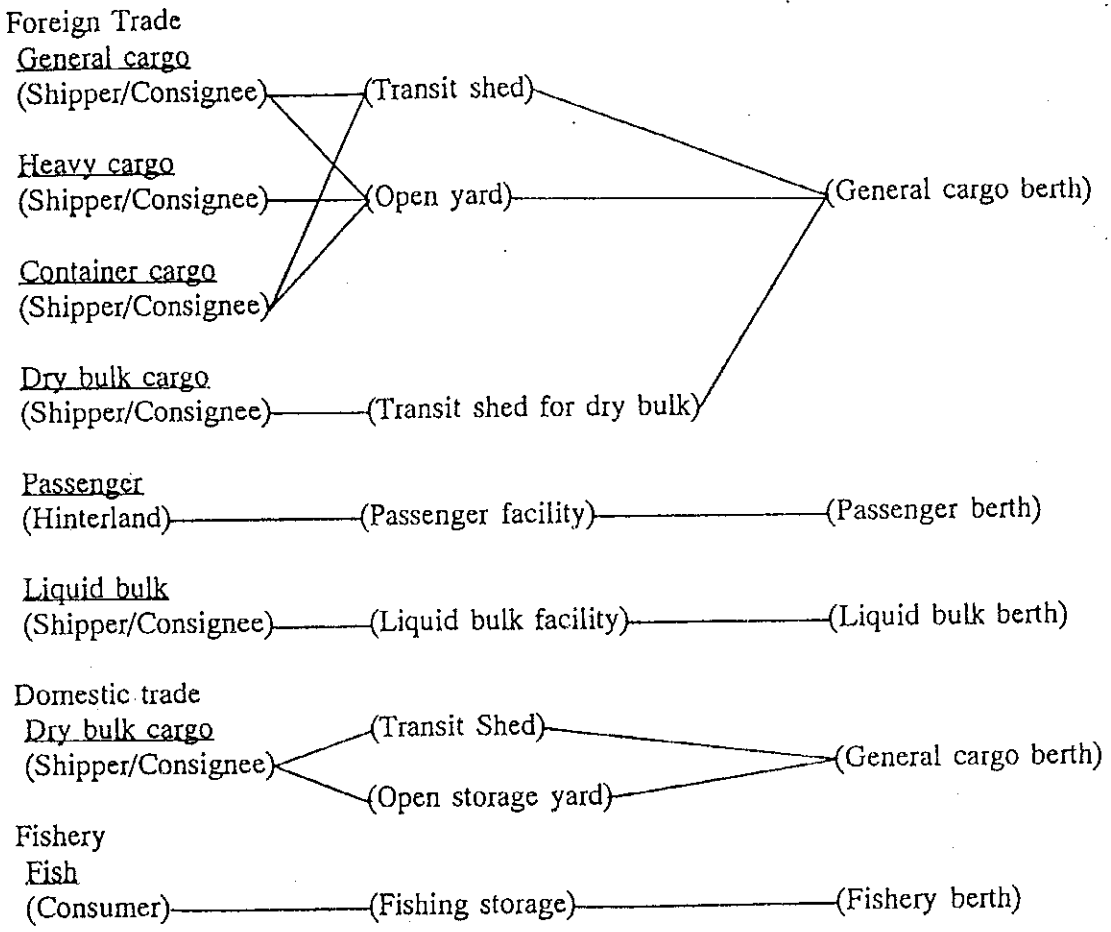

Figure 3.7.1.3 Cargo Flow at Bushehr Port

The main commodity of dry bulk cargo at Bushehr port will be import wheat which is handled from ship to hopper. Then, the wheat will be bagged through the hopper or transported to transit shed for dry bulk cargo by truck. So, dry bulk cargo will be handled at the general cargo berth.

4) Chabahar Port

The basic cargo flow by packing style is assumed based on Table 3.7.3 and Table 3.5.7.3 to Figure 3.7.1.4.

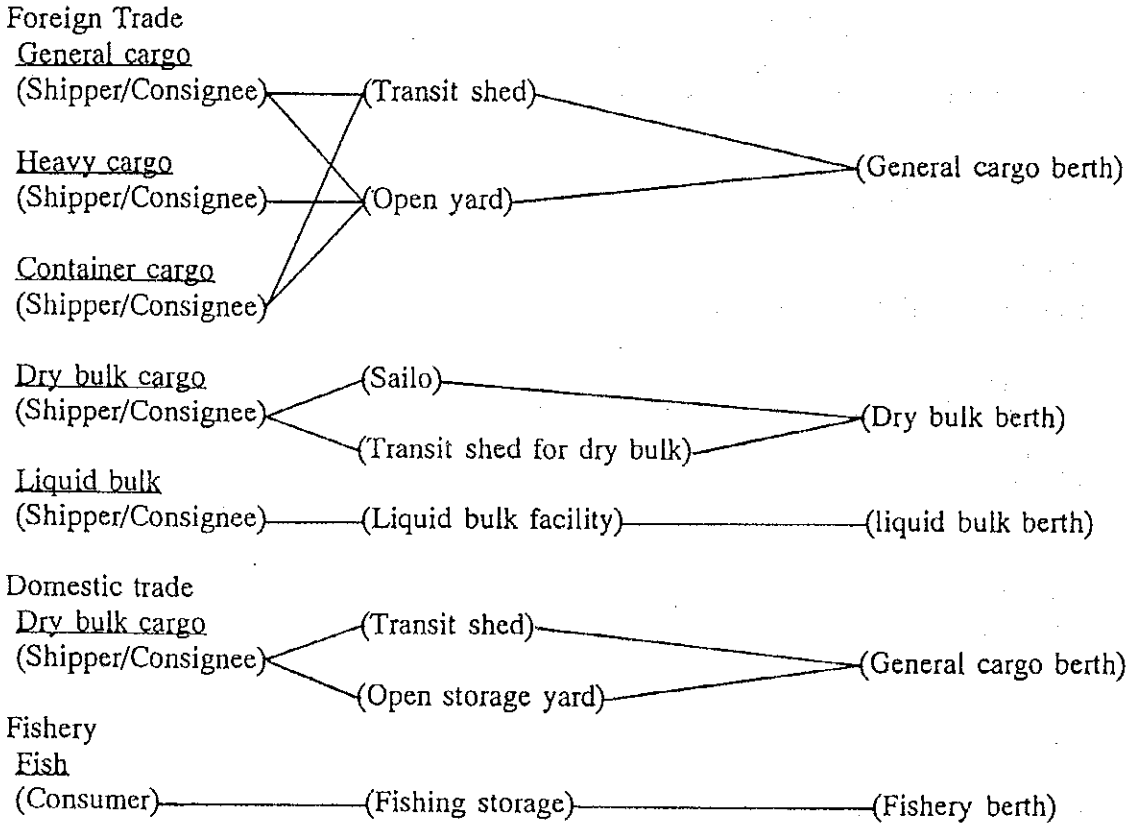

Figure 3.7.1.4 Basic Cargo Flow at Chabahar

According to Table 3.7.3, the cargo allotment degree of future container cargo at Chabahar port is Medium(B). This container cargo will be transported by semi-container vessels. According to cargo statistics of PSO, dry bulk cargo whose major commodity is wheat is the largest in volume at Chabahar port. Considering the above, general cargo, heavy cargo and container cargo in Chabahar port will be handled at the general cargo berth which is used as a multipurpose berth. Then, container cargo will be marshalled and stored in the open yard for conventional general cargo.

Behesti jetty in Chabahar port cannot be used in monsoon season due to heavy waves. Therefore, construction of break-water is given high priority in Chabahar port.

5) Anzali Port

The basic cargo flow by packing style at Anzali port is assumed in Figure 3.7.1.5 based on Table 3.7.4 and 3.5.7.3.

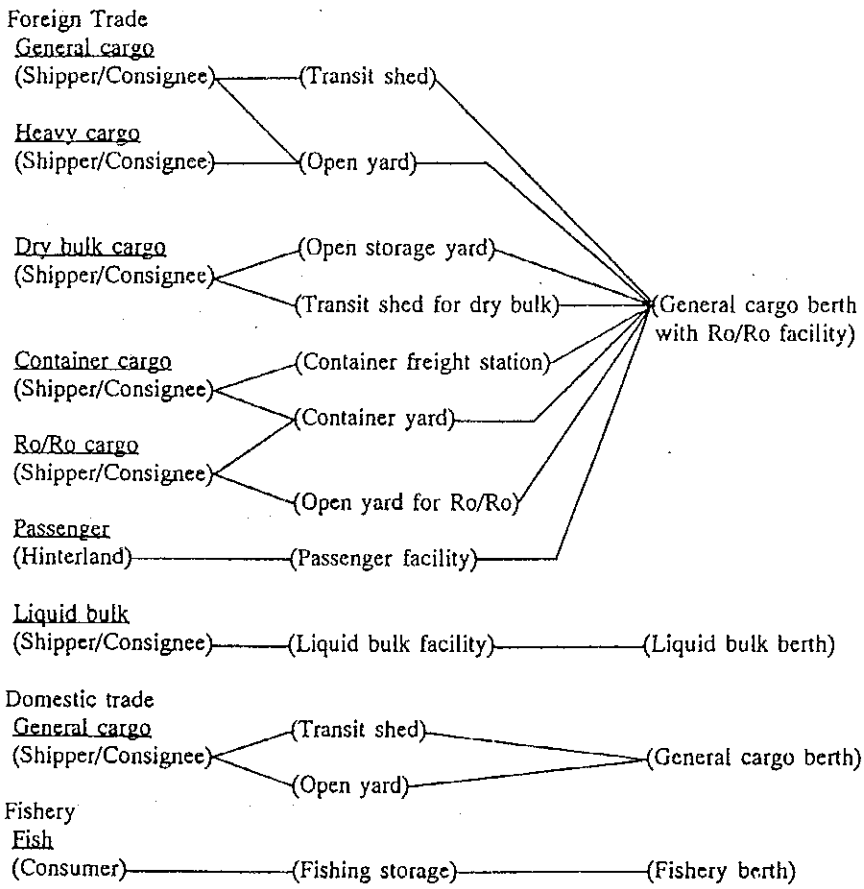

Figure 3.7.1.5 Basic Cargo Flow at Anzali

The future expansion area at Anzali port is limited because this port is surrounded by the city area. According to Table 3.7.4, the basic cargo allotment degree of all the handling cargo at Anzali port is less than High (AA). Therefore, all of the handling cargo at Anzali port except liquid bulk cargo will be handled at the general cargo berth which functions as a multipurpose berth for effective use of the quay.

The sorting area at Anzali port shall be expanded in the near future. In particular, container yard, and sorting facilities for conventional break bulk at Anzali port shall be expanded to meet the increase in container cargo and conventional break bulk cargo.

The water-line in the north area of Anzali port is not suitable for a berthing facility due to stormy waves. Therefore, the break-water shall be expanded or a newly constructed, after which the mooring facilities will be expanded.

6) Nowshahr Port

The basic cargo flow by packing style at Nowshahr port is assumed in Figure 3.7.1.6 based on Table 3.7.4 and 3.5.7.3.

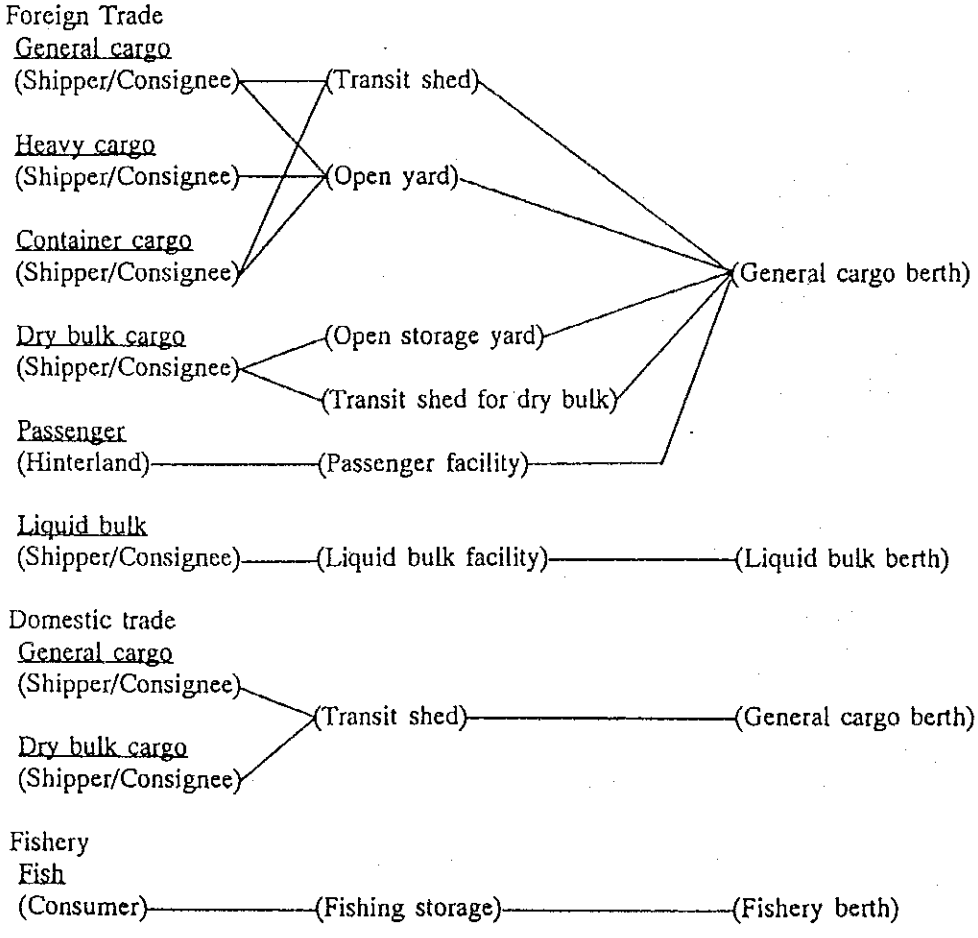

Figure 3.7.1.6 Basic Cargo Flow at Now Shahr

According to Table 3.7.4, basic cargo allotment degrees of all of the cargo by packing style except passenger at Now Shar port are Medium(B) or Minimal(C). Then, the cargo handling volume of Iranian ports on the coast of the Caspian Sea is about 1/16 of total cargo handling volume of all Iranian ports. (Refer to Section 3.5.) Considering the above, all of the foreign trade cargo at Now Shar port will be handled at the general cargo berth which functions as a multipurpose berth. Container cargo at this port will be marshalled and stored at the open yard for conventional break bulk cargo.

(3) Required Port Facilities at Each Major Port

Considering the basic cargo flow by packing style and present situation at each major port, the basic required main port facilities at each major port are shown in Table 3.7.5.

Table 3.7.5 Required Port Facilities at Each Major Port

Name of Port		Imam Khomaini Port	Abbas Port	Busher Port	Chabahar Port	Anzali Port	Now Shar Port
Kind of Berth							
Foreign Trade	General cargo berth	*	*	*	*	*	*
	Container berth	*	*				
	Ro/Ro berth	*	*				
	Dry bulk berth	*	*		*		
	Passenger berth			*			
	Liquid bulk berth	*	*	*	*	*	*
Domestic trade	General cargo berth			*			*
	Dry bulk berth	*	*				
Fishery	Fishery berth	*	*	*	*	*	*
Kind of Sorting Facility							
Foreign Trade	Transit shed	*	*	*	*	*	*
	Open yard for General Cargo	*	*	*	*	*	*
	Container Freight station	*	*			*	
	Container Yard	*	*			*	
	Open yard for Ro/Ro	*	*			*	
	Open Storage Yard	*	*			*	*
	Silo	*	*		*		
	Transit shed for dry bulk	*	*		*	*	*
	Passenger Facility	*	*	*		*	*
	Liquid bulk Facility		*	*	*	*	*
Domestic trade	Transit shed			*		*	*
	Open yard for General Cargo			*		*	
	Open Storage Yard	*	*				
Fishery	Fishing Storage	*	*	*	*	*	*
Break water					*	*	*

Note:*:Required Facility

(4) Required Port Related Business at Each Major Port

1) Imam Khomaini Port

All packing style cargoes are handled at Imam Khomaini Port. In particular, in 1992, break bulk cargo(general cargo and bagged cargo), container cargo and dry bulk cargo are about 23 percent, 18 percent and 44 percent of total cargo handling volume of each packing style at Iranian major ports respectively. And then break bulk cargo and container cargo are given high priority in Table 3.7.2. Concerning the mooring facility at Imam Khomaini Port, general cargo berth and container berth are given high priority in Table 3.8.1.2.

The distance between Imam Khomaini Port and Tehran which is the major hinterland of Imam Khomaini Port is about 1,000 km. In addition, 44 percent of imported dry bulk cargo at all major Iranian ports in 1992 was handled at Imam Khomaini port.

Based on the above, the functions of the business for break bulk cargo, container transportation and heavy cargo should be attracted to the area behind Imam Khomaini Port with priority. And then, construction of the expressway between Imam Khomaini and Esfahan via Ahwaz should be given high priority.

2) Abbas Port

At Abbas Port, all packing style cargoes are handled, especially break bulk cargo, container cargo and liquid bulk cargo which are given high priority in Table 3.7.2 because these cargo volume in 1992 accounted for more than 75 percent of total foreign cargo handling volume at this port, moreover, the total foreign cargo handling volume of this port accounts for more than 40 percent of total foreign cargo handling volume of major Iranian ports. Cargo volume of dry bulk cargo at this port in 1992 accounted for more than 19 percent of foreign cargo handling volume at this port. In addition, in Table 3.8.1.2, general cargo berth and container berth are given high priority.

The largest hinterland of Abbas port is Tehran which is a great distance away with approximately 1,300 km from Abbas port.

In 1992, about 40 percent, 80 percent, 45 percent and 55 percent of total dry bulk cargo, total container cargo, total break bulk cargo and total liquid bulk cargo respectively at Iranian major ports were handled at Abbas port. According the result of the cargo forecast of this study, theses percentage will change to approximately 35, 62, 35 and 49 in 2010 respectively.

Based on the above, the functions of the port related business for dry bulk cargo, break bulk cargo, liquid bulk cargo and container transportation should be attracted to the area behind Abbas port. For land transportation, the construction of the rail-way between Tezerj and Bandar Abbas and the express way between Esfahan and Bandar Abbas via Yazd should given priority.

3) Bushehr Port

The major packing styles of cargo at Bushehr port are break bulk cargo including bagged cargo, liquid bulk cargo, container cargo and dry bulk cargo. In particular, liquid cargo volume at this port to total liquid cargo volume of major Iranian ports is about 18 percent in 2010. Also, there are many passengers between Busher and Arabic countries and the coastal Iranian islands on the Persian Gulf. In Table 3.8.1.2, general cargo berth is given high priority.

Therefore, the functions of port related business for break bulk cargo, liquid bulk cargo and passenger should be attracted to the area behind Busher port.

4) Chabahar Port

The major packing styles of cargo at Chabahar port are break bulk cargo(including bagged cargo), container cargo, dry bulk cargo and liquid bulk cargo. In particular, liquid bulk cargo and bagged cargo have large volumes, more than 1 million tons in 2010. So, the cargo allotment degrees of these cargoes is given middle high priority (A) in Table 3.7.3. And then, general cargo berth at Chabahar port is given high priority in Table 3.8.1.2.

The hinterland of Chabahar port is mainly southeastern Iran. Chabahar port is the supply base to the southeastern Iran for wheat, rice, sugar and fertilizer.

Based on the above, the functions of port related business for break bulk cargo, dry bulk cargo and liquid bulk cargo should be attracted to the area behind Chabahar port. And then, the rail-way between Chabahar and Kerman and Chabahar and Zahkdan should be constructed as soon as possible.

5) Anzali Port

Anzali port is a gateway port for international trade of the Caspian sea. The major packing styles of cargo are liquid bulk cargo, break bulk cargo and container cargo. Also, this port has a lot of passengers because there is a route of passenger ships between Anzali and Baku which is located on the west coast of the Caspian sea in the Republic of Azerbaijan.

Therefore, the cargo allotment degrees of packing style of these cargoes(liquid bulk cargo, break bulk cargo and container cargo including Ro/Ro cargo) in Table 3.7.4 are given middle high(A) priority. In Table 3.8.1.3, general cargo berth and liquid bulk berth in Anzali port are given high priority. Imported oil products which is major commodity of liquid bulk cargo is sent from Anzali to Rasht by pipe-line.

Based on the above, the functions of port related business for break bulk cargo, container cargo including Ro/Ro cargo and passenger should be attracted to the area behind Anzali port.

Anzali port and Tehran which is the major hinter-land of Anzali port is connected by Main road which is one of the load classification in Iran. So, transportation of container trailer for 40 foot sea container is available between Anzali and Tehran, but this route some times stops during the year due to landslides. Therefore, a road which would always be available to transport container trailer for 40 foot sea container should be constructed.

6) Nowshahr Port

Now Shahr Port is one of the major ports in Iran which is located on the coast of the Caspian Sea. The major packing styles of cargo at Now Shahr Port in 2010 are break bulk cargo, container cargo and liquid bulk cargo. Also, passengers are included in the target year of the Master Plan.

The total cargo handling volume of Nowshahr Port is the smallest of the major Iranian ports. So, cargo allotment degree of all packing style cargoes except passenger is Medium(B) or Minimal(C) in Table 3.7.4.

Therefore, the function of port related business for break bulk cargo, liquid bulk cargo and passenger should be attracted to the area behind the port with priority.

The design road of some bridges on the approach road of Nowshahr Port is not sufficient for the traffic of heavy-weight trucks including container trailer. Therefore, these bridges should be expanded as soon as possible.

3.8 Framework of General Development Scenarios for Major Iranian Ports

3.8.1 Framework of Planning Stage and general Development Scenario for Major Iranian Port

The major packing style of each commodity in Table 3.5.3-(4)-2)-2 and 3.5.3-(4)-2)-3 can be envisioned in Tale 3.8.1.1.

Table 3.8.1.1 Exchange Items to Packing Style

Items in Table 3.5.3	Items by packing style
Dry bulk cargo	Dry bulk cargo
Liquid bulk cargo	Liquid bulk cargo
Bagged cargo	Break bulk cargo
Container cargo	Container cargo
Refrigerated cargo	Container cargo
Steel Material	Heavy cargo(majority in case)
Mineral	Dry bulk cargo
General cargo	Break bulk cargo

The cargo handling volume by commodity in Table 3.5.1-(4)-2)-2 and 3.5.3-(4)-2)-1 can be re-arranged in Figure 3.8.1.1 and 3.8.1.2 using Table 3.8.1.1.

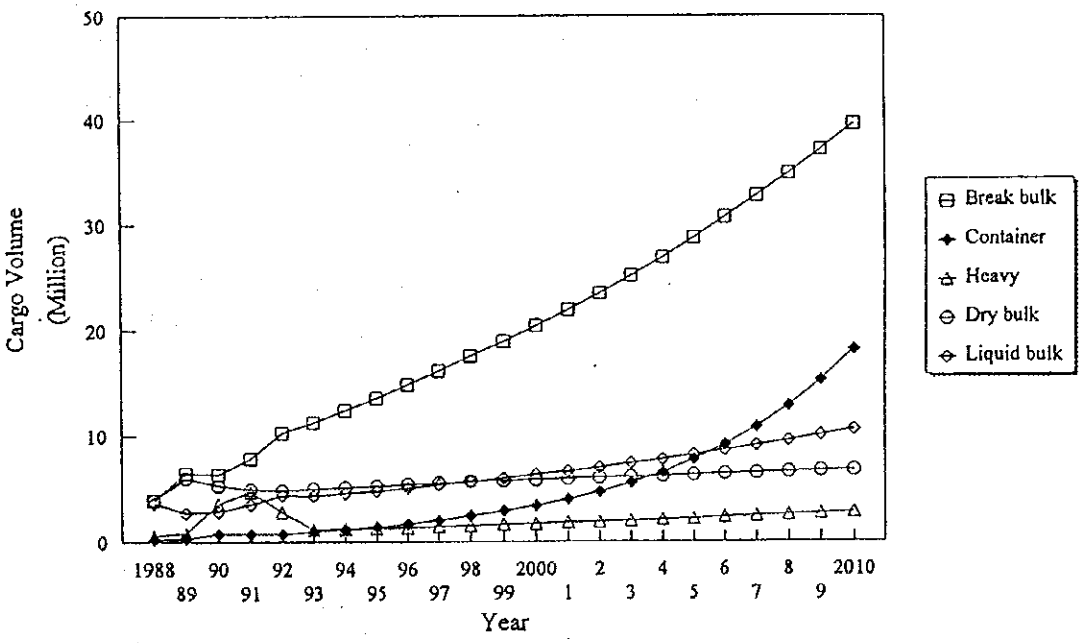

Figure 3.8.1.1 Cargo Handling Volume at Major Ports on the South Iranian Coast

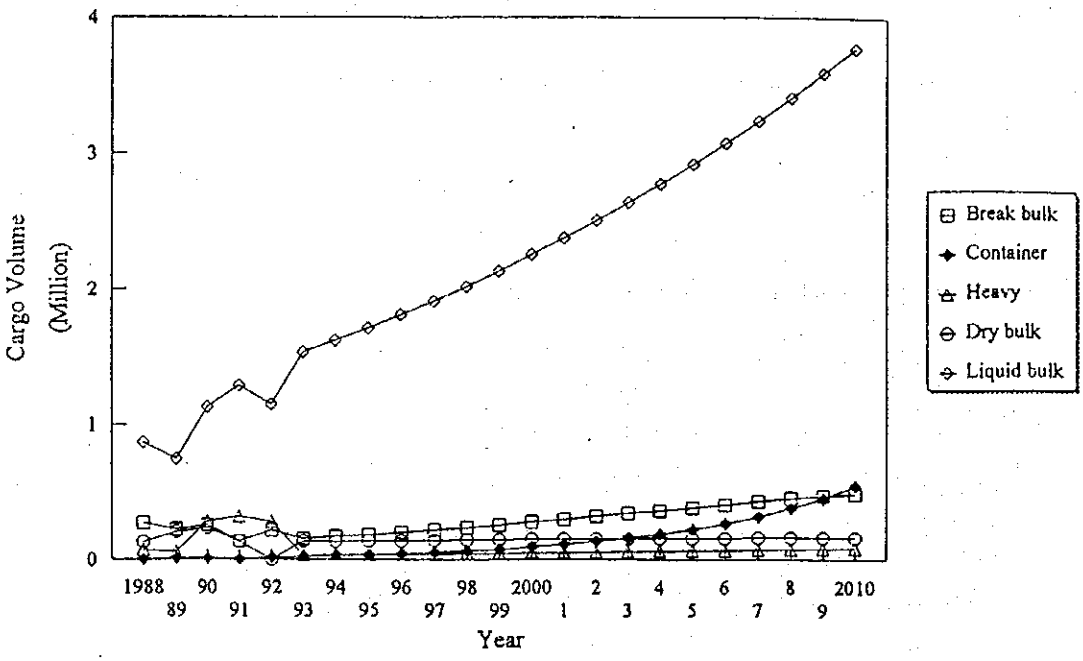

Figure 3.8.1.2 Cargo Handling Volume at Major Ports on the North Iranian Coast

According to Figure 3.8.1.1 and 3.8.1.2, there are two types of cargo transition. One is a gradual and constant transition and the other is an abrupt transition. The former type is break bulk cargo, heavy cargo and dry bulk cargo, liquid bulk cargo and the latter type is container cargo in Figure 3.8.1.1 and 3.8.1.2.

The largest volume cargo in 2010 at major ports on the southern coast in Iran is break bulk cargo with about 50 percent. The second largest volume cargo is container cargo with about 23 per cent. The third and the fourth largest are liquid bulk cargo and dry bulk cargo respectively.

In 2000, the largest volume cargo is break bulk cargo with about 54 percent. The second is liquid bulk cargo with about 17 percent, followed by dry bulk cargo and container cargo respectively.

Considering section 3.7 and above, the priority of preparation of major port facilities at each major port on the southern coast of Iran is shown in Table 3.8.1.2.

Table 3.8.1.2 Priority of Required Port Facilities at Each Major Port on the Southern Coast of Iran

Name of Port		Imam Khomaini Port	Abbas Port	Busher Port	Chabahar Port
Kind of Berth					
Foreign Trade	General cargo berth	***	***	***	***
	Container berth	***	***		
	Ro/Ro berth	**	**		
	Dry bulk berth	**	**		**
	Passenger berth			**	
	Liquid bulk berth	*	**	**	**
Domestic trade	General cargo berth			**	
	Dry bulk berth	**	**		
Fishery	Fishery berth	*	**	**	*
Kind of Sorting Facility					
Foreign Trade	Transit shed	***	***	***	***
	Open yard for General Cargo	***	***	***	***
	Container Freight station	***	***		
	Container Yard	***	***		
	Open yard for Ro/Ro	**	**		
	Open Storage Yard	**	**		
	Silo	**	**		**
	Transit shed for dry bulk	**	**		**
	Passenger Facility	*	***	**	
	Liquid bulk Facility		**	**	**
Domestic trade	Transit shed			**	
	Open yard for General Cargo			*	
	Open Storage Yard	**	**		
Fishery	Fishing Storage	*	**	**	*
Break water					***

Note:***:Required Facility with first priority for construction
**:Required Facility with second priority for construction
*:Required Facility with third priority for construction

Table 3.8.3 which was made considering section 3.7 and Figure 3.8.1.2 in the same way as Table 3.8.2 shows the priority of preparation of basic major port facilities at each major port on the northern coast of Iran.

Table 3.8.1.3 Priority of Required Port Facilities at each Major Port on the Northern Coast of Iran

Name of Port		Anzali Port	Now Shar Port
Kind of Berth			
Foreign Trade	General cargo berth	***	**
	Container berth		
	Ro/Ro berth		
	Dry bulk berth		
	Passenger berth		
	Liquid bulk berth	***	*
Domestic trade	General cargo berth		*
	Dry bulk berth		
Fishery	Fishery berth	**	*
Kind of Sorting Facility			
Foreign Trade	Transit shed	***	**
	Open yard for General Cargo	***	**
	Container Freight station	***	
	Container Yard	***	
	Open yard for Ro/Ro	**	
	Open Storage Yard	*	*
	Silo		
	Transit shed for dry bulk	*	*
	Passenger Facility	**	**
	Liquid bulk Facility	***	*
Domestic trade	Transit shed	*	*
	Open yard for General Cargo	*	
	Open Storage Yard		
Fishery	Fishing Storage	**	*
Break water		***	**

Note:***:Required facility with first priority for construction
**:Required facility with second priority for construction
*:Required facility with third priority for construction

A part of container cargo and break bulk cargo in Table 3.8.1.2 and 3.8.1.3 will be handled by Ro-Ro handling system.

3.8.2 Investment for Port Development

(1) Maximum handling capacity at Iranian Ports

Maximum handling capacity after improving existing facilities and operation system is calculated for 15 ports by berth. (See Appendix II-6)

The results is shown in Table 3.8.2.1.

Table 3.8.2.1 Maximum Handling Capacity and Required Number of Berths

South Port (Imam, Khomeini, Abbas, Bushehr, Chabahar, Khoramshahr, Abadan)

Berth (South Ports)	Number	Total Length (m)	Capacity (1,000 ton/Year)
Conventional*	71	12,152	36,710
Container	10	2,081	11,564
Sub Total	81	14,233	48,274
Under Construction	5	932	2,300
Total	86	15,165	50,754
Cargo Volume			Forecast 2010/11 61,304
Over Cargo Volume			10,730

North Port (Anzali, Nowshahr, Amir Abad, Torkaman)

Berth (North Ports)	Number	Total Length (m)	Capacity (1,000 ton/Year)
Conventional*	6	1,324	1,720
Container	2	200	680
Sub Total	8	1,524	2,400
Under Construction	9	1,970	1,865
Total	17	3,494	4,265
Cargo Volume			Forecast 2010/11 4,421
Over Cargo Volume			156

Note: Excluding Oil, Oil Products.

(2) Required number of berth

In the Persian Gulf, total required number of berth in 2010/11 is 19, while the same is 14 in the Caspian Sea.

(3) Estimated cost of required port development

The cost, improving the existing facilities and to construct the new facilities, is estimated as follows.

Table 3.8.2.2 Cost of Port Development

Total Construction Cost	US$ 1,854 Mn.
Government Funds	US$ 1,800 Mn.
Lack of Funds	US$ 54 Mn.

3.9 Environmental Aspect

The environment is a very important matter in Iran, which is a signatory country of several environment related treaties: for example, "Convention on International Trade in Endangered Species of Fauna and Flora", "United Nations Convention on the Law of the Sea", "Convention on Wet-lands of International Importance Especially as Waterfowl Habitat", "Convention Concerning the Protection of the World Cultural Heritage".

PSO is drafting regulations to prevent oil pollution. The regulations are being prepared by concerned authorities such as DOE, PSO and Navy, and include measures for prevention of oil spills and provision of waste oil disposal plant and data regarding waste oil diffusion. This regulation includes various clauses such as:

a) Category of wastes
b) Oily water from engines
c) Oily water from engine room
d) Other like bilge

A special committee consisting of government organizations concerned with environmental conservation such as DOE, Navy and PSO and environmental specialists has been established to exchange of information.

However, the environmental conservation system for ports is not sufficient. In particular, routine inspection system for water and seabed material quality, standards of sea water quality test and geological test of seabed are lacking in the present regulations.

In this study, site survey which involved taking samples for sea water and seabed material at Imam Khomeini Port and Anzali Port was conducted to ascertain the environmental conditions. According to the result of the survey at Imam Khomeini Port, the quality of sea-water and seabed material is not very good. Concerning Anzali Port, the floating waste and water plants observed at the basin in the port suggest that the environmental condition has been deteriorating. In addition, waste water from Anzali city flows out to Anzali lagoon which has a passage that leads through Anzali Port.

Based on the above, the study team makes the following preliminary recommendations:

1) Standards of air, sea water and seabed material quality in the port area should be set in consultation with DOE.

2) Routine inspection system for water and seabed qualities should be established.

3) A laboratory for minimum requirement analysis of the samples for sea water and seabed material should be established.

4) Engineers to sample environmental quality and analyses data should be trained and assigned to all major ports.
Screening Sheets and Scoping Sheets at each port are attached to Appendix II-3. III-8.

3.10 Cargo Handling Equipment and Maintenance System

3.10.1 Purpose of Cargo Handling Equipment to be installed at the quay side

The purpose of cargo handling equipment are understood generally as follows;
a. To get high productivity at the port
b. To reduce the cargo handling cost at the port

However the idea shown above is not always correct.
The final purpose of the cargo handling equipment to be installed at the quay side is to reduce the total cost of cargo transport and handling.
Therefore, the handling cost at the port will be increased by the occasional introduction of cargo handling equipment.
The cost saved due to a ships quick dispatch might be larger than the additional cost increased in the above case.

3.10.2 Determination of the Appropriate Amount of Cargo Handling Equipment

(1) Optimum possession level of cargo handling equipment

To handle cargoes reliably and functionally, the minimum requirement of cargo handling equipment should be owned and maintained by the P.S.O.
A "possession level" numerical is shown VALUE A "VALUE A" is deciding the annual operating days (hours) divided by the annual available days (hours) of each unit of equipment.
However the desirable VALUE A is influenced by the number of unit of the same (nearly) capacity of each kind of equipment.
Although this item is very important, any available data for this formula could not get at all the ports.
The study for VALUE A is indispensable for planners to consider the required number of cargo handling equipment.
It is recommended that the related data should be collected and the study for the relation between VALUE A and actual problems due to shortage of cargo handling equipment should be done.

(2) Adequate stock of spare equipment

PSO should stock spare equipment of cargo handling equipment in addition to net amount of required equipment, giving due consideration to the number of days required for repair,except for the following special cases;

1) The number of equipment possessed is a few (one to three units) and,furthermore their purchase price is high

2) Annual operating days (hours) are so short that preventive maintenance is possible during the interval of operation.

If spare equipment is possessed,it is essential to carry out sufficient preventive maintenance in order to reduce the number of interruption in cargo handling wok caused by break-down of the equipment and to minimize the number of days required for corrective maintenance, Moreover, preventive maintenance should be carried out so as not to interfere with cargo handling operation.
The ratio of adequate stock of spare equipment is influenced by the total non-operational days (required preventive maintenance days plus required corrective maintenance days) The ratio is about 10% usually.

(3) Ratio of operational days for cargo handling equipment (VALUE B)

The value B is calculated by the following formula
B= (P+ C)/365
P: Required preventive maintenance days
C: Required corrective maintenance days
The simple average figures of the VALUE B at each port are shown in Table 3.10.1.

1) The following items are understood from the above Tables

a. The figures are generally affected by the site and kind of equipment.

However,the dispersion of the figure is too large and it could be affected by other factors.

b. For high figure

The available data for actual working days on each piece equipment has not been obtained but most of equipment may not be worked so much. Then the corrective maintenance days for break-down by working is very small and furthermore,the preventive maintenance had not been done.

c. For low figure

The reasons can be divided into two items

* The required corrective maintenance day was very long because it takes long time for the delivery of parts.
* There is not any intention of repairing because the equipment is not unnecessary.

2) Dispersion

It is not a good phenomenon to show large dispersion on VALUE B on each equipment.
The dispersion shall be reduced by good management for the equipment.

Table 3.10.2.1 Ration of Operational Days for All Cargo Handling Equipment

Ratio(%) of operational Day in 1991

Port	Mobile Crane	Forklift	Tractor	Average
I. Khomeini	73	74	74	73
Rajaee	90	78	95	87
Anzali	65	60	84	69
Nowshahr	89	98	98	95
Bashehr	90	95	95	93
Chabahar	68	73	84	75
Average	79	79	88	82

Ratio(%) of operational day in 1992

Port	Mobile Crane	Forklift	Tractor	Average
I. Khomeini	77	80	77	78
Rajaee	85	74	96	85
Anzali	77	67	94	79
Nowshahr	76	96	96	89
Bashehr	90	93	91	91
Chabahar	55	56	84	65
Average	76	77	89	81

Averge Ratio(%) of operational day

Port	1991	1992	Average
Khomeini	73	78	75
Rajaee	87	85	86
Anzali	69	79	74
Nowshahr	95	89	92
Bashehr	93	91	92
Chabahar	75	65	70
Average	82	81	81

3) Desirable VALUE B

The VALUE B will be calculated by the required days for preventive maintenance and corrective maintenance. However ,the corrective maintenance will be affected by the level of the preventive maintenance.
Thus the VALUE B is finally decided by the level of preventive maintenance.
It is generally acceptable that the value is less than 0.1 Therefore the ratio of the adequate stock of spare equipment is 0.1.

3.10.3 Preparation of the Procurement/Disposal Plan

The Study team could find only procurement plan but no disposal plan at Tehran. It is impossible to set high productivity at ports where no cargo handling equipment is provided and the cost for cargo handling equipment including initial cost, operation cost and maintenance cost is great.
There it is very important to maintain the optimum capacity for the cargo to be handled at each port.
Therefore PSO Tehran and PSO each port shall formulate the procurement plan combined with the disposal plan.
For efficient, stable and safe cargo handling operation, cargo handling equipment must be kept in satisfactory condition,keeping in mind life span such as economical service life,regulation service life and service life from the viewpoint of parts procurement.

(1) Economical service life

Service life is calculated by the total cost including procurement cost and aggregate amount of the maintenance cost. The calculative formula is follow.

C= Procurement cost + Aggregate amount of the maintenance cost
Y= Passed year
VALUE D = dc/dy

When dc/dy becomes zero (0), the Y is the most economical service life In order to determine the economical service life, the following records for each equipment should be kept.

a. Actual operating days
b. Actual repair costs (cost of parts for preventive and corrective maintenance
c. Actual repair costs (cost of parts for preventive and corrective maintenance, and personnel expenses required in the maintenance shop and the outside contract costs)

(2) Service life from the aspect of parts procurement

Though the life of equipment is within the regulation service life and has not exceeded the economic service life, possession of equipment is some time difficult for the shortage of spare parts.

This is especially true that operating rate of some equipment is low,but cannot be abandoned because of their special use.
The following are recommended by the Study Team:
The PSO should make a replacement or disposal plan, in consideration of the following three factors for the cargo handling equipment: namely regulation service life,economical service life and service life from the aspect of parts procurement.

3.10.4 Establishment of Effective Maintenance System

In order to keep each piece of handling equipment in a good condition for safety and to keep the most of its original function display,maintenance (checking and repair) is indispensable. It can be roughly divided into two categories.

i. Preventive maintenance ii. Corrective maintenance

Preventive maintenance is to check and repair before the equipment breaks-down or its function deteriorates, and to avoid break-down and ensure its original function. On the other hand, corrective maintenance is a passive form of maintenance which restores the original function of the equipment by carrying out repairs after the trouble occurring.

(1) Need for preventive maintenance

In order to handle cargo economically, cargo handling equipment must be used economically, basic concepts are as follows:

1) To ensure the high operating availability ratio (refer to VALUE B)
2) To ensure preventive maintenance costs and corrective maintenance costs are kept to a minimum

a. Operating availability ratio B (VALUE B) is determined by the sum of preventive maintenance days and corrective maintenance days.
b. Number of corrective maintenance (number of break-down x number of days required for repair) depends on the quality of preventive maintenance.
c. Corrective maintenance cost (number of break-down x required cost) depends on the quality of preventive maintenance cost.
d. The kind of spare parts to be kept will be reduced because the break-down which required spare will be reduced by sufficient preventive maintenance.

(2) Ratio of preventive maintenance and corrective maintenance

Optimum preventive maintenance level can be achieved by minimizing the sum of preventive maintenance and corrective maintenance.
However, as mentioned above,as the corrective maintenance cost depends on the preventive maintenance cost, the sum of maintenance cost is determined by the preventive maintenance cost.
Therefore,either the best preventive maintenance level or its cost shall be found and the maintenance should be carried out accordingly.

The most optimum preventive maintenance level will be found by both the preventive cost curve and corrective cost curve which are drawn on actual results.
Therefore, it is necessary to keep the records of repair cost for each piece of equipment from this aspect, too.
At present,the number of necessary days for optimal preventive maintenance cannot be determined in the ports without the past data of maintenance.
Ports with the past records should carry out the optimum preventive maintenance by getting the necessary days.
The minimization of total maintenance costs plus decreasing the corrective maintenance days serves not only to decrease the total maintenance cost, but also to decrease losses caused by a sudden pause in the cargo handling operations due to equipment trouble.

(3) Maintenance days (target figure for the total days of preventive maintenance days and corrective maintenance days)

The number of simple overall maintenance days in six ports averages 19% per year: Some ports have simple average of more than 25% per year. Since there is specific data now, the number of corrective maintenance days is assumed to be more than that of preventive maintenance days.
The following is recommended by the study team It is preferable to determine each maintenance day and contents of maintenance so that the target figure of the number of total maintenance days should be less than about 37 days (365 x 0.1). In the case of a large piece of equipment not having enough spare facilities, sufficient preventive maintenance should be carried out during the idle time of cargo operation, without any concern the above days, economical preventive maintenance days and corrective maintenance days.

(4) Interval of preventive maintenance

As cargo handling equipment is composed of an enormous number of parts,it is impossible to carry out individual preventive maintenance based on their necessary life span or intervals at which they have to be checked.
Therefore, it is more rational to carry out preventive maintenance by grouping together the parts or components of equipment. The grouping shall be made not according to the used time,but by each actual operation hour.
If a simple maintenance system for every 500 hours is adopted, then the checking for the parts with 100 hours life span or with 500 hours checking interval will be neglected totally, and this will also lead to trouble, shortening of the life span or increasing the total repair cost.
The interval in a preventive maintenance in order to change parts or to check pats is recommended as follows:
It is preferable to carry out preventive maintenance by dividing 3 or 4 preventive maintenance groups.

(5) Unit of the combinations for carrying out preventive maintenance logically The

interval should be based on actual operating hours, but there is another way of carrying out preventive maintenance without connecting the actual operating results.

This way is to carry out preventive maintenance in a set period of time by making an assumption regarding actual operating hours within a certain limited period of time based on the actual data of the past, and by determining what are checked and repaired in advance. this is so-called weekly,monthly or yearly maintenance.
This has the advantage that the repair plan is easier to make,and that the amount of idle time will decrease because the maintenance shops can handle the preventive maintenance in a regular fashion.

(6) Preventive maintenance manual

In order to put preventive maintenance into practice accurately and promptly, manuals for preventive maintenance are essential.
Generally,manuals for preventive maintenance are included in the brochures furnished by manufacturer, which are usually supplemented by various paper and reports concerned with tests and inspections,etc.
This general manual tends to only mention general cases. To promote more reasonable preventive maintenance,it is recommended that the PSO produce an original manual by improving on the manufacturers general manuals.
The devised version should be made on actual local data for maintenance, such as the contents of work, weather conditions,peculiarities of equipment operators and workers at maintenance shop etc.

(7) Role of maintenance shop

All the ports operate a maintenance shop to carry out maintenance of equipment smoothly and economically. PSO policy as far as the above is concerned will be as follows.
The main work of a maintenance shop is to carry out preventive maintenance on equipment possessed by the PSO. In addition, a maintenance shop also carries out corrective maintenance in accordance with its abilities.
Corrective maintenance beyond the capacity of the maintenance shop will be assigned the outside,giving due consideration to the following:

1) General repairs (preventive maintenance) are more smoothly and cheaply carried out by maintenance shops than that of the outside contractors.
2) Complicated and special repairs can be assigned the outside.

3.10.5 Stocking of the Appropriate Spare Parts

(1) Appropriate Spare Parts

To possess a sufficient amount of parts it is necessary for reducing the maintenance period,but possessing too many spare parts is not a preferable measures because of the resulting heavy financially burden. The most appropriate amount of spare parts

to be possessed must be determined from an economical point of view.
The biggest and the only merit of possessing spare parts is the reduction of the maintenance period. The demerits,on the other hand, are as follows:

1) Burden of interest.
2) Inventory control costs.
3) Losses caused by deterioration of quality attendant on long-term inventory.

Therefore,the appropriate amount of spare parts is determined by the time loss caused by non-working hours of equipment, the interval of parts required, term of delivery and unit costs.
The PSO ports should keep the following records for each spare part:

1) For parts delivered out of the storehouse;purchase data,date of use, purchase price, equipment requiring the part and type of maintenance (preventive or corrective).
2) For parts newly purchased; required term of delivery, data of use,purchase price, equipment requiring the part and type of maintenance.

As a matter of fact,spare parts for both preventive and corrective maintenance will be kept together,and will be used without distinguishing preventive maintenance from corrective maintenance. However, it will be easier to separate them when determining the appropriate amount of parts. The appropriate amount, in principle, is determined by analyzing the past data.

(2) Management of Spare Parts

The number and types of spare parts have been increased, and their names differ from manufacture to manufacture, even though their function and size may be the same.
Inevitably, the management business (purchase, inventory, taking out of storage and using) has become complicated.
Therefore most of ports have introduced the computer system.
If the computer system is not operated fully, the following administrative problems tend to occur:

1) Negligence in finding the necessary spare parts causes delay in adequate maintenance timing and consequently under parts will be left in the warehouse for a long time.
2) Spare parts with the same function and size but with more than two names are stocked at different places, thus causing duplication.
3) The difference between the registered pats and those actually stocked becomes notable, and so a large number of parts are always lacking and the necessary parts must be purchased whenever trouble occurs.

3.10.6 Management and Utilization of Records and Data

(regarding the cargo handling equipment,maintenance shops and spare parts)
Determination of the appropriate amount of cargo handling equipment, the best effective maintenance system for cargo handling equipment and for stocking the appropriate spare parts cannot easily be achieved. Only fully analysis of all the actual records and data will be able to produce a reasonable and economical system.
The collected records shall be in putted into small-capacity computer and stored on cassettes or floppy disks.
Necessary records and data shall be taken from cassettes or floppy disk whenever necessary and will be utilized for making various types of statistics and analyses.