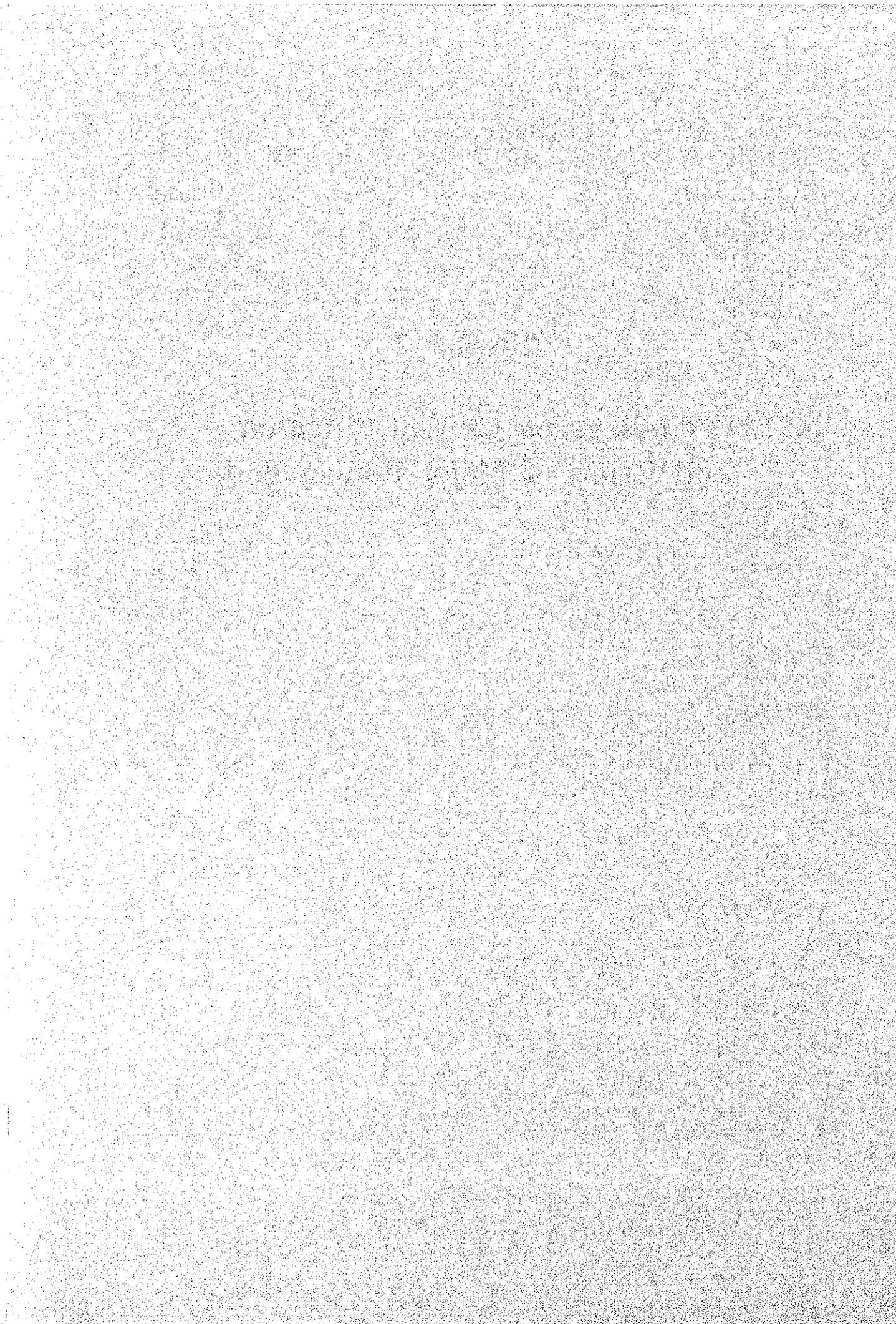


Chapter 2

Findings on Current Situation and Issues of Major Iranian Ports



Chapter 2 Findings on Current Situation and Issues of Major Iranian Ports

2.1 Port Administration System

2.1.1 Port and Shipping Organization (PSO)

Port and Shipping Organization (PSO) is responsible for the construction, maintenance, management and operation of Iranian commercial ports. PSO was established in 1800, as a national institution under the Ministry of Finance. PSO moved under the Ministry of Road and Transportation in 1974. its head office is in Tehran, and it has port authorities at major ports. Its organization and function is based on "the Law of Ports and Shipping Organization approved in 1970" (hereinafter referred to as PSO law).

PSO owns land and all facilities of the ports except oil ports. PSO is also in charge of administration of Iranian coastal areas and sea areas.

In order to fulfill its objectives, PSO executes the following functions:

- (1) Administration of port and maritime affairs.
- (2) Construction and management of port facilities.
- (3) Preparation and execution of maritime, port and marine regulations.
- (4) Arranging the pilotage affairs.
- (5) Administration of cargo handling operation, storage, transportation of cargo in the port area.
- (6) Operation of communication systems on sea and land, supply of the relevant equipment.
- (7) Supervision and promotion of marine navigation and coastal shipping.
- (8) Installation and operation of navigation aids on the seas and rivers.
- (9) Registration of commercial, pleasure ships having Iranian flag.
- (10) Issuing certifications for technical competence to the individuals and vessels.
- (11) Receiving river and port dues and charges including those for cargo handling, transport and storage.
- (12) Enforcement of maritime law of Iran, carrying out the duties stipulated in the PSO law and other relevant laws and regulations.
- (13) Determination of the way for utilization and the rate for operation of port installation and equipment.
- (14) Investigation and study of commercial navigation, marine and port affairs.
- (15) Preparation and execution of program for the following year and long term range.
- (16) Drafting the international agreements and contracts concerning commercial navigation, marine and port affairs.
- (17) Joins international organizations concerning commercial navigation, marine and port affairs.
- (18) Participation in international conferences concerning commercial navigation, marine and port affairs.
- (19) Establishment of free zone and preparation of the regulations and conditions concerning utilization of the free zone.

- (20) Operation of railroad in the port.
- (21) Establishment of schools for pilots and navigation staff.
- (22) Issuing authorization for construction of pier and other facilities
- (23) Issuing authorization for construction of offices, restaurants and store.
- (24) To give over a part of the port services to competent private sector
- (25) To try to lower the freight rate by sufficiently equipping the ports

2.1.2 Organization of PSO

Figure 2.2.2.1 shows the organization chart of PSO.

(1) The Supreme Council

The Supreme Council, which is located at the highest position in the chart, is composed of five members as shown below.

- 1) Minister of Road and Transportation (President of the Supreme Council)
- 2) Minister of Finance
- 3) General of the Iranian Navy
- 4) Minister of Defense
- 5) Chief of Planning and Budget Organization

The Supreme Council is the superior decision-making organization of PSO, of which functions are shown below.

- 1) To determine general policy of PSO.
- 2) To approve with the port tariff to be proposed to the authorities concerned.
- 3) To approve the budget of PSO.
- 4) To approve the annual report of PSO.
- 5) To decide to obtain loans.
- 6) To elect the members of Board of Management.
- 7) To make decisions on settling of disputes.
- 8) To approve the organization charts, description of the duties of each division of PSO and regulations for PSO employment.
- 9) To approve the internal regulations of PSO
- 10) To determine the salaries for the members of Board of Management.
- 11) Others

The Supreme Council normally has meetings twice a year. It examines mainly the PSO annual report at the first meeting. At the second meeting, budget, organization, management and operation policy for the next year are examined mainly. The first meeting is held by Tir (22nd of June ~ 22nd of July), the second one is held by Azar (22nd of November ~ 21st of December).

(2) The Board of Directors

The Board of Directors, which is located under the Supreme Council, is composed of

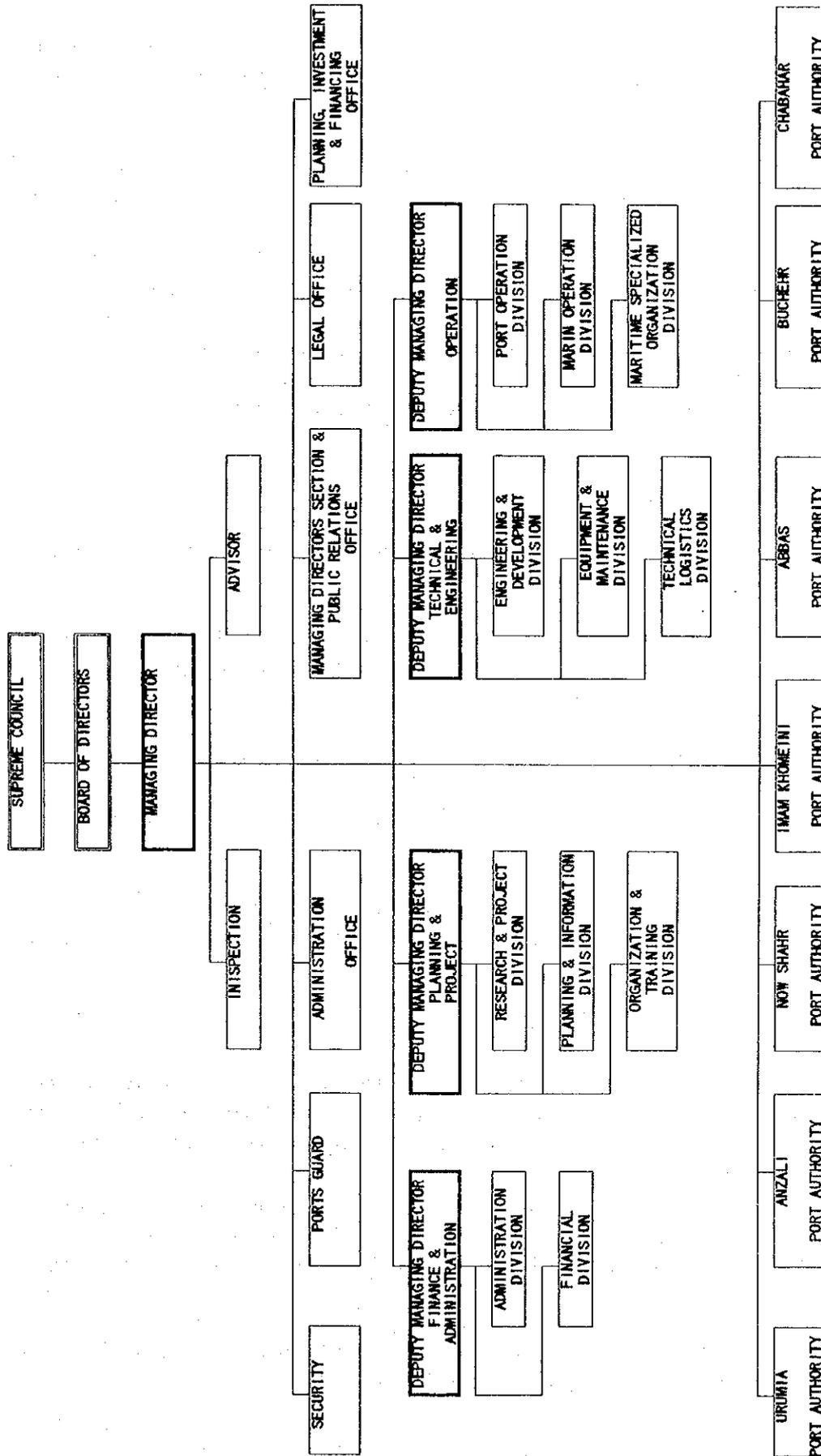


Figure 2.1.2.1 Organization Chart of PSO.

SOURCE : P S O

Managing Director and four Deputy Managing Directors of PSO. Their tenure of office is three years and they can be reelected for subsequent terms. The functions of the board are shown below.

- 1) To prepare the organization charts, description of the duties of each division of PSO and regulations for PSO employment and submit them to the Supreme Council.
- 2) To prepare the regulations of PSO, submit them to the Supreme Council.
- 3) To prepare budget and programs of PSO, submit them to the Supreme Council.
- 4) To prepare the annual report of PSO, submit it to the Supreme Council.
- 5) To propose the settlement of the disputes to the Supreme Council.
- 6) To propose obtaining local loans to the Supreme Council.
- 7) To prepare the port tariff, submit it to the Supreme Council.
- 8) Others

(3) The Managing Director

The Managing Director, under the Board of Directors, is the legal representative of PSO. Functions are shown below.

- 1) To undertake the administrative, technical and financial matters, to carry out the items which the Supreme Council and the Board of Directors approve.
- 2) To employ, suspend or dismiss PSO employees and determine their jobs, salaries and promotions
- 3) To open accounts in the bank to issue authorization for payment.
- 4) To represent the PSO, to give authority to attorneys.
- 5) To prepare reports of the financial situation and current affairs and submit them to the Supreme Council.
- 6) To obtain local loans.
- 7) To fix and change the working hours of each division of PSO.
- 8) To delegate a part of his powers to members of the Board of Directors or PSO staff.

(4) The Deputy Managing Directors

In order to provide general support to the Managing Director, Advisors, Inspectors and some offices which have specialized purposes are established such as Legal Office, Managing Directors Section and Public Relations Office, Administration Office, Port Guard and Security.

In addition, four main department, namely Finance and Administration Department, Planning and Project Department, Technical and Engineering Department and Operation Department, are established and they are headed by the four Deputy Managing Directors.

- 1) The Finance and Administration Department has two divisions concerning general administration matters and financial and fiscal matters.

- 2) The Technical and Engineering Department has three divisions concerning technical and procurement.
- 3) The Planning and Project Department has three divisions concerning port investment planning and personnel training. It is one of the characteristic points of the PSO organization that the Planning and Project Department is in charge of organizational matters.
- 4) The Operation Department has three divisions concerning provision of marine and port service and international maritime affairs.

2.1.3 Personnel

(1) Number of Personnel

Table 2.2.3-1 shows the number of PSO employees by age in 1993. PSO head office has 382 personnel which is about 6% of total PSO personnel.

Table 2.2.3-2 shows the movement of the number of PSO employees registered during the period of 1987 to 1993. The total number of employees was reduced by 11% during the period.

The number of personnel at the Abbas port authority was reduced by 33% followed by the Chabahar port authority with 30%.

This is partly because PSO introduced its privatization policy, as explained later.

(2) Appointment, Adoption and Promotion of Personnel

1) Appointment of Managing Director, Deputy Managing Directors and Port directors

(a) PSO Head Office

The Managing Director of PSO is recommended by the Minister of Road and Transportation and appointed by the Supreme Council. The Deputy Managing Director is recommended by the Managing Directors and appointed by the Supreme Council.

(b) Port Authority

The Port Director is recommended by the Deputy Managing Director and appointed by the Board of Directors. The Deputy Port Director is recommended by the Port Director and appointed by the Board of Directors. Board of Directors also appoints some specific posts such as the chief of the Financial Division and the chief of the Port Operation Division of port authorities.

2) Recruitment of Personnel

At present, PSO employs persons who have bachelor degrees or higher as clerk personnel. PSO interviews the applicants and selects candidates. (PSO does not hold a written examination.) After permission of PBO and Administration and Employment Organization, PSO can recruit them. PSO head office employs all clerk personnel

Table 2.1.3.1 Number of PSO Employees by Age Group (in 1993)

	Total	Years Old					
		-30	31-40	41-50	51-60	61-	
PSO Head Office	382	57	81	180	58	6	
share(%)	100.0%	14.9%	21.2%	47.1%	15.2%	1.6%	
Persian Gulf	Imam Khomeini	1872	165	375	709	523	100
	share(%)	100.0%	8.8%	20.0%	37.9%	27.9%	5.3%
	Busher	696	43	163	374	109	7
	share(%)	100.0%	6.2%	23.4%	53.7%	15.7%	1.0%
	Abbas	1518	83	282	796	295	62
	share(%)	100.0%	5.5%	18.6%	52.4%	19.4%	4.1%
	Chabahar	182	42	67	56	17	-
	share(%)	100.0%	23.1%	36.8%	30.8%	9.3%	0.0%
Khoramshahr	275	21	35	131	70	18	
share(%)	100.0%	7.6%	12.7%	47.6%	25.5%	6.5%	
Sub total	4543	354	922	2066	1014	187	
share(%)	100.0%	7.8%	20.3%	45.5%	22.3%	4.1%	
Caspian Sea	Anzali	646	48	275	247	76	-
	share(%)	100.0%	7.4%	42.6%	38.2%	11.8%	0.0%
	Now Shahr	372	44	65	181	69	13
	share(%)	100.0%	11.8%	17.5%	48.7%	18.5%	3.5%
	Oromieh	49	-	5	23	17	4
share(%)	100.0%	0.0%	10.2%	46.9%	34.7%	8.2%	
Sub total	1067	92	345	451	162	17	
share(%)	100.0%	8.6%	32.3%	42.3%	15.2%	1.6%	
TOTAL	5992	503	1348	2697	1234	210	
share(%)	100.0%	8.4%	22.5%	45.0%	20.6%	3.5%	

Source : PSO

Table 2.1.3.2 Number of PSO Employees from 1987 - 1993

		1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94
PSO Head Office		366	361	367	382	339	371	382
(1987=100%)		100.0%	98.6%	100.3%	104.4%	92.6%	101.4%	104.4%
Persian Gulf	Imam Khomeini	1,599	1,577	1,815	1,840	1,904	1,946	1,872
	(1987=100%)	100.0%	98.6%	113.5%	115.1%	119.1%	121.7%	117.1%
	Busher	868	887	916	845	817	756	696
	(1987=100%)	100.0%	102.2%	105.5%	97.4%	94.1%	87.1%	80.2%
	Abbas	2,235	2,146	1,979	2,092	2,096	1,622	1,518
	(1987=100%)	100.0%	96.0%	88.5%	93.6%	93.8%	72.6%	67.9%
	Chabahar	262	310	394	477	429	204	182
	(1987=100%)	100.0%	118.3%	150.4%	182.1%	163.7%	77.9%	69.5%
Khoramshahr	265	155	85	106	105	141	275	
(1987=100%)	100.0%	58.5%	32.1%	40.0%	39.6%	53.2%	103.8%	
Sub total	5229	5075	5189	5360	5351	4669	4543	
(1987=100%)	100.0%	97.1%	99.2%	102.5%	102.3%	89.3%	86.9%	
Caspian Sea	Anzali	752	734	730	724	724	698	646
	(1987=100%)	100.0%	97.6%	97.1%	96.3%	96.3%	92.8%	85.9%
	Now Shahr	339	334	347	341	372	359	372
	(1987=100%)	100.0%	98.5%	102.4%	100.6%	109.7%	105.9%	109.7%
	Oromieh	52	52	53	56	55	48	49
(1987=100%)	100.0%	100.0%	101.9%	107.7%	105.8%	92.3%	94.2%	
Sub total	1,143	1,120	1,130	1,121	1,151	1,105	1,067	
(1987=100%)	100.0%	98.0%	98.9%	98.1%	100.7%	96.7%	93.4%	
TOTAL	6,738	6,556	6,686	6,863	6,841	6,145	5,992	
(1987=100%)	100.0%	97.3%	99.2%	101.9%	101.5%	91.2%	88.9%	

Source : PSO

including port authority staffs, and transfers them to each division. The Administration Division of PSO head office is in charge of employment affairs.

Concerning the hiring of marine work and operational work personnel, persons who are selected by the port authority after graduation are sent to special schools corresponding to job types such as marine school for three years. After graduating from the special schools, they take an entrance examination. After passing the examination, they enter the training centers at Abbas port authority and Anzali port authority for two years. After that, they are employed by each port authority .

3) Promotion of Personnel

(a) PSO Head Office

Promotion of personnel who are under the Deputy Managing Director class is recommended by the Deputy Managing Director, and decided by the Managing Director.

The evaluation system of the employee is such that each chief evaluates the capability and working manner of an employer and then may recommend promotion to the Deputy Managing Director. The systems to evaluate personnel objectively such as staff evaluation report system have not yet been introduced at moment. The employees are evaluated subjectively by their chiefs.

Sometimes the PSO staffs are appointed from entities outside of PSO such as private companies etc..

(b) Port Authority

For clerk personnel who are under the Deputy Port Director class, the Deputy Port Director recommends a candidate to the Port Director. If the Port Director approves, he recommends the candidate to Managing Director for final approval. But sometimes the Deputy Port Director recommends a candidate directly to the Deputy Managing Director concerned, then he gives his recommendation to the Managing Director. The evaluation system is the same as PSO head office such that each chief evaluates the capability and working manner of an employee then may recommend him to the Deputy Port Director.

Promotion of marine work and operational work personnel can be decided by the Administration and Financial Department of each port authority in general. Specific job type employees such as pilots can promote to higher possessions after examinations held at the training center at the Abbas port authority.

4) Personnel Movement

There is personnel transfer between PSO head office and the port authorities. The Port Directors Deputy Port Director and some other personnel of the port authority are transferred from PSO head office. The engineers in particular are often transferred

between the port authorities, and this is performed through a mutual agreement.

(3) Working Conditions

The working conditions of PSO personnel are regulated mainly by the Labor Law, National Employment Law and PSO law. According to these laws and regulations, a person who has reached the mandatory retirement age (65 years old) or worked for 30 years has to retire.

At present PSO is encouraging employees to retire at age 55 or after 25 years of service to promote privatization of port operations. PSO does not, however, provide any special allowance for people who retire early.

As with other governmental organizations, the PSO does not have labor unions.

(4) Training System

PSO has two types of training course, namely long term and short term courses. An outline of each is shown below.

1) Short-Term Training Course

The short-term training courses are held for marine work staff and operational work staff. The courses have a variety of curriculums and the terms are normally three months. After finishing these training courses, the trainees receive certifications which are necessary for them to be promoted to higher class jobs. The training centers at Abbas and Anzali port authorities are in charge of the short-term training courses. The training centers plan and conduct these curriculums. Marine work staff and operational work staff, however, refine their skill mainly through on the job training.

2) Long-Term Training Course

The long-term training courses are held for clerk personnel. As shown below, two types of long term courses are prepared. Both PSO Central personnel and port authority personnel can participate. The Organization and Training Division of PSO head office arranges these courses.

a) PSO sends clerk personnel to domestic universities and institutes for them to master knowledge needed for their work. PSO has contracts with 17 universities. PSO personnel study at these universities, and complete the necessary courses. PSO also sends the personnel to "The Iran Administration and Management Institute". The period changes by each course; normally it is two to four years.

PSO personnel can go to university two or three days a week, and go to the office the other days. Or, they can go to university in the morning and go to the office in the afternoon. If they have to work overtime because of attending university, PSO compensates them.

b) PSO sends personnel to international maritime institute and university for them to study highly specialized maritime affairs. PSO sends them to "The International Maritime Law Institute" in Malta and "The World Maritime University" in Sweden. The period of study is normally one year.

In the former, they study international maritime regulations and treaties, PSO only sends personnel who have a Bachelor of Law. They are later assigned to the Maritime Specialized Organization Division.

PSO, however, does not hold any general training courses. PSO plans to prepare this type of training course.

2.1.4 Budget

(1) Flow of Income and Expenditure

1) Income

The income from the ports are transferred to the special account of PSO. The income can be used exclusively for the port expenditure in principle.

2) Expenditure

The expenditure of PSO is covered by two accounts. One of them is the general account from Government, which should be exclusively used for large scale investment of the ports. The other is the special account of PSO which, as mentioned above, can be used exclusively for the port expenditure. It can also be used for investment of the port, if there is a surplus.

(2) Outline of Investment Budget

The Budget of PSO is classified into operational budget and investment budget. Table 2.2.4-1 shows outline of the recent investment budget from 1989 to 1992. As shown in the Table, the investment budget was mainly allocated to Shahid Rajaei Port until 1991, and after that to the Imam Khomeini Port and Shahid Rajaei Port. More than half of the budget is allocated to those two ports.

(3) Budget-Making Procedure

The budget-making procedures of the PSO special account and general account are different. An outline of each follows.

1) The general account

After Department estimates investment budget for the coming year, PSO head office collects them and arranges the draft budget of PSO. After approval of the Board of Directors, it is submitted to PBO through the Ministry of Road and Transportation. PBO examines proposed budgets of all Ministries and institutes of Government. PBO

arranges them for the National budget. PBO submits it to the Parliament for final approval.

Table 2.1.4.1 Investment Budget of PSO

	(million RLS)				
	1989/90	1990/91	1991/92	1992/93	1993/94
Development of Imam Khomeini Port	756	5,225	9,914	11,845	19,301
Rehabilitation of Imam Khomeini Port	128	450	700	524	3,130
Grain Berth of Imam Khomeini Port	78	480	293	119	1,072
Silo of Imam Khomeini Port	-	-	50	14	799
Development of Shahid Rajaei Port	2,481	28,352	6,300	7,945	20,393
Development of Bushehr Port	558	1,230	1,999	1,920	3,943
Rehabilitation of Khoramshahr Port	125	846	2,375	3,544	8,896
Rehabilitation of Abadan Port	70	130	79	316	910
Others	907	1,099	2,122	2,240	10,677
Total	5,103	37,812	23,832	28,467	69,121

2) PSO special account

After Department estimates its operational budget for the coming year, PSO head office collects them and arranges the draft budget of PSO. After approval of the Board of Directors, it is submitted to PBO through the Ministry of Road and Transportation. And after approval PBO it is submitted to the Supreme Council and then to the Parliament.

(4) Revision and Diversion of Budget

The budget is allocated to each port authority. The item-wise budget of the port is fixed. The major nine items of the operational budget are shown below.

Code No 8100 Salary and allowance for clerks

Code No 8200 Other personnel cost

Code No 8300 Service contracts

Code No 8400 Maintenance and repair

Code No 8500 Fuel

Code No 8600 Water and electricity

Code No 8700 Wage for workers

Code No 8800 Other administration cost

Code No 8900 Reserve for emergency

There are sub-codes for each code. In Code No 8400, for example, sub-code No 8440 is for repair of equipments, sub-code No 8445 is for procurement of spare parts.

If the port authority intends to use the budget beyond the sub-code-wise budget, approval of PSO head office (the Administration and Finance Department) is necessary.

If PSO intends to use more than total budget, approval of the Board of Directors, the Supreme Council and the Parliament is necessary.

2.2 Overall Assessment of Port Management and Operation Affairs

2.2.1 National Port Authorities

In this section, a general outline of current port management and operation practices in Iran is summarized as a base of assessment of port management and operation affairs.

(1) Ports and Shipping Organization (PSO)

In Iran, the Ministry of Roads and Transportation controls the construction related to roads and transportation, and land, marine and sky transportation, and it plans and constructs for the purpose of economic development and national land defence.

PSO is the state-run port management entity under the Ministry of Roads and Transportation.

PSO is responsible for the construction, maintenance, management and operation of Iranian commercial ports. PSO is also in charge of administration of the Iranian coastal and river waters area.

The Supreme Council of PSO, which is composed of heads of relevant Ministries and organizations, is the supreme decision-making organization of PSO. PSO has its head office in Tehran and seven port authorities at the major ports:

(2) Port Authority

Under PSO head office, seven port authorities, shown below, have been established. These authorities manage and operate commercial ports and administrate the coastal area and water areas.

- 1) Abbas Port Authority (ABPA)
- 2) Imam Khomeini Port Authority (IKPA)
- 3) Bushehr Port Authority (BPA)
- 4) Chabahar Port Authority (CPA)
- 5) Anzali Port Authority (ANPA)
- 6) Now Shahr Port Authority (NSPA)
- 7) Urumia Port Authority (UPA)

These authorities normally administrate plural ports and water area of oil ports and small local ports. For example, Abbas port authority administrates two major ports (Shahid Rajaei Port, Shahid Bahonar Port), two minor ports (Lengeh, Jask), water area of several minor local ports and two oil ports. At the major ports, the port authorities conduct cargo handling operation. Table 2.4.1.1 shows the name of the ports controlled by each port authority.

Figure 2.4.1.1 shows the organization chart of Imam Khomeini port authority (IKPA,

and so forth).

Table 2.2.1.1 Port Authority Offices and their Jurisdictional Ports

Port Authority Office	It's Jurisdictional Ports		Reference
Imam Khomeini Port Authority	Major Port	Imam Khomeini	
	Minor Port	Khoramshahr Abadan	War - Damaged War - Damaged
	Oil Port	Mahshahr	
Abbas Port Authority	Major Port	Shahid Rajaei Bahonar	
	Minor Port	Lengeh Jask	
	Other Port	Hormoz Qeshm Abu Musa Dargahan Kish Island Kong	
	Oil Port	Sirri Lavan Island	
Bushehr Port Authority	Major Port	Bushehr	
	Minor Port	Deylam Genaveh Deyyer Asalu Kangan Kharg Island	
	Oil Port	Kharg Island	
Chabahar Port Authority	Major Port	Chabahar	
Anzali Port Authority	Major Port	Anzali	
Now Shahr Port Authority	Major Port	Now Shahr	
	Minor Ports	Amir Abad Fereydunkenar	Under Construction Under Construction
Urumia Port Authority	Other Port	Urumia	

(3) Personnel

The number of PSO personnel is about 5,990. The port authorities have a large number of personnel because they have their own personnel to conduct cargo handling service by themselves as mentioned below.

(4) Port management

PSO owns all land and major infrastructure and facilities of the ports except oil ports and navy bases. The berths are open to public use in principal, except oil berths. Container vessels without crane are given priority at container berths of Imam Khomeini port and Shahid Rajaei port which are equipped with the gantry cranes.

(5) Cargo Handling Services

At the major ports, cargo handling service is provided by the port authorities and private companies.

Private entities provide cargo handling service on ships, while port authority conducts on land-cargo-handling service at the major ports along the Persian Gulf. At the

major ports along the Caspian Sea, the port authorities and private entities provide cargo handling service on ships, while port authority conducts on land-cargo-handling service. Entities which want to provide stevedoring service have to get a license from PSO.

Concerning PSO's cargo handling service, it should be noted that cargo delivery operation including customs clearance is not efficient in general and is very time-consuming. Long turn-around-time of vessels is often observed which is possibly due to improper cargo handling practice such as direct delivery operation of cargo.

(6) Financial Condition

PSO has its own special account. The income from the ports is transferred to this account. The income can be used exclusively for the port expenditure in principle. PSO has been able to make a profit in this account.

However, PSO gets a subsidy from Government. Large scale investments are made with this subsidy. In this context, PSO is not financially independent from Government.

The financial condition of PSO is not sound enough to allow for large scale port development.

(7) Tariff Structure

In the PSO tariff, the charges which shipping companies should pay are defined in dollars, which had been defined in Rials until 1992. In the fiscal year 1993, it was changed to US dollars using the former official fixed rate (one dollar = 70 Rials) which was different from the actual value, and therefore the tariff is higher than average ports.

On the other hand, the charges on consignees of cargo are defined in Rials, which have not been changed for a long time.

PSO has authority to revise almost all items of its tariff. Permission of the parliament, however, is necessary concerning the revision of several items.

2.2.2 Findings on Current Situation and Issues of Port Management and Operation Affairs

Positive and negative findings of current situation and relevant issues to be discussed on port management and operation affairs are listed here below.

(1) Positive Findings

1) PSO has appropriate competence to control port area and infrastructure.

PSO owns land and major infrastructure and facilities of the commercial ports. PSO can administrate Iranian coast area and water area.

2) PSO aggressively promotes privatization of port activities.

PSO had already planned to promote privatization of the port activities in the first five-year plan. PSO is now also promoting privatization of the operational sections of port authorities.

3) PSO promotes introduction of information system to port management.

PSO aggressively intends to introduce information systems for port management and operation. PSO has already introduced various kinds of office management systems.

4) Accounting system is modernized.

As mentioned above, PSO has its own special account. PSO prepares modern financial statements of this account.

5) PSO has a comparatively sufficient statistics database.

PSO has databases of port statistics of recent years including detailed commodity wise cargo volume by each ship and origin port and destination of ship. The database is input into the computer system.

(2) Negative Findings

1) Port promotion activity is not sufficient.

PSO does not conduct any port promotion. This may be based on the understanding that the public sector does not need any port sales activity.

2) Tariff system is not modernized

In the PSO tariff, the charges which shipping companies should pay are comparatively high because they were changed to US dollars using the former official fixed rate which was different from the actual value, while the charges to be paid by consignees of cargo are defined in Rials. The above situation seems to value the tariff not attractive to shipping companies.

3) Training system and staff evaluation system is not modernized.

PSO does not hold any general training courses for its administrative personnel. Systems to evaluate personnel objectively such as staff evaluation report system are not introduced at the moment. The employees seem to be evaluated subjectively by their chiefs.

4) Decentralization is not sufficient.

PSO is not financially independent from Government because large scale investment

is made using the subsidy from Government. And permission of the parliament is necessary to change several items of PSO tariff.

PSO head office still seems to have excess administrative power against Port Authorities in the field of port operation, personnel affairs, procurement procedure, port planning and development.

5) Port operation is not efficient

As mentioned above, cargo delivery operation including customs clearance is not efficient in general with time-consuming practice. Also, long turn around time of vessels is observed which is possibly due to improper cargo handling operation such as direct delivery of cargo.

6) Management system of port area and port infrastructure and facilities is not modernized.

There is not a clear and objective management policy for port area and port infrastructure and facilities. Absence of modernized port management system based on clear and objective policy may normally jeopardize proper management of port area and port infrastructure and facilities.

7) PSO does not have sufficient data-bases necessary for port planning and administration.

PSO does not have sufficient data-bases such as data on ship calling, usage of port facilities and cargo handling efficiency, which are necessary for port planning and proper port administration.

(3) Issues Requiring Improvement

1) Further promotion of privatization of port activities.

Cargo handling service is mainly provided by Port Authorities. PSO should promote privatization of the operational sections of Port authorities to upgrade the efficiency and quality of cargo handling service expecting to reduce the national expenditure.

2) Further promotion of decentralization

It is important that PSO becomes financially independent from Government and has the power to decide investments to realize more efficient and financially sound port management and operation

And, it is also desirable to transfer a part of administrative competence of PSO gradually to the port authorities to provide the port users with higher quality services in the future.

3) Introduction of information system to improve port management and operation.

Further promotion of introduction of information system is desirable. Introduction of systems for container terminal operation, in particular, is effective in providing efficient service.

4) Improvement of tariff system

PSO should modify its tariff system to attract more customers while maintaining sound financial condition for future port development.

5) Improvement of training system and staff evaluation system.

PSO should improve training system for administrative and operational staff. And, introduction of a modern personnel evaluation system by which PSO staff can be objectively evaluated is desirable to raise morale of port authorities' staff and to promote their ability.

6) Introduction of aggressive port promotion activity

Port promotion activities are vital for the Iranian ports to attract more customers and become hub ports in this area. This will contribute to development of the Iranian national economy.

7) Introduction of modern port management system

Basic administration policy and plan for development and conservation of port area should be formulated. Port area should be properly controlled based on this policy and plan.

8) Improvement of statistics and recording system

Statistics and recording system should be further improved. This is necessary to realize proper port planning and port administration.

2.3 Scale and Pattern of Seaborne Cargo

2.3.1 Cargo handling volume by port

Table 2.3.1.1, 2.3.1.2, 2.3.1.3 and Figure 2.3.1.1, 2.3.1.2, 2.3.1.3 show the total cargo handling volume (import and export) by port in major Iranian Ports.

Total cargo handling volume of Imam Khomeini Port and Abbas Port(Rajae Port and Bahonar Port) has increased constantly every year since 1988/89, from a 70% share in 1988/89 to an 85% share in 1993/94. In particular, the share of export cargo handling volume reached 95% in 1993/94. But cargo handling volume of the other four ports is stagnant. The stagnancy of import cargo volume after 1991/92 and the rapid increase of export cargo volume since 1990/91 at Imam Khomeini Port are especially worthy of note.

2.3.2 Cargo handling volume by commodity

Table 2.3.2.1, 2.3.2.2, 2.3.2.3 and Figure 2.3.2.1, 2.3.2.2, 2.3.2.3 show the total cargo handling volume (import and export) by commodity in the six major ports of Iran. Import volume of liquid bulk cargo has steadily increased since 1989/90 and that of general cargo has slowly but steadily increased. On the other hand, steel product cargo volume showed a rapid increase from 1989/90 to 1991/92, fell sharply in 1992/93 and then maintained the same level in 1993/94.

Regarding the export cargo volume, exports of bagged cargo and steel product cargo which were hardly exported at all, prior to 1991/92 suddenly increased at a rapid pace. The general cargo which is the staple article of export cargo as before and the above-mentioned cargoes occupied 93% share of total export cargo.

Table 2.3.1.1 Total Cargo Volume by Port

Import + Export Unit:1,000 tons

Port Name	1988/89		1989/90		1990/91		1991/92		1992/93		1993/94	
	tons	Share	tons	Share	tons	Share	tons	Share	tons	Share	tons	Share
Persian Gulf												
1 Imam Khomeini	1,815	13.3%	5,631	32.0%	6,293	30.5%	8,982	38.0%	8,924	35.9%	10,047	37.0%
2 Abbas	7,676	56.1%	8,011	45.5%	9,306	45.1%	9,735	41.2%	11,008	44.3%	13,224	48.7%
Rajae	4,726	34.6%	5,834	33.1%	6,688	32.4%	5,949	25.2%	7,281	29.3%	9,341	34.4%
Bahonar	2,950	21.6%	2,177	12.4%	2,618	12.7%	3,786	16.0%	3,727	15.0%	3,883	14.3%
3 Bushehr	2,196	16.1%	1,799	10.2%	2,094	10.1%	2,017	8.5%	1,967	7.9%	1,586	5.8%
4 Beheshti	632	4.6%	900	5.1%	1,025	5.0%	1,021	4.3%	1,262	5.1%	818	3.0%
Sub-Total	12,319	90.1%	16,341	92.8%	18,718	90.7%	21,755	92.0%	23,161	93.3%	25,675	94.6%
Caspian Sea												
5 Anzali	334	2.4%	803	4.6%	1,226	5.9%	1,193	5.0%	1,068	4.3%	1,078	4.0%
6 Noshahr	1,025	7.5%	460	2.6%	702	3.4%	691	2.9%	601	2.4%	396	1.5%
Sub-Total	1,359	9.9%	1,263	7.2%	1,928	9.3%	1,884	8.0%	1,669	6.7%	1,474	5.4%
TOTAL	13,678		17,604		20,646		23,639		24,830		27,149	

Source: Ports & Shipping Organization

Table 2.3.1.2 Import Cargo Volume by Port

Import Unit:1,000 tons

Port Name	1988/89		1989/90		1990/91		1991/92		1992/93		1993/94	
	tons	Share	tons	Share	tons	Share	tons	Share	tons	Share	tons	Share
Persian Gulf												
1 Imam Khomeini	1,688	13.6%	5,161	31.7%	5,866	30.4%	7,930	37.3%	7,368	33.9%	7,259	32.0%
2 Abbas	6,605	53.1%	7,231	44.4%	8,523	44.2%	8,634	40.6%	9,698	44.6%	11,740	51.8%
Rajae	4,262	34.3%	5,418	33.3%	6,389	33.1%	5,462	25.7%	6,616	30.4%	8,410	37.1%
Bahonar	2,343	18.9%	1,813	11.1%	2,134	11.1%	3,172	14.9%	3,082	14.2%	3,330	14.7%
3 Bushehr	2,149	17.3%	1,729	10.6%	1,966	10.2%	1,796	8.4%	1,774	8.2%	1,412	6.2%
4 Beheshti	631	5.1%	898	5.5%	1,024	5.3%	1,017	4.8%	1,260	5.8%	816	3.6%
Sub-Total	11,073	89.1%	15,019	92.3%	17,379	90.0%	19,377	91.1%	20,100	92.4%	21,227	93.7%
Caspian Sea												
5 Anzali	333	2.7%	801	4.9%	1,225	6.3%	1,192	5.6%	1,055	4.9%	1,036	4.6%
6 Nowshahr	1,023	8.2%	457	2.8%	699	3.6%	691	3.3%	593	2.7%	388	1.7%
Sub-Total	1,356	10.9%	1,258	7.7%	1,924	10.0%	1,883	8.9%	1,648	7.6%	1,424	6.3%
TOTAL	12,429		16,277		19,303		21,260		21,748		22,651	

Table 2.3.1.3 Export Cargo Volume by Port

Export Unit: 1,000 tons

Port Name	1988/89		1989/90		1990/91		1991/92		1992/93		1993/94	
	tons	Share	tons	Share	tons	Share	tons	Share	tons	Share	tons	Share
Persian Gulf												
1 Imam Khomeini	127	10.2%	470	35.4%	427	31.8%	1,052	44.2%	1,556	50.5%	2,788	62.0%
2 Abbas	1,071	85.7%	780	58.8%	783	58.3%	1,101	46.3%	1,310	42.5%	1,484	33.0%
Rajae	464	37.1%	416	31.3%	299	22.3%	487	20.5%	665	21.6%	931	20.7%
Bahonar	607	48.6%	364	27.4%	484	36.0%	614	25.8%	645	20.9%	553	12.3%
3 Bushehr	47	3.8%	70	5.3%	128	9.5%	221	9.3%	193	6.3%	174	3.9%
4 Beheshti	1	0.1%	2	0.2%	1	0.1%	4	0.2%	2	0.1%	2	0.0%
Sub-Total	1,246	99.8%	1,322	99.6%	1,339	99.7%	2,378	100.0%	3,061	99.3%	4,448	98.9%
Caspian Sea												
5 Anzali	1	0.1%	2	0.2%	1	0.1%	1	0.0%	13	0.4%	42	0.9%
6 Nowshahr	2	0.2%	3	0.2%	3	0.2%	0	0.0%	8	0.3%	8	0.2%
Sub-Total	3	0.2%	5	0.4%	4	0.3%	1	0.0%	21	0.7%	50	1.1%
TOTAL	1,249		1,327		1,343		2,379		3,082		4,498	

Source: Ports & Shipping Organization

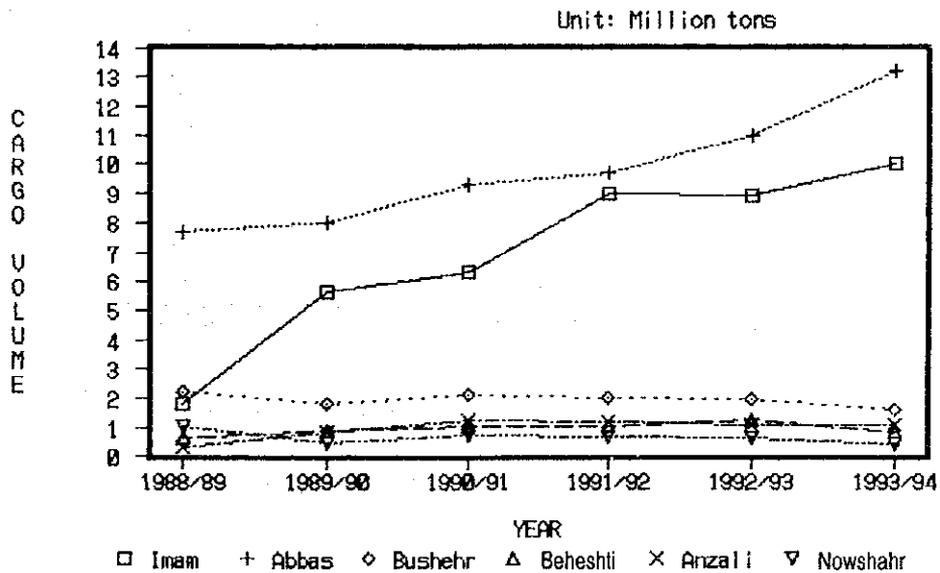


Figure 2.3.1.1 Total Cargo Volume

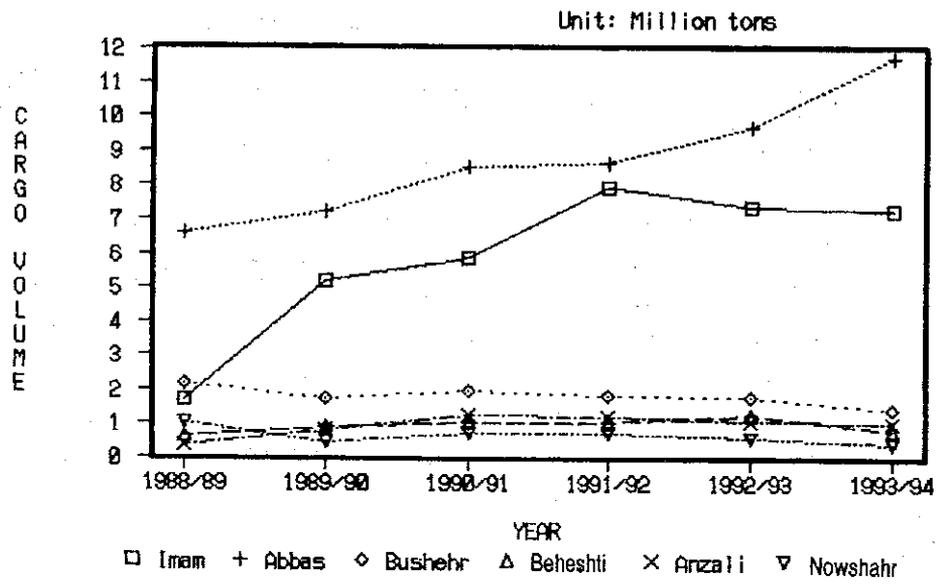


Figure 2.3.1.2 Import Cargo Volume

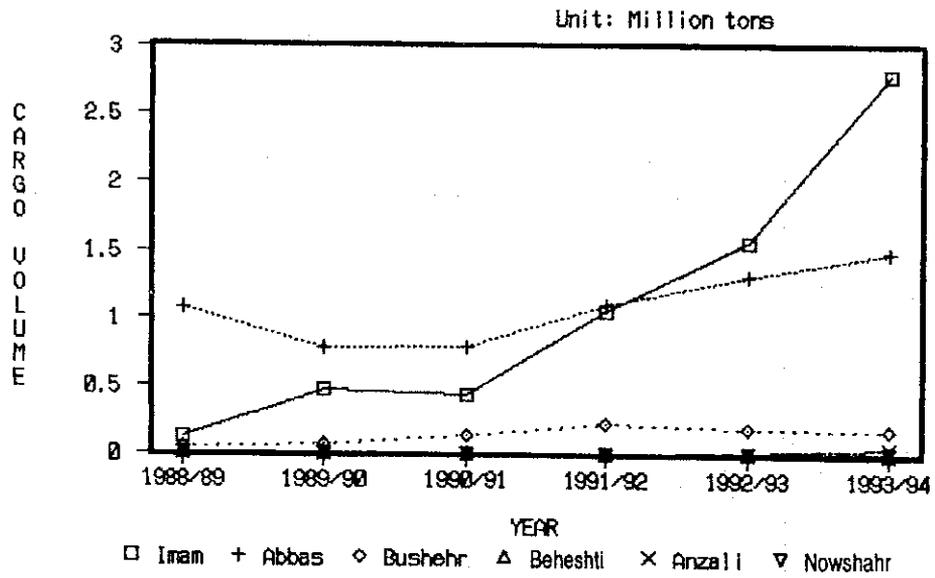


Figure 2.3.1.3 Export Cargo Volume

Table 2.3.2.1 Total Cargo Volume by Commodity

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, Bushehr, Rajae, Bahonar and Beheshti

Caspian Ports ----- Anzali and Nowshahr

Table 2.3.2.2 Import Cargo Volume by Commodity

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%

Table 2.3.2.3 Export Cargo Volume by Commodity

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

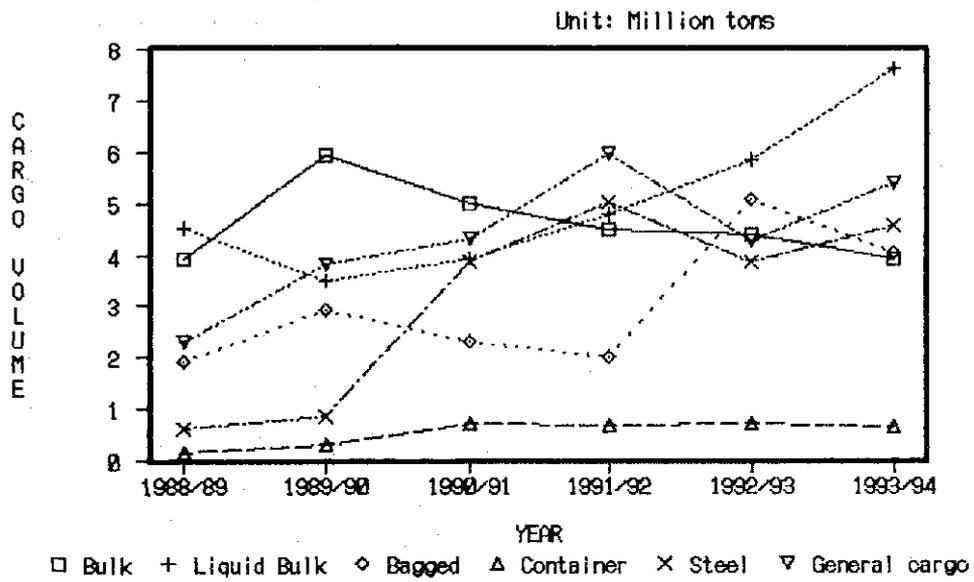


Figure 2.3.2.1 Total Cargo Volume

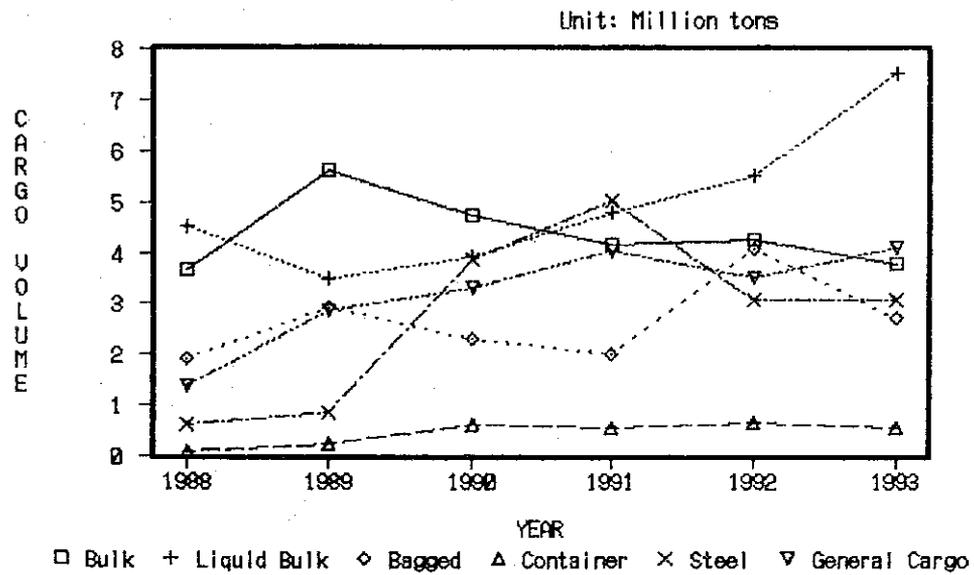


Figure 2.3.2.2 Import Cargo Volume

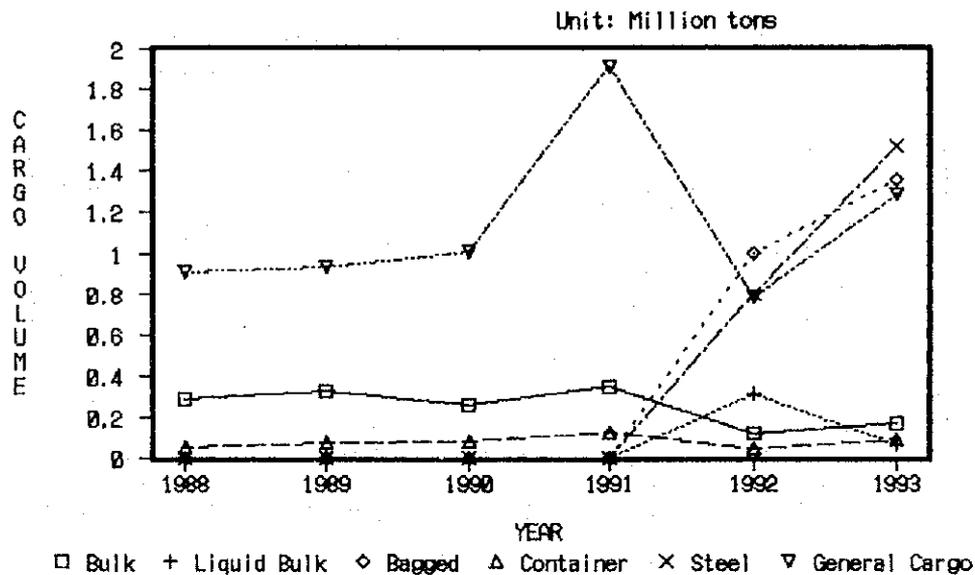


Figure 2.3.2.3 Export Cargo Volume

2.4 Situation of Port Facilities

Current situation of the existing main facilities at Major Ports are shown in Table 2.4.1.1.

Table 2.4.1.1 Major Port Facilities and Equipments at Major Iranian Ports

Port	Major mooring facilities			Major Cargo handling equipment	
	Kind of berth	Length (m)	Depth (m)	Kind of cargo handling equipment	Number of good condition crane
Khorramshahr	Multi purpose berth	720	3.5	Unknown	-
Abadan	General cargo berth	490	4.5	Unknown	-
	Others	520	4.5		
T. Khomeini Khomeini				Container crane	2
				Portal Jib crane	6
				Unloader	7
				Grain loader	1
				Transfer crane	2
Busher				Mobile crane	17
	General cargo berth	419	9.0	Mobile crane	16
	Dolphin berth	-	9.0		
S. Rajae	Container berth	1000	12.0	Container crane	2
	Multi purpose berth	400	12.0	Unloader	2
	Heavy cargo berth	719	12.0	Transfer crane	10
	General cargo berth	2200	12.0	Mobile crane	31
S. Bahonar	General cargo berth	1000	10.0		
S. Beheshti	Multi purpose berth	150	9.0	Unloader	4
	Multi purpose berth	450	10.0	Mobile crane	8
S. Kalantary	Pontoon berth	480	2.0-4.0		
	Multi purpose berth			Under construction	
Anzali	Multi purpose berth	646	5.5	Unloader	2
				Portal Jib crane	5
				Mobile crane	17
Nowshahr	General cargo berth	450	5.0	Unloader	2
				Mobile crane	22

Source: PSO

2.5 Natural Condition

2.5.1 General Climate in Iran

Because of its varied topography, Iran has a variety of climates but generally speaking it is said to have a continental type of climate which is indeed true of a major part of its interior. Temperatures vary considerably from season to season and from one place to another. The interior deserts of Iran are amongst the hottest in the world but mountains play on all important part in lowering the temperature. Although the average temperature for the whole country is quoted as 18 degrees centigrade, it should be noted that the maximum of over 50° and minimum of -30° are common to the mountainous areas of the north and northwest and to the interior and southern deserts and lowlands.

Rainfall of Iran is rather scanty and this applies particularly to the plateau section of the country.

The Caspian sea littoral is the only exception to the rule. All over the plateau, rainfall is produced by the winter depressions that take their origin in the Mediterranean Sea. Here rainfall is limited to the cold months of the year and its distribution is strongly dominated by topography. Higher level of ground and windward slopes facing the direction of western moisture bearing winds receive more rainfall than the low plains and deserts. The average for the country as a whole is around 35 centimeters per annum. The Caspian fringe receives its rain throughout the year. Here the annual precipitation ranges from above 150 centimeters in the west to about 50cm in the east.

For the country as a whole, it may be said that, the temperature decreases from south to north and from west to east, whereas rainfall assumes a similar pattern from north to south and from west to east. Briefly the Caspian area has a temperate climate with relatively plenty of rainfall and moderate temperature, the western and the northwestern mountainous areas enjoy a Mediterranean climate with cold rainy winters and dry hot summers. The Persian Gulf littoral suffers from hot and almost moist but few rain climate and the remaining central and eastern parts of Iran are the domains of various arid climates.

2.5.2 Natural Conditions at Imam Khomeini Port

This subsection deals with an outline information regarding to the natural conditions to be considered in both the preparation of general plan and design of facilities.

(1) Climatic Condition

Temperature

The Imam Khomeini climate, like that of Khorramshahr, is subtropical, hot and dry, with few clouds for most of the year. Temperature are highest in July with a daily average of about 35°C and maximum average of about 43°C. The lowest temperature

are in January with a daily average of about 12°C and minimum average of about 7°C. Extreme temperature may reach about 50°C in July and drop to about 1°C in December - January. Sun temperature may reach 75°C.

Rainfall

Rainfall is sparse, but the intensity may be considerable. There is normally no rainfall from May to October. Rain occurs mainly in the months of November to February. The total yearly rainfall varies from 100 mm to 300 mm. Daily precipitation of 45 mm is not uncommon and the daily maximum is around 80 mm.

Wind

The most common wind is the "Shama" between W.N.W. and N.N.W. The "Shama" seldom reaches Beaufort force 6 (11 - 14 m/sec) and Beaufort force 8 (17 - 21 m/sec) has been observed on only a few occasions. The average wind speed is Beaufort force 2 to 5, corresponding to about 1 to 2.6 m/sec.

Dust storm usually occurs in the project site during August and September and may reduce visibility to 1 km. The dust comes from the deserts of Iran or the Arabian Peninsula and is particularly fine and damaging to all kinds of mechanical equipment not especially protected.

The salt content of the air is high and special required must be given in order to protect the steel parts and mechanical equipment against corrosion. Fog may occur during November, December and January.

(2) Oceanographic Condition

Tide

Range between LAT and HAT is 5.70 m, however, the normal range is about 5.0 m. The extreme high water records in past is 6.40 m above LAT which is Cesco Chart Datum and is adopted as the datum level (DL) for the project.

LAT = Cesco Chart Datum = Datum Level (DL) for design.

Table 2.5.2.1 shows the tidal characteristics at Imam Khomeini port.

Table 2.5.2.1 Tide Levels

Tidal Characteristics		DL
Extreme High Water	EHW	+6.40m
Highest Astronomical Tide	HAT	+5.70m
Mean Higher High Water	MHHW	+5.00m
Mean Sea Level	MSL	+3.10m
Mean Lower Low Water	MLLW	+0.90m
Lowest Astronomical Tide	LAT	±0.00m
Extreme Low Water	ELW	-0.10m

Current

Maximum currents of 0.8 m/sec were measured for both ebb and flood flows in Dorag Channel and Musa Channel in 1973. Directions were sometimes contrasted to what could be expected according to the shape of channel, however, this is at least partly due to the extremely irregular bottom configuration at the locations of the measurement stations. Maximum currents at some stations were observed to be almost perpendicular to the channel axis.

Tidal currents in the lower part of Musa Channel set N.N.W. and S.S.W., turning at about the time of high water and low water respectively. The greatest rate was recorded at 1.5 knots in February. At the Musa bay, spring tides produce average 4 knots ebb currents and 3 knots flood currents. Current direction through the bay is generally parallel to the channel axis. Strongest tides within the estuary are 4.5 knots during maximum ebb and 3.5 knots during maximum flood, found bear beacon No. 18 about 15 km west of the Western Jetty. Currents in front of the existing two jetties may occur rates of 3.0 knots at maximum ebb and up to 2.3 knots at maximum flood.

Visibility

Fog, visibility less than 1 km due to water droplets in suspension, is very rarely observed in the open Gulf, as compared to along the shore. Haze, visibility less than 8 km, due mainly to dust particles in suspension, is considerably more frequent, particularly in summer. Haze, occurs less than 5 percent of the time in November and December but ranges from 20 - 30 percent in April, to 60 - 70 percent in July, decreasing to less than 30 percent in August.

Wave

The project site is protected well by narrow and bended channels against the washing due to offshore wave, thus the wave intensity in front of proposed quaywall is the main target to be evaluated. It is reported that wave intensity at the port basin is relatively moderate since the limited fetch length. Possible generated wave height in front of the Berth No. 11 were roughly estimated by using the S-M-B method.

Table 2.5.2.2 Range of Wave Height in Imam Khomeini Port

Wind Speed m/sec	Fetch Length F(km)	Height H1/3(m)	Length Lo(m)	Period To(sec)
10	10	0.7	12.5	2.8
15	10	0.9	17.0	3.3
20	10	1.4	22.5	3.8
25	10	1.8	27.5	4.2
30	10	2.2	31.5	4.5

Hydrology

Karun River is the largest one among the major watersheds and rivers draining into

the Persian Gulf. Most of the rivers are essentially seasonal and highly subject to temporary torrential flooding carrying large amounts of brown mud, gravel, sand and boulders. Because of the occurrence of salt formations in the coastal areas, the rivers are frequently of brackish water. In essentially flat regions where the groundwater table is high considerable evaporation takes place resulting in relatively high concentration of salt in the ground water.

Many of the small rivers do not reach the coast as the water is absorbed in alluvial plains, a portion of which subsequently flows into the Persian Gulf as groundwater. Formation of deltas are observed in most major rivers. Tidal influence is frequently measurable fair inland due to the very porous calcareous soil.

Bathymetric Condition

Within Musa estuary the channel is of exceptional depths, averaging DL-20 to -45 meters for the 55 km channel extending from the bar to Imam Khomeini port. These favorable depths also will be extended into two channels, Dorag and Zangi. The seabed in the upper of estuary consists mainly of soft mud and fine silt.

Depths are generally greater to the outside of bends, as in normal to narrow waterways. Then the Zangi Channel branches to the east with depths rapidly decreasing to about DL -4 m minimum and then increasing to over DL -30 m at its eastern extremity due to the turbulence caused by the sharp bend to the north.

Depths in the Zangi Channel diminish to the north and a centerline profile in the continuation of Zangi Channel through Temur Channel to the west and returning to the south generally showed water depth above datum elevation.

The Dorag Channel continues to the west of the junction with Zangi Channel with depths increasing from DL -13 m to -30 m at its junction with Temur Channel. A centerline profile down Kushi Channel showed shallow waters of DL -1 to -3 m.

Average changes of depth in past 20 years in Zangi Channel is about 1.2 m of deposit.

Siltation

Suspended sediment concentrations were measured during 12 months of 1972/73 as part of previous study on siltation. Indications were that silt concentrations are generally low and that sedimentation rates should be low. The silt were fine, relatively uniformly distributed vertically and concentration did not greatly vary during a tidal cycle. However, sediment concentration increased with tidal amplitude.

The coarser sediments moved close to one along the seabed; that concentration was directly related to current velocity. As the seabed was generally composed of these coarse sediments, siltation was expected to result principally from movement of this material. Turbulence of tidal flows, except a closed basin, would prevent most of the finer silt from settling out.

(3) Geotechnical Condition

According to the geological maps issued by the general condition at site is basically categorized as residual stratum to alluvial soil group. It is understood that the soil composition in this area consist of two layers.

Upper Estuarine and Deltaic Deposits

The upper stratum is an estuarine or deltaic deposit of alternating clays, silts and sands. The presence of shells indicates the sediments to have been laid down in a marine environment. Sand layers, in places several meters thick, indicate the sediments have been deposited in shoals.

Lower Residual Stratum

A very stiff to hard slightly cemented clay under heavy preconsolidation. This layer is a hard bottom for purpose of settlement calculation. There is a dense to very dense sand or residual clays starting from DL -30 m to -40 m.

2.5.3 Natural Conditions at Anzali Port

(1) General Climate Around Anzali Port

The climate of the narrow coast along the Southern Caspian is quite distinct from that of the rest of Iran. Unlike the climate in the plateaus and mountains of central and southern Iran, the Caspian shore is characterized by moderate temperature, low daily and annual temperature ranges, high humidity and heavy precipitation. Mean summer temperatures along the coast are about 26°C and mean winter temperatures +7°C.

Average annual precipitation decreases from west to east, with average annual rainfalls of 2,000 mm in Anzali, 1,400 mm in Nowshahr, 800 mm in Babolsar and 500 mm in Gorgan. Heaviest rainfalls in Anzali are generally in the autumn. The driest months are early summer.

Weather at Anzali is moderated in the summer, and in winter temperatures at Anzali rarely go more than several degree below freezing.

Ice sometimes forms on the fresh water of the port basin.

In summer the absolute maximum daily high temperature rarely reaches 35°C and shipping as well as tourist activities are very pleasant.

The yearly precipitation ranges from 1,600 to 2,300 mm, but as much as 353 mm has been recorded in day.

Monthly rainfall ranges from about 4 days of 1 mm or more rain in the summer, to around 10 or 12 days during six winter months. The rain frequency is a factor in cargo movement and in covered storage requirements.

Relative humidity is extreme in Anzali. Average daily humidity ranges from 85% to 99% for Anzali in January and decreases to about 65% to 90% in July.

Fog occurs in Anzali Port but usually only for an hour or two, on about 30 days of the year.

The prevailing wind in this area is from the north. Storms are frequent, and maximum wind can reach 107 knots or 55 m/sec.

Northerly winds prevail in the Western regions of the Iranian Caspian Sea coast. In Eastern region the direction of prevailing winds is predominantly east and west. The frequency of winds over 10 m/sec. and maximum wind velocity also varies from west to east.

(2) Water Level

The Caspian Sea has no tide; however, due to the changing balance of precipitation, discharge and evaporation, as seasonal water level variation of 30 to 40 cm occurs each year.

Since 1,869 of the highest +1.3M C.D, the level of the Caspian Sea has dropped almost 3.3m up to the bottom, -2.0m C.D, in 1,977. An average drop was 3cm/year. (330cm ÷ 108 years) Since 1978, the level is under the recovery process and becomes same level of Chart Datum (C.D). An average increase is 13 cm/year. (200cm ÷ 15 years). If this speed is maintained for next ten years, water level will be +1.3m C.D. which is the same with recorded highest in 1869.

It is unknown that the time when the level can touch the ceiling and how high the level. However, it should be noted that the level was already +1.3m C.D. 125 years ago.

The causes of water level variation in a closed basin such as the Caspian Sea, are usually the following:

- General Changes in weather
- Artificial or natural changes in the course and flows of rivers
- Seismic changes under the seabed, altering the seabed elevations or rate of infiltration or seepage losses.

In the sense of port engineering practice, such a maximum change in 3.3m height is within the ordinary condition. For example, the change of water level or Imam Khomeini Port is more than 4.5m. Thus the problem is on the structures which were built during the lower water period, for example 23 years from 1954 to 1977. If the structures were designed to meet the water level at that time, they should meet the problem during the higher water period, presently or in future.

Currents

There are two basic currents, namely the river currents caused by lagoon discharges and sea current. The former is the prevailing currents in the port basin and inner channel. The discharges run the basin and go the open sea through the breakwater opening. It is reported that this river current is about one knot (0.5 m/sec).

Fine materials are carried by these currents and settle near the entrance.

Alongshore currents, coupled with wave action, create a littoral drift that may destroy or build up beaches. The short term water level variations in the Caspian Sea are due to local effect, such as wind, barometric pressure gradients and seiche effects.

These also influence the current pattern of the sea, but the greatest overall determinate of current velocity and direction are surface winds, river inflows, the earth's rotation, water density gradients and differences in rate of evaporation within the individual basins and from basin to basin.

Littoral Drift and Siltation

There is few erosion in the port basin, although the discharge current is 0.5 m/sec. Water plants can be seen in the port basin, this may imply a few seabed changes.

While the siltation amounting to 250,000 m³ per year is observed. This volume is supported by study in MP-74 and the PSO records of maintenance dredging. About two third of this is deposited in front of the main quaywalls. It is assumed that remaining one third settles at the anchorage bewared the western breakwater and the port entrance.

Zone A	In front of the main quaywalls at the second port basin
Zone B	Widest area at the first port basin
Zone C	Port entrance

Dredging records indicate few situation at zone B.

It is assumed that fine deposits may be removed to the upstream then return to the open sea through the channel.

Siltation at Zone C will be mixed deposits between the discharged ones and littoral drift.

Littoral drift at the port entrance might be affected various phenomenon including the current, waves discharges from the passage, seabed materials, water level and shape of breakwater. It is assumed that the basic direction of coastal currents are the west to the east. Wave induced currents might take mixed direction since it depend on the wave direction.

Thus, the direction of coastal currents may change places one after another.

With the use of available dredging records and 15 successive sounding charts of the port, taken over a 3 years period, the average rate of shoaling for 24 areas of the harbor was computed.

Shoaling was found to vary from about 1.0 m/year in the areas just outside and inside the port entrance to 0.3 m/year in the inner outside and inside the port entrance to 0.3 m/year in the inner basin near the berths. The total sedimentation was estimated to be 390,000 m³/year by this method which compares well with reported dredging of 300,000 to 400,000 m³/year.

Therefore the siltation appears to be more severe in the approach channel than in the inner basin, where, however, it is still considerable.

Since from one half to one third of the total amount of siltation comes from the sea, this would reduce the total siltation to 215,000 - 270,000 m³ per year.

If the flow from the Anzali lagoon would also be eliminated the total amount of siltation could be further reduced to a possible minimum of 13,000 m³ per year and a maximum of 20,000 m³ per year.

One of the major sediment sources is the lagoon. MP-74 provides a short description as follows:

River sediment transport is of direct influence for the Caspian Sea ports of Anzali, Nowshahr and other. Several rivers bring sediment into the lagoon which subsequently empties into the Caspian by way of Anzali Port. In periods of decreasing sea level the lagoon no longer acts as a settling basin and excess sediments from the bed of the lagoon are sluiced into Anzali Port causing sedimentation along the quays and in the dredged channels.

These sedimentation are caused both by river sediments and littoral drift of sands along the coast.

Waves

Along the western Iranian coast, the most intense wave action is from the North, the direction of the stronger prevailing winds and of the longer fetch. Wave heights and direction were observed visually 3 times daily for one year at/from this data it was seen that Anzali Port experiences a relatively high frequency of waves of over 1.0 m height. Storm waves of 3.5 m or more were observed principally in the winter months.

The frequency of storm winds decreases sharply from west to east. Storm wave frequency also decreases in the Gorgan-Babolsar region to about 20% of that in the West.

Forecasts of wave heights from existing wind data show significant wave heights of 1% probability may be as high as 4.0m at Anzali.

Sakoo Report also provide wave observation data together with wave forecasts.

Geotechnical Condition

SPT values of all boring are shown in Figure 6.6.2. Geological log at Borehole No. MB5 is shown in Figure 6.6.4. As seen in these data there are four distinct types of soil. The soil profile which passes through boreholes No.3 and No.5 and No.4 is shown in Figure 6.6.3. The characteristics of each layer is given below:

Fill Materials

This layer is consisted of 10cm of asphalt on the top of 30cm of sub-base materials consisting of sand and gravel. Under the pavement there are fill materials composed of sand with angular fragment of rocks with a 3.0 to 3.20 meters thickness. The average SPT values is between 6 to 16.

Upper Fine Sand

Under the fill material a layer of grey fine sand with a thickness of 6.0 to 6.50 meters are observed. Small amount of shell fragments is detected in this layer. A very distinct behavior which is observed in this layer is the very low SPT values of 4 to 12 at the depth between 5 to 9 meters at B.H 2, 3, 4 and 5.

There is a possibility that a loose layer of sand is deposited at this depth during the sedimentation. However, it is also possible that the fill materials consisting of clean fine sand is deposited. As fragments of artificial materials were not observed up to depth of 5 to 9 meters, it has not been possible to distinguish fill material from the naturally deposited fine sand. In fact it is also reasonable to argue that the naturally deposited sand starts at the very low SPT values at difference boreholes.

Thin layer of Silty Clay (or Clayey Silt)

There is a thin layer of silty clay with a thickness of 30cm to 50cm at the depth of 9.0 to 10 m. The SPT value of the layer is between 10 to 15.

Lower Fine Sand

From the depth of 10 to 16 meters a relatively dense layer of fine sand is observed. The SPT valued increases with depth up to the maximum values of 30 at B.H 3 and 50 at B.H 4. It is believed that the increase is the SPT values and relative density are due to the overburden pressure during the geological time or frequent earthquakes.

Lower Clayey Silt

Underneath the layer of fine sand a thick layer of fine materials consisting clayey silt or silty clay with a thickness of 5.0 to 6.0 meters at all boreholes are observed. The importance of this layer is due to the low SPT values of approximately 0 to 10.

Dense Sand

From the depth of approximately 21.0 meters to 30 meters a very dense grey fine sand is observed. The SPT values are more than 50.

Earthquake and Structures

An earthquake makes the ground shake. Soft layer like a mud layer section generally accelerates its movement by earthquake energy. It is essential for port structure planning to decide the earthquake design magnitude together with its design method.

Earthquake intensity in the design should be one which may happen every 50 years or more, (at a recurrence probability of 50 years or more). The longer year of recurrence, the larger seismic magnitude. Recurrence year should generally be longer than the project life.

It is also important to know the design of the earthquake for the existing port facility. Unfortunately, no design report is available for the existing structures.

Damage by earthquake largely depends on its intensity, distance from an epicenter and soil condition. Among them, most prevailing factor is a size of earthquake, or intensity.

The Institute of Geophysics, Tehran University, has analyzed 70 years of earthquake data for Iran.

The south Caspian Sea coast is subject to earthquakes of magnitude 6 and 7 Modified Mercalli scale, except that to the east between Nowshahr and Farahabad the scale is 7 to 8.

It should be noted that, June 21st 1990, Manjil-Rudbar area in Gilan and Zanjan Provinces was attacked by a large scale earthquake, intensity of which was Magnitude 7.7 in the Richter Scale.

Existing earthquake zoning map indicates that Anzali Port is located at the High Seismic Zone.

2.5.4 Natural Conditions of Other Port

In the Persian Gulf, Abadan and Khoramshahr port face the river. These port need to dredge annually at entrance channel. Also Genaveh, Deylam and Torkaman Port need to dredge.

2.6 Navigation Safety

In adopting measures to promote navigation safety in the ports, or to minimize the occurrence of sea accidents, it is useful to make a detailed examination of past records, in particular to trace the origins of past accidents.

Based on past experience, accidents involve a variety of complex factors. However, excepting unavoidable causes such as unusual natural conditions, most of the factors are enclosed by proper countermeasures that lead to minimizing accidents.

Countermeasures to prevent sea accidents, e.g., navigational aids such as light buoys indicating center line of the fairway and lateral light buoys indicating boundary of the fairway, are arranged roughly. But the positioning of some of them is not reliable, nor are they sufficient in number at the berth approach and manoeuvring area. Maintenance dredging is not periodically executed. Compulsory pilotage for foreign vessels and more than 1500 GRT Iranian Vessels is being enforced, but the current number of manoeuvring vessels is so small that Pilots don't gain the necessary experience.

It has already been mentioned that calling vessels will increase both in size and number in line with the socioeconomic growth in Iran. Even if the current vessel traffic were to remain unchanged in future, it is an important issue for Iranian ports to plan a strategy for preventing loss of lives and property from sea accidents.

Furthermore, it is recommended that local traffic regulations, which are primarily the responsibility of the PSO, be revised.

It will be necessary to seek the cooperation of NIOC, fishery organization and users of the water area to improve the situation for the purpose of navigation safety.

2.7 Cargo Handling System and Equipment

2.7.1 Cargo Handling System

(1) Entity responsible for Cargo Handling Operation

There are two entities responsible for cargo handling operation in major ports. One is that cargo handling operations are conducted by combination of PSO (public) and private companies, the other is conducted by PSO only. Cargo handling System is shown in Table 2.7.1.1.

In the major ports at the Persian Gulf, Imam Khomeini, Bushehr, Rajaei, Bahonar and Chabahar, cargo handling operations on ship are conducted by private companies, while land operations such as transportation in yard storing operation are done by PSO. Cargo handling equipment is operated by PSO staff.

On the other hand, in Anzali and Nowshahr ports, cargo handling operations are

conducted by PSO in principal. Some portions of cargo handling operations on ship are done by private company.

Table 2.7.1.1 Cargo Handling Operations

Port	Cargo handling entity	
	On ship	On land
Imam Khomeini	Private	PSO
Bushehr	Private	PSO
Rajae	Private	PSO
Bahonar	Private	PSO
Chabahar	Private	PSO
Anzali	PSO & Private	PSO
Nowshahr	PSO & Private	PSO

(2) Operating time

Major ports are using the shift system for cargo handling operation in port areas. The operating time in major ports is shown in the following Table 2.7.1.2. "Direct Delivery" mentioned in Table 2.7.1.2 means that cargo is delivered to and from trucks from and to vessels, and this type of delivery is usually performed by private companies although operation of equipment is conducted by PSO.

In Anzali port, PSO makes monthly plan of cargo handling operations based on the number of calling vessels and cargo volume. This monthly plan includes volume of cargo that has to be handled daily. If the daily work is completed before the next shift time, works is officially over.

Table 2.7.1.2 Operating Time in Major Ports

Port	Cargo Type / Handling Method	First Shift		Second Shift		Third Shift	
		From	To	From	To	From	To
Imam Khomeini	Direct Delivery	7:00	15:00	15:00	22:00	22:00	7:00
	Container	7:00	15:00	15:00	24:00	-	-
	Others	7:00	15:00	15:00	24:00	-	-
Rajae	Direct Delivery	7:00	19:00	19:00	7:00	-	-
	Container	7:00	16:00	16:00	2:00	-	-
	Others	7:00	16:00	16:00	2:00	-	-
Anzali	All	6:30	13:45	14:00	20:45	-	-
Nowshahr	All	6:30	13:00	13:00	21:00	-	-
Bushehr	Direct Delivery	6:30	16:30	16:30	2:00	-	-
	Others	6:30	16:30	-	-	-	-
Chabahar	Direct Delivery	7:00	19:00	19:00	7:00	-	-
	Others	6:30	17:00	-	-	-	-

(3) Cargo handling operation

In 1992, the seven major ports handled 24.8 million tons cargoes, of which 21.7 million tons (87.6 %) were imports (unloading) cargo and 3.1 million tons (12.4 %) were exports (loading).

Among major ports, three ports of Imam Khomeini, Rajae and Anzali ports have quay cranes for loading and unloading of cargo except container. Imam Khomeini port purchased six portal jib cranes with the capacity of 15 tons in 1993 which are currently located at berth no.16 to 19. Abbas port has six portal jib cranes with capacity of 15 tons at berths Nos 13 and 14, which are in good condition. Anzali port has three portal jib cranes (2 units of 16 ton capacity, 1 unit of 10 ton capacity) at shore side. In the open yard two cranes of 10 ton capacity are used. There is no quay crane in other ports.

For solid bulk cargo handling, major ports have pneumatic unloaders. There are four units in Imam Khomeini port, two units in Rajae port, two units in Bushehr port, four units in Beheshti port, two units in Anzali port and two units in Nowshahr port. Imam Khomeini port also has a grain terminal with a silo of 70,000 ton capacity and two berths (one pier).

In Imam Khomeini and Rajae ports, general cargo is unloaded and loaded by the above quay cranes, ship's gear, mobile crane or a combination of them. About 50 % of discharging cargo are loaded to trucks directly and then transported to outside. The remaining 50 % of cargo are carried to transit shed or open yard by chassises with tractors or fork lifts. In open yard, cargoes are handled by mobile cranes and fork lifts. Solid bulk cargo except at the grain terminal in Imam Khomeini port is unloaded by the above quay cranes, pneumatic unloader, ship's gear, mobile crane or combination of them. Almost all of discharging cargo is loaded to trucks directly and then transported to outside. This direct delivery sometimes causes a long line of trucks waiting for loading cargo.

In Anzali port, general cargo is loaded and unloaded by quay crane or mobile crane, and solid bulk cargo is unloaded by quay crane, mobile crane or pneumatic crane. In case of discharging, 70 % of general cargo, 50 % of bagged cargo and all of solid bulk cargo are directly transported to outside by trucks. In open yard, there are two portal jib cranes. These cranes, mobile cranes and fork lifts are used for handling of cargo. In transit sheds, fork lifts are used for cargo handling such as loading to truck and stacking.

(4) Cargo Flow in Port Area

In 1991/2, according to PSO statistics published in 1992, 56.1 % of total cargo volume through the ports were directly transported to and from outside the port area from and to vessels by trucks. The remaining cargo of 43.9 % was transported through the transit sheds, warehouses or open yards in the port area. Table 2.6.1.3 shows

cargo movement in the ports in 1991/2 and Table 2.6.1.4 shows number of vehicles used for cargo transportation in each port. In some ports, this direct delivery system sometimes causes a long line of trucks due to long waiting time for loading of cargo.

Table 2.7.1.3 Cargo Movement in Major Ports

PORT	CARGO IN WAREHOUSES BEGINNING OF YEAR	TRANSPORTATION OF CARGO				TOTAL	CARGO IN WAREHOUSES END OF YEAR
		DIRECT DELIVERLY		WAREHOUSE			
		(%)	(%)	(%)	(%)		
Imam Khomeini	274	3,860	50.1%	3,851	49.9%	7,711	435
Bushehr	9	705	85.5%	371	34.5%	1,076	8
Rajae	623	2,704	47.0%	3,047	53.0%	5,751	318
Bahonar	19	1,323	96.5%	48	3.5%	1,371	18
Beheshti	2	739	96.9%	24	3.1%	763	1
Anzali	56	271	68.3%	126	31.7%	397	76
Nowshahr	22	67	38.7%	106	61.3%	173	22
Total South Port	927	9,331	56.0%	7,341	44.0%	16,672	780
Total North Port	78	338	59.3%	232	40.7%	570	98
TOTAL	1,005	9,669	56.1%	7,573	43.9%	17,242	878

Source: PSO

Table 2.7.1.4 Number of Vehicles for Cargo Transportation

PORT	NUMBER OF TRUCKS			NO. OF WAGON
	DIRECT DELIVERY	FROM WARE HOUSE	TOTAL	
Imam Khomeini	84,286	178,969	263,255	38,743
Bushehr	38,808	33,114	71,922	0
Rajae	178,718	147,071	325,789	0
Bahonar	108,294	4,290	112,584	0
Beheshti	48,163	1,494	49,657	0
Anzali	15,508	8,718	24,226	0
Nowshahr	5,031	10,415	15,446	0
Total South Port	458,269	364,938	823,207	38,743
Total North Port	39,672	39,672	39,672	0
TOTAL	478,808	384,071	862,879	38,743

SOURCE: PSO

Cargo flows by type of cargo in Imam Khomeini, Rajaee and Anzali ports are shown in Appendix -2.4. Shares of handled cargo are shown in following Table 2.7.1.5 to 2.7.1.7.

Table 2.7.1.5 Share of Cargo Handled in Imam Khomeini Port

Cargo	Transit Shed (Warehouse)	From/To Vessel Open Shed	Direct Yard	From/to Storage Area Truck Delivery	Rail
Discharged Cargo					
General	15	35	50	100	0
Bagged	100	0	0	90	10
Solid Bulk	0	0	100	0	0
Metallic	0	50	50	90	10
Loaded Cargo					
General	30	10	60	100	0

Table 2.7.1.6 Share of Cargo Handled in Rajaee Port

Cargo	Transit Shed (Warehouse)	From/To Vessel Open Shed	Direct Yard	From/to Storage Area Truck Delivery	Rail
Discharged Cargo					
General	15	35	50	100	0
Bagged	5	5	90	100	0
Solid Bulk	0	0	100	0	0
Metallic	0	50	50	100	0
Loaded Cargo					
General	30	70	0	100	0

Table 2.7.1.7 Share of Cargo Handled in Anzali Port

Cargo	Transit Shed (Warehouse)	From/To Vessel Open Shed	Direct Yard	From/to Storage Area Truck Delivery	Rail
Discharged Cargo					
General	10	20	70	100	0
Bagged	50	0	50	100	0
Solid Bulk	0	0	100	0	0
Metallic	0	60	40	100	0
Loaded					
General	45	45	10	100	0

(5) Storage Facilities

In some ports, no distinction is made between transit sheds and warehouses in the port area. Table 2.6.1.8 lists transit sheds, warehouses and open yards in major ports. The following shows details of facilities in Imam Khomeini, Abbas and Anzali ports.

1) Imam Khomeini Port

There are twelve transit sheds and two warehouses. Size of transit shed and warehouse is 60 x 150 m (9000 m²). Transit sheds are located behind apron, and warehouses are located behind transit sheds. At present, three transit sheds and six warehouses are under construction. Transit sheds and warehouses are usually used for machinery goods (parts), bagged cargo of fertilizer and rice and so on. The open yard is used for steel products, large-sized products and others. Some steel products are rusting in the open yard.

2) Rajae Port

There are ten transit sheds and eight warehouses between basins No.1 and 2. Transit sheds are located along berths No.10 to 14 and No.19 to 23. Dimension of transit sheds and warehouses are 55 x 140 m (7,700 m²) and 60 x 140 m (8,400 m²), respectively. Area of existing open yard is about 1,708,000 m², and new open yard is under construction in north side of container yard.

3) Anzali Port

There are two warehouses, one is 51 x 199 m (10,149 m²) and the other is 52 x 195 m (10,140 m²). Area of open yard is about 118,200 m² and located between shore and warehouses. Warehouses are generally used for imported general cargoes such as rolled paper and fertilizer in bag. Open yard is mainly used for steel, metallic products and wood. However, as in Imam Khomeini port, large portions of steel products are rusting in yard.

Table 2.7.1.8 Storage Facilities in the Major Ports

PORT	IMAM KHOMEINI			RAJAEI			BAHONAR			BUSHEHR				
	BERTH	EXISTING		BERTH	NO.	LENGTH	BERTH	NO.	LENGTH	BERTH	NO.	LENGTH		
			GRAIN EAST	1	130.00	OIL JETTY	1	-	G. CARGO	6	1,050.0	G. CARGO	1	343
			GRAIN WEST	1	100.00	SERVICE	1	200.0	OIL DLPN	3	-			
			EASTERN J	3	520.00	MULTI 9, 24	2	400.0						
			DRE DLPN	1	-	G. C 10-14	5	989.6						
			WESTERN J	3	540.00	S. C 15-18	4	719.2						
			G. C 7-8	2	385.50	S. C 19-23	5	989.6						
			G. C 16-20	5	911.25	SUB. TTL	18	3,298.4						
			G. C 21-26	6	1,093.75									
			G. C 27-31	5	910.00	CONTAINER	5	989.6						
			SUB TTL	27	4,590.50									
			CONTAINER	5	1,091.50									
			G. TOTAL	32	5,682.00	G. TOTAL	23	4,288.0	TOTAL	9	1,050.0	TOTAL	1	343.0
UNDER CONSTRUCTION			G. C 9-10	2	365.50									
			G. C 32-34	3	547.00									
			SUB TTL	5	932.50									
WAREHOUSE			NO.	AREA (M2)	NO.	AREA (M2)	NO.	AREA (M2)	NO.	AREA (M2)	NO.	AREA (M2)		
			T. S 60x150	12	308,000.0	T. S 55x140	10	77,000.0	T. S 40x100	2	8,000.0	T. S 30x100	2	6,000.0
			W. H 60x150	2	18,000.0	W. H 60x140	8	67,200.0	W. H 40x150	1	6,000.0			
			TOTAL	14	326,000.0	TOTAL	18	144,200.0	TOTAL	3	14,000.0	TOTAL	2	6,000.0
UNDER CONSTRUCTION			T. S 60x150	3	27,000.0									
			W. H 60x150	6	54,000.0									
			S. TOTAL	9	81,000.0									
			CFS 300x160	1	48,000.0									

PORT	CHABAHAR			ANZALI			NOWSHAHR				
	BERTH	EXISTING		BERTH	NO.	LENGTH	BERTH	NO.	LENGTH		
			BEHESHTI 1	1	150.00	G. CARGO	5	564.00	EAST	1	350.00
			BEHESHTI 2	1	150.00				WEST	1	350.00
			BEHESHTI 3	1	150.00				SOUTH	1	260.00
			BEHESHTI 4	1	150.00						
			TOTAL	4	600.00	TOTAL	5	564.00	TOTAL	3	960.00
UNDER CONSTRUCTION											
WAREHOUSE			NO.	AREA (M2)	NO.	AREA (M2)	NO.	AREA (M2)	NO.	AREA (M2)	
			NEW 4500	2	9,000.0	199x51	1	10,149.0	OLD 50x20	6	6,000.0
			NEW 3000	1	3,000.0	195x52	1	10,140.0	NEW 102x34	1	3,468.0
			TOTAL	3	12,000.0	TOTAL	2	20,289.0	NEW 108x33	1	7,032.0
									TOTAL	8	16,500.0

4) Transit Shed and Warehouse

Transit shed is normally installed behind apron for smooth arrangement of cargo flow between vessel and land transportation. Transit shed is used for collection, distribution, arrangement and short period storage of cargo.

Warehouse is normally installed at second line from berth such as behind transit shed, and main purpose of warehouse is long period storage of cargo. Therefore, transit shed should be distinguished from warehouse which is used for long period storage of cargo.

Figure 2.7.1.1 shows flow of determination using turnover ratio for transit shed and warehouse.

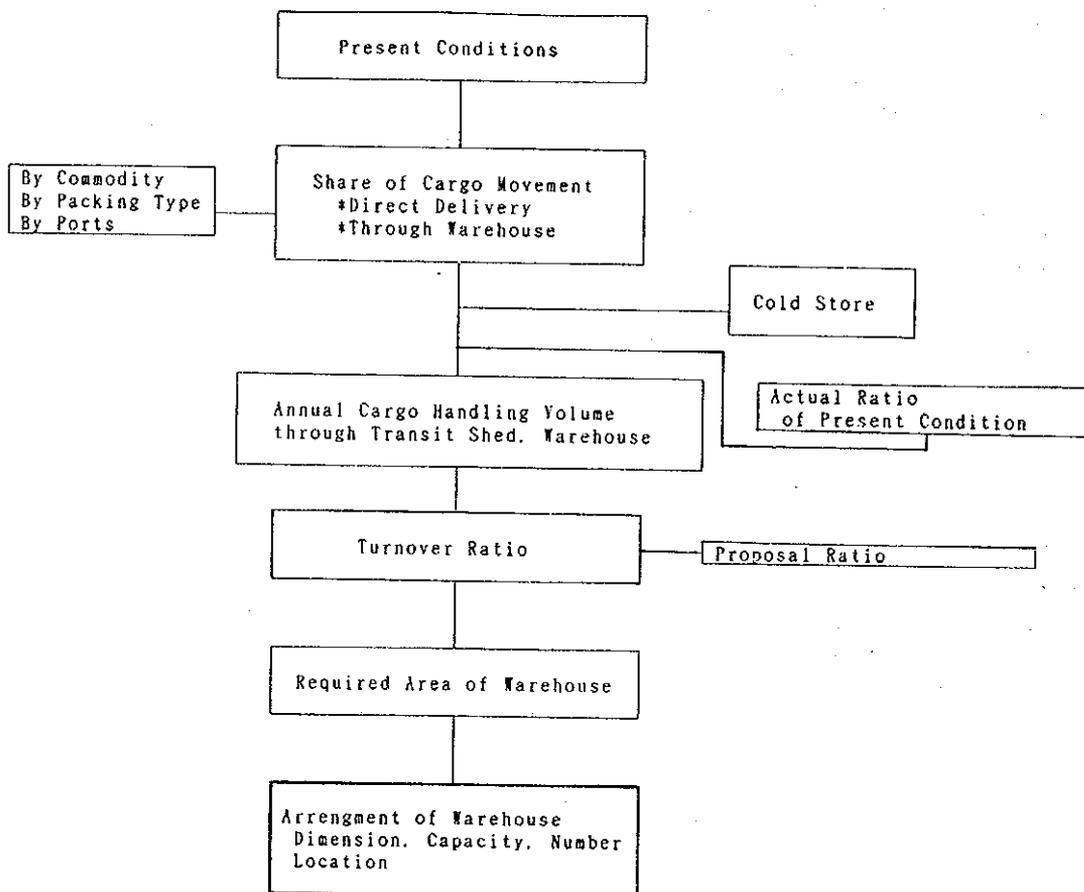


Figure 2.7.1.1 Transit shed and Warehouse

The required area of transit shed and warehouse is calculated by the following formula.

$$Ab = L \times B = Mb \times p / (Rt \times w \times r)$$

Where Ab : Required area of storage Facility (m²)
 L : Length of transit shed or warehouse (m)
 B : Breadth of transit shed or warehouse (m)
 Mb : Annual cargo volume (ton/year)
 Rt : Turnover ratio (times/year)
 w : Volume of cargo per unit area (ton/m²)
 r : Utilization rate (0.5 - 0.7)

Table 2.7.1.9 shows volume of cargo per unit area of transit shed or warehouse in general.

Table 2.7.1.9 Volume of Cargo per Unit Area

Commodities	Packing style	Capacity (ton/m ²)	height of loading (m)
Rice	Bag	2.0 - 3.5	3.0 - 5.0
Cotton, Wool	Bale	1.0 - 2.0	3.0 - 4.0
Cement	Bag	3.0 - 3.5	-
Fertilizer	Bag	2.0 - 2.5	2.5 - 5.0
Metallic products	-	2.0 - 3.5	0.5 - 2.5
Machinery parts	Case	0.5 - 1.5	1.5 - 4.0

Table 2.6.1.10 shows present conditions regarding transit shed and warehouse at major ports in 1991/92. Items in Table 2.6.1.10 are explained below.

- 1) Row "A" shows cargo handling volume at major ports in 1991/92 by commodity.
- 2) Row "B" shows volume of cargo which had the possibility of being stored in port area such as in open storage area, transit shed and warehouse.

$$S = (\text{Bagged cargo}) + (\text{Refrigerated cargo}) + (\text{Metallic cargo}) + (\text{General cargo})$$

$$SS = (\text{Bagged cargo}) + (\text{General cargo})$$

- 3) Row "C" shows estimated volume of cargo transported through transit shed and warehouse considering "utilization ratio".

Utilization ratio is percentage of cargo transported through transit shed and warehouse against total volume of handling cargo at port. It follows Table 5.11.4 of PSO's statistics published in 1991/92.

$$S' \text{ or } SS' = S \text{ or } SS \times \text{Ratio}$$

4) Row "D" shows area of transit shed and warehouses.

W : Total area of transit sheds and warehouses

5) Row "E" shows annual cargo volume per unit area (ss'/W) at each port in 1991/92.

From Table 2.7.1.10, values of (SS'/W) at each port are as follows, and if 2.5 ton/m² is used as the cargo volume per unit area and 0.5 as utilization rate, turnover ratios of transit shed and warehouse are as follows.

$$(\text{Turnover ratio}) = (\text{SS}'/\text{W}) / (\text{storage capacity} = 2.5\text{ton}/\text{m}^2) / 0.5$$

Port	Annual Cargo Volume (ton/m ²)	Turnover Ratio (times/year)
Imam Khomeini	10.80	8.64
Rajae	9.84	7.87
Bahonar	2.93	2.34
Bushehr	51.58	41.26
Beheshti	0.95	0.76
Anzali	2.57	2.06
Nowshahr	2.23	1.78

In general, turnover ratio is 20 to 25 times/years for transit shed and 8 to 12 times/year for warehouse. Above values of turnover ratio are rough estimates, however, these values are assumed small for major ports with the exception of Bushehr port.

Table 2.7.1.10 Transit Shed and Warehouse

ROW	1991/92 PORT NAME	I. KHOMEINI	RAJAE	BAHONAR	BUSHEHR	BEHESHTI	ANZALI	NOWSHARR
	CARGO VOLUME (x1000 TON)							
	A BULK	2,044	1,716	0	239	364	103	28
	B LIQUID	0	494	1,833	877	290	775	517
	C BAG	488	507	200	449	314	25	39
	D CONTAINER	72	596	0	0	0	4	0
	E REFRIG	62	3	0	0	0	0	0
	F METALLIC	4,076	464	162	4	0	234	86
	G MINERAL	0	0	618	0	0	0	0
	H G. CARGO	2,240	2,169	973	448	53	52	21
	T TTL	8,982	5,949	3,786	2,017	1,021	1,193	691
	B S=C+E+F+H (x1000 ton)	6,866	3,143	1,335	901	367	311	146
	SS=C+H (x1000 ton)	2,728	2,676	1,173	897	367	77	60
	C UTILIZATION RATIO (%)	49.9	53.0	3.5	34.5	3.1	68.3	61.3
	S' (x1000 ton)	3,426	1,666	47	311	11	212	89
	SS' (x1000 ton)	1,361	1,418	41	309	11	53	37
	D W: WAREHOUSE+TRANSIT SHED(M2)	126,000	144,200	14,000	6,000	12,000	20,492	16,500
	E S'/W TON/M2	27.19	11.55	3.34	51.81	0.95	10.37	5.42
	SS'/W TON/M2	10.80	9.84	2.93	51.58	0.95	2.57	2.23

(6) Residence Period of Vessels

Table 2.7.1.11 and 12 shows the average residence period of vessels and number of calling vessels by month in major ports at 1992. The values indicated in Table 2.7.1.11 are calculated by data of PSO's calling vessels. Average port time is 11.43 days in southern ports and 2.98 days in northern ports. Average service time and operation time are 8.99 and 8.41 days in southern ports, 2.62 and 2.37 days in northern ports, respectively. Average waiting days are 2.44 days in southern ports, 0.37 days in northern ports.

Appendix II-2.5 to II-2.6 shows details of the above data and appendix II-2.7 shows characteristics of vessels that were staying over 30 days in port areas. In 1992, eighty three vessels stayed over thirty days in the port area. The longest port and service time of vessels was 95 days (over three months) in Imam Khomeini port. The longest waiting days of vessels were 69 days in Rajae port.

Table 2.7.1.11 Average Residence Period of Vessels in 1992

	Unit: Days									
	B. I. K	BUSHEH	RAJAE	BAHONAR	BEHESH	ANZALI	NOWSHAR	SOUTH	NORTH	TOTAL
PORT TIME	11.12	8.90	11.36	15.80	14.01	2.98	2.98	11.43	2.98	9.38
SERVICE	9.53	7.24	8.83	7.93	11.49	2.58	2.69	8.99	2.62	7.44
WAITING	1.59	1.66	2.53	7.87	2.52	0.40	0.29	2.44	0.37	1.93
OPERATION	8.93	6.55	8.36	7.15	10.74	2.32	2.47	8.41	2.37	6.95

Source: PSO

Table 2.7.1.12 Number of Calling Vessels in 1992

ENTER DATE		B. I. K BUSHENRAJAE BAHONARREHESHIANZALI NOWSHAH							SOUTH	NORTH	TOTAL
FROM	TO							TOTAL	TOTAL		
92/01/01	92/01/31	50	16	48	7	8	21	11	129	32	161
92/02/01	92/02/29	44	9	43	8	6	27	17	110	44	154
92/03/01	92/03/31	44	11	39	5	5	20	12	104	32	136
92/04/01	92/04/30	43	10	46	3	7	12	7	109	19	128
92/05/01	92/05/31	39	13	51	12	9	29	8	124	37	161
92/06/01	92/06/30	54	15	52	6	5	30	10	132	40	172
92/07/01	92/07/31	43	11	55	10	3	27	14	122	41	163
92/08/01	92/08/31	34	11	51	8	2	18	12	106	30	136
92/09/01	92/09/30	39	9	59	9	6	32	18	122	50	172
92/10/01	92/10/31	44	11	50	6	6	35	21	117	56	173
92/11/01	92/11/30	41	17	54	6	7	20	9	125	29	154
92/12/01	92/12/31	33	15	52	9	5	27	15	114	42	156
TOTAL		508	148	600	89	69	298	154	1414	452	1866

Source: PSO

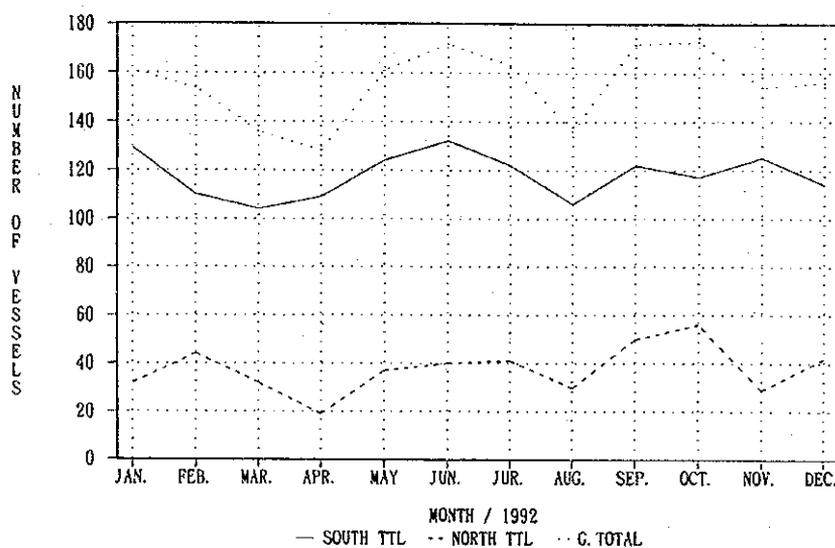


Figure 2.7.1.2 Number of Calling Vessels in 1992

(7) Container Handling Operations

Table 2.7.1.14 shows container activities in the Major Ports in 1992. According to Table 2.7.1.14 container cargo volume through major ports was 703 thousand tons of 2.8 % of the total volume of handled cargo. (Total cargo volume was 24.787 million tons) Among major ports, four (4) ports handled container cargo in 1992, Imam Khomeini, Rajae, Anzali and Nowshahr ports.

Container cargo flows at Imam Khomeini, Rajae and Anzali ports are shown in Appendix II-2.9.

Table 2.7.1.13 Container Activities at Major Ports in 1992

PORT	NO. OF VESSEL		NUMBER OF CONTAINER		CARGO VOLUME BY CONTAINER	
	FULL CON.	SEMI CON.	NUMBER	RATIO (%)	(TON)	RATIO (%)
Imam Khomeini	5	127	6,399	11.4	72,403	10.3
Bushehr	0	0	0	0.0	0	0.0
Rajace	41	484	48,739	86.6	615,066	87.4
Bahonar	0	0	0	0.0	0	0.0
S. BEHESHTI	0	0	0	0.0	0	0.0
Anzali	1	33	733	1.3	8,383	1.2
Nowshahr	0	18	406	0.7	8,000	1.1
South Total	46	611	55,138	98.0	687,469	97.7
North Total	1	51	1,139	2.0	16,383	2.3
G. TOTAL	47	662	56,277	100.0	703,852	100.0

Source: PSO

Table 2.7.1.14 Container Activities in the Major Port, 1983 to 1992

YEAR	NUMBER OF VESSEL		NUMBER OF CONTAINER	CARGO VOL. BY CONTAINER (TON)
	FULL CON.	SEMI CON.		
1983	0	0	0	0
1984	0	0	0	0
1985	177	175	38,221	488,754
1986	173	139	32,814	449,306
1987	130	112	24,851	383,146
1988	147	188	23,283	349,492
1989	122	234	27,682	451,057
1990	96	211	19,279	305,260
1991	212	287	35,418	591,382
1992	458	429	88,329	1,389,854

Source: PSO

1) Imam Khomeini Port

There are five container berths (Berths No.11 to 16, total length is 1091.5 meters.) with ten to twelve meters deep and container yard of 168,000 m².

In 1992, number of calling container vessels is 132 vessels, of which five (5) vessels were full-container vessels and 127 vessels were semi-container vessels. Number of handling container boxes is 6,399 boxes.

There are two container cranes at berth Nos 11-16 and two transfer cranes and five top lifters in container yard. One container crane, however, is out of order due to an accident in 1991. At this moment, container cargo is handled by container crane, ship's gear, mobile crane or combination of them.

In case of discharging (import) container, 80 % of containers are transported through container yard. Ten percent of containers transported through container yard are transported to outside by rail wagons. And 90 % of containers transported through container yard are transported to outside by trucks. Twenty percent of imported

containers are carried to container freight station (CFS), and then transported to outside by trucks.

In container yard, containers are stored with six lanes by transfer crane. Both of import and export containers are usually stacked with three (3) layers. Container boxes are kept in good condition.

In case of loading (export) containers, 60 % of container cargo are carried to container yard through CFS by trucks. Forty percent of container cargo are carried directly to container yard by trucks.

2) Rajae Port

There are five container berths (Berth No. 4 to 8, total length is 989.6 meters.) with fourteen meters deep and container yard of 1,000 m x 300 m or 300,000 m².

In 1992, there were 525 calling vessels, of which 41 vessels were full container vessels and 484 vessels were semi-container vessels. There were 48,739 container boxes handled.

Regarding container handling equipment, there are two container cranes at berths No.7 to 8 and seven transfer cranes and five top lifters in the container yard. Two container cranes were installed in 1993. Container cargo is usually loaded and unloaded by these container cranes at container berth. In other berths such as general cargo berth, container cargoes sometimes are handled by ship's gear or mobile crane. Even at container berth, when container crane is not available, container cargo is handled by ship's gear or mobile crane.

In case of discharging (import) container, containers are transported through container yard (55 %) and container freight station (CFS, 45 %).

In container yard, containers are stored in six lanes by transfer crane. Containers are usually stacked in three layers. Condition of container boxes is good.

In case of loading (export) container, all of container cargoes are carried to container yard through CFS by trucks.

3) Anzali and Nowshahr Ports

Number of calling container vessels was fifty-two (52) vessels (34 vessels in Anzali port, 18 vessels in Nowshahr port), of which one (1) vessel was full container vessel and fifty-one (51) vessels were semi-container vessels. Numbers of handling container boxes in both ports are 1,139 boxes.

Regarding container handling equipment, Anzali port has two (2) top lifters and Nowshahr port has one (1) top lifter. Container cargo is loaded and unloaded by

quay crane and mobile crane in Anzali port. There is no export container cargo at present in both ports.

In case of discharging (import) container, 80 % of containers are transported through container yard. All containers transported through container yard are transported to outside by trucks. Twenty percent of imported container cargo are carried to container freight station (CFS), and then transported to outside by trucks.

(8) Other Major Ports

In 1992, Bahonar, Bushehr, Chabahar, and Nowshahr ports handled the following cargo volume (unit:thousand tons).

Port	Bahonar	Bushehr	Chabahar	Nowshahr
Import	3,083	1,774	1,260	593
Export	645	193	2	8
Total	3,728	1,967	1,262	601

As for cargo handling equipment, they have some of mobile cranes, fork lifts, tractors, chassises. Three of Bushehr, Chabahar and Nowshahr ports have pneumatic unloaders and hoppers for solid bulk cargoes and Nowshahr port has one (1) of top lifter for container handling. General cargoes, usually, are handled by ship's gear or mobile crane or combination of them. In case of solid bulk cargo, pneumatic unloaders are used for unloading from vessels when available. Solid bulk cargoes are handled by ship's gear, mobile crane or combination of them. All of discharging solid bulk cargoes are transported directly to outside of port by trucks. There is sometimes a shortage of trucks, in which case enough gangs for cargo handling are not available.

(9) Minor Ports

There are nine minor ports; Abadan, Khoramshahr, Lengeh, Jask, Deylam, Genaveh, Torkaman, Amir Abad and Fereydunkenar. Torkaman, Amir Abad and Fereydunkenar ports are now under construction. These four minor ports are used by small wooden ships or fishing boats except Abadan and Khoramshahr. Cargo handling works in minor ports are conducted by private companies. Lengeh port has one mobile crane of 25 tons, one fork lift and ten tractors. Jask port has two fork lifts and one trailer. In Abadan and Khoramshahr Port, crane are destroyed in the War. There is no equipment in other ports. Cargoes are usually handled almost by hand.

2.7.2 Cargo Handling Equipment

(1) Existing Cargo Handling Equipment

The existing cargo handling equipment at six Major Ports are shown in Appendix II-

2.10.

(2) Feature of existing cargo handling equipment

1) Distribution of equipment by purchasing year

The distribution of equipment by purchasing year at each port is not even and a lot of equipment have been procured irregularly at one time.

The unit price of the equipment will be low when a lot of equipment are procured at one time. However, some of them will be the equipment which are not used effectively or too many equipment will be hold impermanently.

It seems that the phenome is due to the economical or political conditions in the country.

2) Old-aged equipment and un-used equipment for long term

There are some very old equipment which are used at present. It seems that their age have been beyond the their economical service life.

On the other hand, some un-used equipment are kept for long time at some ports. It shall be recognized that all equipment which are kept will be aged and will be old regardless of their actual working hours.

3) Imbalance-balance of the amount of equipment which are kept in each port.

As a result of the field survey at the ports, the amount of equipment which are kept at each port is not in proportion to the cargo volume.

It is found that the low berth productivity due to shortage of cargo handling equipment at some ports.

On the other hand the un-effective used cargo handling equipment are found due to excessive cargo handling equipment at some ports.

(3) Utilization for cargo handling equipment

The data for net working days of the existing equipment is not available at all the ports. Then the extent of utilization for equipment can not be shown clearly by figure. However, judging from operationable days and site survey, there are some in-effective equipment at some ports.

Ratio of operationable days for equipment at six major ports are shown in Table 2.7.2.1 and Fig 2.7.2.1.

Table 2.7.2.1 Ratio of Operable Days for all Cargo Handling Equipment

Ratio(%) of operatable day of the 1991

PORT	Mobile Crane	Folk-lift	Tractor	Average
Khomeini	73	74	74	73
Rajace	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 operatable day of the 1992

PORT	Mobile Crane	Folk-lift	Tractor	Average
Khomeini	77	80	77	78
Rajace	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

Average Ration(%) of operatable day

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

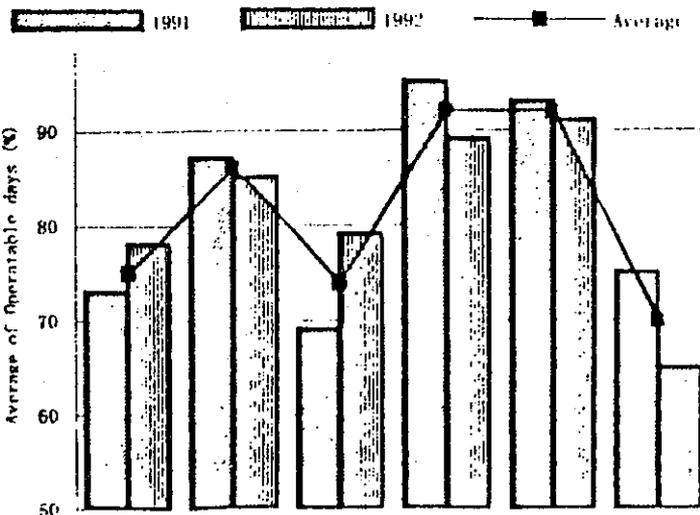
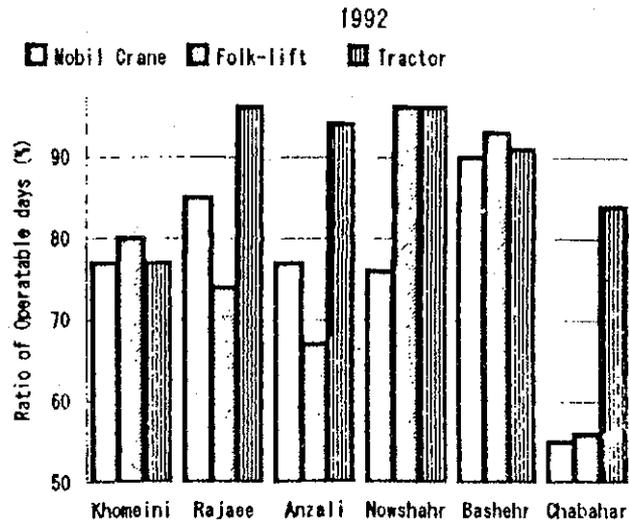
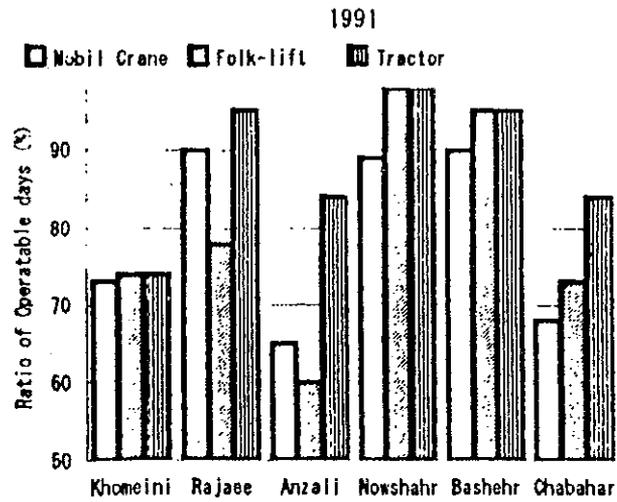


Figure 2.7.2.1 Ratio of Operable Days for all Cargo Handling Equipment

(4) Maintenance system at present

1) Maintenance policy

In order to keep each piece of handling equipment in good condition for safety and to keep its original function display, maintenance (checking and repair) is indispensable. The basic policy for maintenance to the existing equipment is not found at Tehran and all ports.

2) Preventive maintenance

Preventive maintenance is to check and repair before the equipment breaks-down or its function deteriorates, and to avoid breaking-down and ensure its original function. Preventive maintenance is done at the four ports (Rajae, Chahbhar, Bushehr and Nowshahr) and is not done at the two ports (Imam khomeini and Anzali) Preventive maintenance has been done at maintenance shop in accordance with the guide book which is published by manufacturer at three ports (Rajae, Chahbhar and Bushehr). Annual preventive maintenance plan for cargo handling equipment is currently prepared in one year advance by Nowshahr port office. Each equipment has its history card which is written to indicate its repair and trouble records.

3) Corrective maintenance

Most of corrective maintenance have been carried out at their maintenance shop.

4) Maintenance cost

The total maintenance cost for equipment, was shown by each ports. However, the analysis of the data could not be done because the details had not been clarified.

(5) Maintenance shop

All ports have their maintenance shop respectively.

The scope of work of the maintenance shop have not been written clearly and the basic policy for the shop was not shown.

The main work at the shop is the maintenance for equipment. However, some parts which can not be prepared in short term are made in the maintenance shop at some ports.

The scale of shop and number of machines in the shop are quite different between ports.

It seems that the reasons of difference are caused by the scale of equipment which are kept at the port, condition of the outside machinery shop and the policy for role of maintenance shop

(6) Spare Parts

According to the interview at all the ports, all related persons said that the shortage of spare parts disturbs the smooth repair of the equipment which are broken-down.

On the other hand, the result of site investigation in the spare parts storage, many spare parts are stocked in the large scale spare parts storage at the some ports.

The problem for spare parts shall be classified as follows

- a. Long term for delivery of spare parts
- b. Long term for internal procedure of the spare parts procurement
- c. Poor management for the spare parts

Problem a and b shall be solved by endeavor of each port.

(7) Maintenance Engineer

The level of maintenance engineer is different between ports and it is insufficient to maintain the required equipment.

Most of maintenance engineers will bring up not in the school or short term training but through job (on the job training).

Then the systematic training program to all related persons shall be established and the program shall be carried out for long time without haste.

Furthermore, the arrangement of engineers at all the ports (including Tehran) shall be followed by the program.

On the other hand, good trainers are required for effective training. Then it shall be examined to get good trainer.

(8) Statistics

As a result of site investigation, it is not enough with statistics in all the ports.

The effective and reasonable maintenance work can not carried out without any available data and statistics because their work depend on the theory combined with statistics.

Required items, contents and their purpose shall be examined fully in advance because the value of the statistic is affected by the without break and homogeneous.

2.8 Issues and Problems of Each Major Port

2.8.1 Current Situation of Major Ports

Prior to identify issues and problems of major ports, general current situations are briefly described here below.

According to the statistics of PSO (Refer to Chapter 1), there is an imbalance in the cargo handling volume between imports and exports at each major port. The import cargo volume is much larger than the export cargo volume.

Road network plays a very important role as the major transportation means between each major port and its main hinterlands. The distance between each major port and almost all of the main hinterlands is very long. For example, the distance between Abbas port and Tehran, which is the largest hinterland of Abbas port, is approximately 1,300 kilometers. Therefore, it is assumed that railway transportation cost would be less than the road transportation cost for transporting goods between each major port and its main hinterlands in general. However, railway is not available for any of the major ports except Imam Khomainsi port.

The majority of roads between each major port and its main hinterland are not express roads. Considering the distance between each major port and its main hinterland, each major port and its main hinterlands should be connected by express roads.

The major ports on the south coast in Iran except Chabahar port require dredging to maintain the entrance channel. In particular, Busher port, located on the coast with a gradually shoring beach, requires a large volume of dredging every year.

The most common problem faced by ports on the coast of the Caspian sea is the rise in the sea level. The Caspian sea has been rising up since 1977 at an average rate of about 13 cm (as of 1992).

2.8.2 Issues and Problems

Based on the site surveys, interviews with PSO at Tehran and each major port and analysis of the present conditions, the following issues and problems are identified as the basis of port planning.

(1) Common problem for major ports

1) No suitable future plan of port facilities and handling equipment for deciding area or capacity, lay out or number and their stage plan, except Chabahar port and Now Shar port.

2) Large imbalance between export and import cargo volume (Import cargo volume is larger than export cargo volume).

(2) Imam Khomaini Port

- 1) No access to express road.
- 2) Shoals are lying in the container berths.
- 3) No sufficient depth for large ships.
- 4) Many damaged fender and cargo equipment.
- 5) No sufficient navigation aids in the entrance channel.
- 6) Environmental pollution, especially the type caused by chemical industry.

(3) Bushehr Port

- 1) Large dredging volume for maintaining the entrance channel every year.
- 2) Difficulty in deciding future function in Iranian ports network.

(4) Abbas Port

- 1) Shortage of the expansion area for long term development plan.
- 2) No access to express road.
- 3) Available depth of the basin and the entrance channel is not adequate compared with depth of the container berths and general cargo berths.

(5) Chabahar Port

- 1) No railroad connection between Chabahar port and its hinterland.
- 2) The jetty at Shahid Beheshti isn't functional in monsoon season (from June to September).

(6) Anzali Port

- 1) Rising water level of the Caspian Sea.
- 2) Shortage of open storage area.
- 3) No calmness of the basin at the port.
- 4) Shortage of the future expansion area.
- 5) No railroad connection between Anzali port and its hinterland.

(7) Nowshahr

1) The design-load of bridges within 40km of Now Shahr port is insufficient for the traffic of heavy-weight trucks including container trailer.

2) No railroad function between Nowshahr Port and its hinterland.

3) Rising water level of the Caspian Sea.

2.8.3 Current Situation of Other Ports

(1) Length

Bandar Lengeh (Hereinafter referred to as Lengeh Port) is Located in the west side of Hormozgan Province on the coast of the Persian Gulf, 270km west from Abbas Port.

This port consists of the old port, which was opened in the 15 century, and the new port. The old port has been reconstructed with the breakwater with a length of about 800m. The old port has been used by small boats including fishing boats. The new port has been started to operate in 1986 with the present facilities.

Number of calling ships which sail mainly between Lengeh and Kish island and between Lengeh and Dubayy is approximately 3,000 ships per annum. Tonnage of the calling ships except large passenger ships is 50tons-400tons. Tonnage of the large passenger ships is about 2,000 GRT.

Cargo handling volume at Lengeh Port in 1992 is 315,276 tons for import and 144,410 tons for export. Commodities of the cargo are rice, sugar jute, electric goods, tires, kitchen il, furniture, tea and paper for import, fruit and vegetables for export. The hinter land is mainly around Shiraz for export, and Shiraz and the west area in Hormozgan province for import. The number of calling ships at this port in 1991 and 1992 are 2,885 and 3,177, respectively.

Major facilities of new port at Lengeh Port are wharf (length:235m, depth:4.5m), office building (area:1,180m²), transit shed (area:2,700m²).

(2) Jask

Jask (hereinafter referred to as Jask Port) is located in east side of Hormozgan Province, 350km east from Abbas Port. Port activity of Jask Port is scanty. Only passenger's cargo are handled without passenger because the passengers travel by plane. Volume of the passenger's cargo is about 1,000 - 1,500 tons per annum. Most of the calling ships are small launches whose tonnage are from 20 to 100 tons. These small launches come and go to dubayy. The number of calling ships in this port in 1991 and 1992 are 12 and 8, respectively.

Facilities of Jask Port are a breakwater with quay-wall, office building, transit shed and open storage area. Size of the facilities are as follows:

Breakwater with quay-wall:500 m length(quay length:150 m, depth:5.5 m)
Office building: 1,180 m²
Transit shed: 2,700 m²
Open space(port area for land):20,000 m²

Cargo handling equipments at Jask Port are two forklifts with 2 tons capacity and a trailer with 12 tons capacity.

Jask Port has a master plan. On the master plan, a jetty with 1000 m length will be constructed at west side of the port.

(3) Deylam and Genaveh

Bandar Deylam (hereinafter refereed Deylam Port) is located in the north of Busher Province on the coast of Persian Gulf, near the boundary between Khuzestan Province and Busher Province. This port is mainly used by fishing boats. The number of fishing boats at this port is about 50. Main facility of this port is only wharf with 60 m length and -3.5 m depth. Port activity of this port is very scanty, this port is a minor port in Iran.

Gonaveh Port is located in the center between Busher Port and Deylam Port in Busher Province, 75 km north-west from Busher Port on the coast of Persian Gulf. This port is the used small wooden ships which come and go to arabic countries along the coast of the Persian Gulf and. The facilities are two transit shads and a wharf with 140m length and -2.0m depth. This port is a minor ports in Iran. The major problem of this port is shoring.

(4) Amir Abad, Fereydunkenar and Torkaman

Amir Abad Port and Fereydunkenar Port are under construction. Fereydunkenar Port is located in the center of Mazandaran Province on the coast of Caspian Sea, about 100 km from Now Shahr Port. The located of Amir Abad Port is 75 km east from Fereydunkenar, about 60 km west from Torkaman, on the coast of Caspian Sea. Transportation between these ports and their hinterlands can be performed by railway. Torkaman Port prepare the development plan.

(5) Abadan and Khormashahr

Abadan Port is located in the Tigulis river. This port is the old port near the city. There are many jetties along the river. General cargo from China, Taiwan and Japan and to Saudi Arabia is handled by this port. Maximum depth is four meters. Yard is very narrow.

Khoramshahr Port is located in the Tigulis river. This port is old big port near the industrial zone. The quay-wall length is about 2,000 m. There is the development plan with 500 ha. area. Railway connect to Tehran. Damage of War is big. Port starts to operate the cargo handling and passenger from few years ago.

2.9 Environmental Administration

2.9.1 System of Environmental Conservation for Ports

The Department of the Environment, the Marine Conservation Office of Marine Operation Department in PSO, and Port Authority at Major Ports are responsible for overseeing the environmental conditions in ports in Iran. Their functions are as follows.

(1) The Department of the Environment

The department of the Environment (DOE) was established in 1972, replacing the Organization for Control of Hunting and Fishing which was former organization of DOE.

DOE, by law, is empowered to practice and supervise the protection and conservation of the country's environment. The functions of DOE are as follows:

- Conducting research for studies
- Establishment of regulations and environmental standards
- Promoting environmental education
- Supervising, controlling and enforcement of environmental laws (submitting data, orders for disposal/improvement of problems, and guidance)
- Collecting information on environmental issues

To fulfill the above task, besides its basic organizational structure, it is furnished with the Environmental High Council and three coordinating councils:

- The Environmental High Council for determination of environmental policies and strategies of the country,
- The Council for coordination of environmental programs,
- The Council for coordination of environmental research, supply of data, and documents,
- The Council for coordination of environmental education and awareness.

The members of the High Council are as follows:

Chairman : President of the Islamic Republic of Iran

Member : 1. Minister of Health and Medical Education

2. Minister of Industries

3. Minister of Heavy Industries

4. Minister of Mines and Metals

5. Minister of Agriculture

6. Minister of Interior

7. Minister of Finance

8. Minister of Energy

9. Minister of Petroleum

10. Minister of Housing and Urban Planning

11. Attorney General

12. Vice-President and Director for the Plan and Budget

Organization

13. Vice-President and Director of the Department of the Environment and four highly qualified officials.

(2) PSO (Head Office)

In PSO, Marine Conservation Office of Marine Operation Department of PSO is responsible for environmental matters.

The major function of PSO for environmental matters is as follows:

- Instructing the Port Authority Offices at Major Ports regarding sample collections at problem water areas or from drainage nozzles from calling vessels at Major Ports
- Analyzing the samples
- Studying the water pollution sources in Iranian ports
- Reporting to DOE all types of contamination and pollution except contamination by oil
- Removing oil contamination in all Iranian water areas (including lakes)

(3) Port Authority Office

Similar organizations as PSO in Tehran are found at each Port Authority. Marine Operation Department at each major Port Authority has the following functions for environment.

- Removing sea contaminations in Iranian ports
- Inspecting waste oil and water of calling vessels in Iranian ports
- Collecting samples at problem water areas or from drainage nozzles of calling vessels in Iranian ports

2.9.2 Environmental Strategies of the Iranian Government

According to the result of interviews at DOE, the environmental strategies of the government of Iran are as follows:

1. Protection of environmental resources through public education and participation.
2. Protection and rehabilitation of natural resources through research, education, resource control, and law enforcement.
3. Prevention of urban and rural environmental pollution through research, control, and supervision to ensure compliance with regulations of government and the general public.

General policies for fulfillment of the above-mentioned objectives include:

1. To provide for more coordination between the policies of the development plan and the objectives and general policies of various environmental programs.
2. To classify environmental problems in ecological and socio-economic categories in order to better prevent or solve the problems.
3. To conduct research on the structure and functions of the country's biological system, in order to find the main causes of environmental problems and disruptions, and further to develop the best models for environmental planning.

- In this respect, the planning models should cover the areas of ecosystems functions; carrying capacities; environmental impact of man's activities; compatible and incompatible technologies; the cultural impacts of development on the quality of life; and common grounds for regional and international cooperation.
4. To coordinate environmental research methodologies and findings in the joint council for environmental research, which will be organized according to joint participation of executive organizations and scientific institutions.
 5. To establish environmental units in those organizations which deal with environmental matters.
 6. To control and supervise the activities of those executive organizations which might have direct effects on the environment by means of law enforcement and the issuance of guidelines and regulations.
 7. To promote people's responsibility and participation, to attract their interests in environmental conservation practices, and to raise environmental awareness by the following means:
 - To coordinate training programs related to the environment for all executive organizations and industries with the objectives of environmental education
 - To promote coordination and cooperation among the Department and those ministries and institutions which are responsible for education
 - To extend environmental knowledge and understanding by dissemination of research findings for the improvement of development plans
 - To establish an environmental data bank as an annex to Joint Council for Environmental Research; to expand libraries; and to prepare an environmental encyclopaedia
 - To introduce a representative of the department of High Councils for Education (High Council for Cultural Revolution and Council for Education and Training Program) for participation in all council meetings.
 - To establish an Environmental Education Council within the Department
 - To establish a Council for Environmental Education Programming in the Ministry of Culture and High Education
 - To observe the principles of environmental conservation in the country's land use/space planning and multiple land use projects
 8. To promote regional and international cooperation in order to acquire and benefit from the findings and experiences of other nations in environmental conservation through:
 - Participation of experts of the Department and other relevant organizations in regional and international events
 - Active participation, as a signatory body, in regional and international conventions on the environment, in accordance with the foreign policy of the country
 - To conduct bilateral research projects and education programs on the environmental matters with friendly countries which share similar needs and priorities
 - To employ the services of international environmental experts, whenever needed
 - To gather environmental literature from other countries, as well as from regional and international organizations
 - To provide budget and necessary facilities for the fulfillment of the above goals.

DOE has the action plan for environmental education, research and supervision and control.

The contents of the action plan are as follows:

[Projects for environmental education]

- To establish new libraries, to expand the existing one, and to institute environmental documentary centers and data banks throughout the country
- To publish environmental journals, bulletins, books, regional mono graphs, pamphlets, brochures and an encyclopedia
- To purchase and translate, or produce, video/films on environmental education.
- To organize short and long term complementary courses for the Department's personnel

[Research Projects]

- To study the potential of the country's major rivers for self-purification; and to determine standards and issue regulations for water pollution
- To study underground water pollution in five regions.
- To investigate waste (garbage) management control in fifteen cities with populations over 100,000
- To study the impact of air pollutants from industries and city traffic in four provinces
- To investigate the feasibility of various industrial effluent treatment systems in five provinces
- To study the environmental pollution of Tehran, particularly noise pollution
- To investigate a development strategy for northern and southern coastal zones
- To conduct pollution and oceanographic studies in relation to the Kuwait Regional Convention
- To investigate the impact of oil pollution on the environment
- To investigate and propose guidelines for an environmental Impact Statement (EIS)
- To investigate environmental crises of the country
- To investigate future trends of the country's environment
- To establish, restore and improve environmental research centers
- Rehabilitation of natural resources through the study of inland and coastal water aquatic life; restoration and improvement of national parks, outdoor recreation areas, protected areas, and wildlife refuges; establishment, restoration and improvement of centers for park rangers.

[Project for Supervision and Control]

- To prevent environmental pollution via law enforcement.
- To prevent the seating of inappropriate industries, or workshops via law enforcement.
- To prevent the degradation of natural systems and wildlife habitats.

At present, the most pressing matter facing DOE is water pollution in Persian Gulf caused by the outflow of the oil from Kuwait during the Persian Gulf War.

General standards for air pollution and water pollution (for industrial drainage, living drainage, discharging water to a river and water quality for supply) were established by DOE. However, there are no standards for port and marine areas. In addition,

guidelines for an environmental impact assessment have not been established. The major regulations and laws for environmental protection are as follows:

- The Environmental Protection and Enhancement Act of 1974, and regulations 1975
- The Clean Air Act, 1975
- The Clean Water Act, 1984
- Guidelines for installation of septic tanks, sewage purification and allocation of industrial unit
- Standards and regulations for air and noise control; sewage discharge to surface and ground waters, and their uses in agriculture

2.9.3 Environmental Study for Development Project

Due to the provisions set forth in Articles, environmental impact assessment has become mandatory. Environmental Impact Assessment Bureau is responsible for the environmental impact assessment, but to date such a study has not been conducted for a port project.

According to interviews at DOE, DOE shall indicate the required items and guideline of environmental impact assessment for this project based on the result of this study and the concrete construction plan of this project. The environmental impact assessment shall be processed after concrete construction plan with method is presented.

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

A special committee consisting of the following government organizations concerned with environmental conservation has been formed:

- 1) Navy
- 2) Air Force
- 3) N.I.C.O.
- 4) MET, Metrological Center
- 5) Fisheries
- 6) PSO
- 7) DOE

The procedure of EIA in Iran is shown Figure 2.9.1.

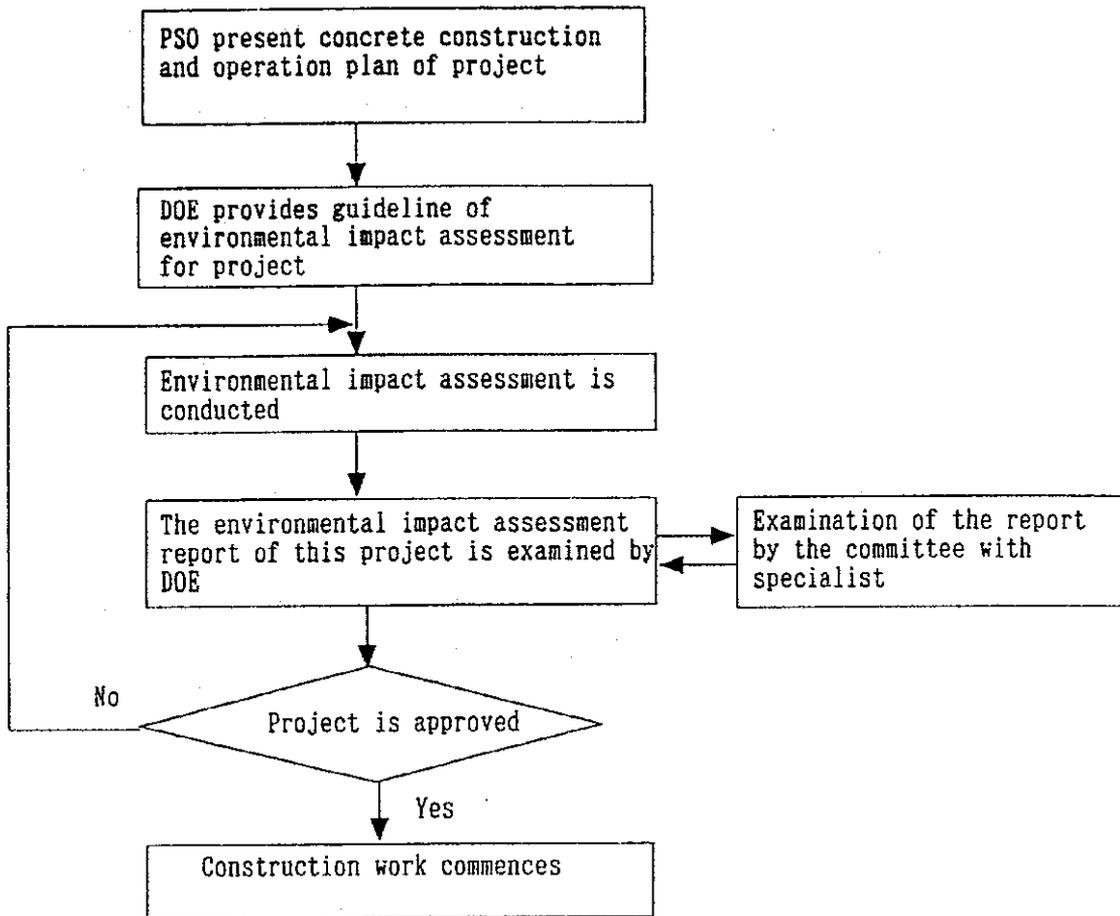


Figure 2.9.1 Procedure of Environmental Impact Assessment

2.9.4 Establishment of Port Environmental Regulations and Standards

The environment is a very important matter in Iran, which is a signatory country of several environment related treaties. 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 of samples for sea water and seabed material at Imam Khomeini Port and site observation at Anzali Port was conducted to ascertain the environmental conditions (Refer to Progress Report, Vol.II). 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

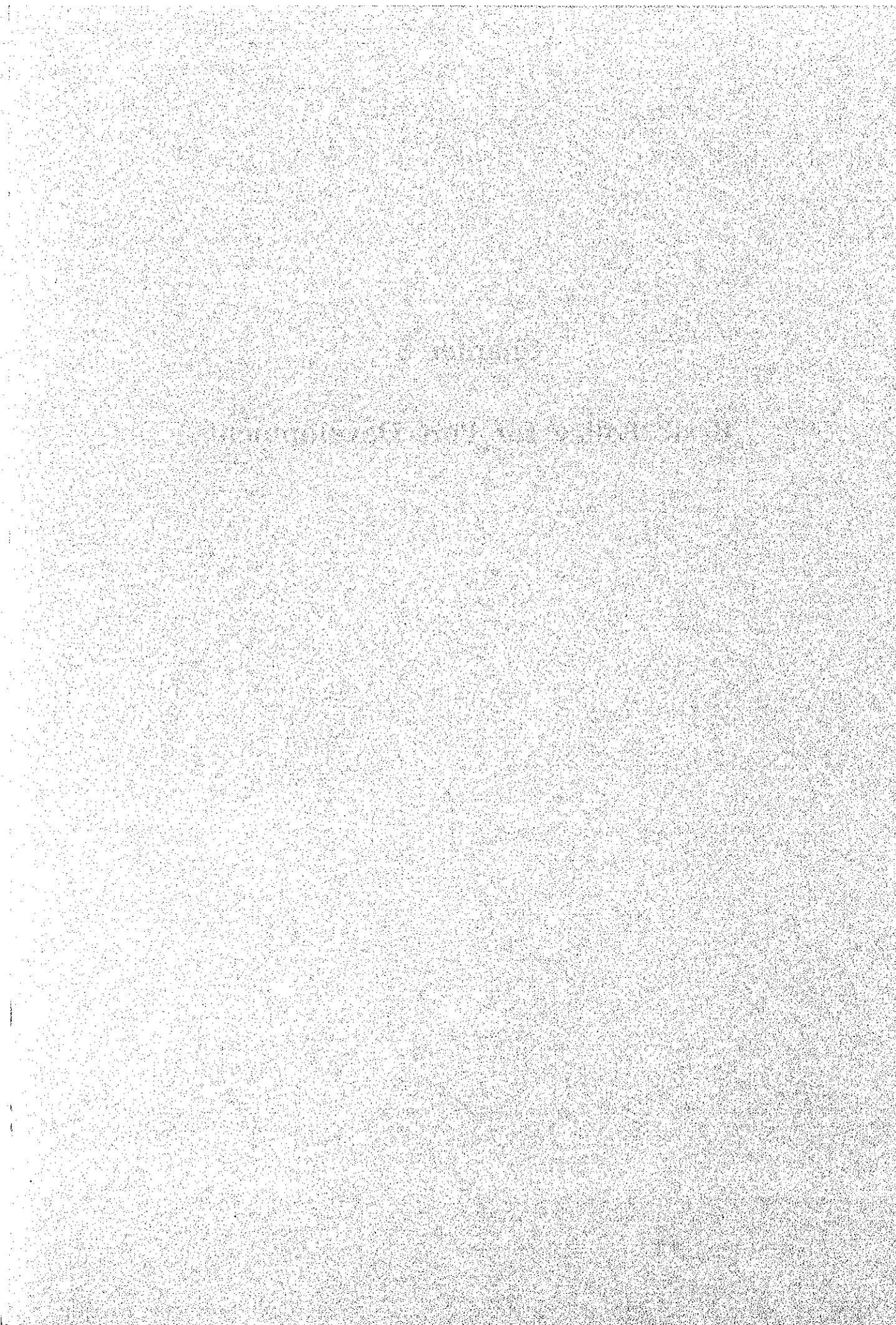
condition has been deteriorating. In addition, waste water from Anzali city flows out to Anzali lagoon which has a passage that leads through Anzali Port.

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 quality should be established.
- 3) A laboratory for minimum requirement analysis of the samples of 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.
- 5) Treatment plants for waste oil from ships and waste water from the port should be established at each major port.

Chapter 3

Basic Policy for Port Development



Chapter 3 Basic Policy for Port Development

3.1 Basic Concept of Public Port and Its Contribution to the National Economic Development

In 1974 PSO compiled the Iran Port Master Plan. Since then no plan has been made until now.

In this section, the basic position of the consultant on original nature and roles of public port as a vital infrastructure of a nation is briefly illustrated from a socioeconomic point of view.

3.1.1 General Function of Public Port for Various Economic and Social Activities

(1) Port for physical distribution

Distribution of goods, which lies between production and consumption, is one of the most important activities in supporting socioeconomic development of a nation. Through this process, raw materials are transported to an appropriate processing site, supplied to the market as finished products and delivered to consumers and users as final commodities.

Distribution has progressed right along with the development of economies everywhere as the most basic activity since man has established its society.

Current economies of the world are mutually dependent on each other for raw materials, semi-manufactured products and finished products which circulate all around the world just like air through world scale physical distribution system including port network.

One of the most economical transport means for long distance demand is water transport, while air transport is for fairly valuable commodities and inland transport for a continent without any available waterways. The port serves as the base for water transport which supports the most economical form of physical distribution.

In this sense, a well-designed port with efficient operation can greatly contribute not only to economical distribution of goods but to realization of economic development of a country, particularly in this era of so-called borderless trade.

It is also an indispensable role of a port to provide a nation with a cheap and efficient means for domestic transport activities which have a great significance for national or regional economic development through active promotion of coastal shipping or domestic water-borne transport.

As mentioned above, the port is indispensable to the total distribution activities of a nation.

(2) Port for industrial and commercial activities

Many types of heavy industries and port related commercial business require the most inexpensive means of distribution. Factories of such industries normally need to transport large quantity of raw materials or its products by large vessels through the wharves.

In order to enjoy full benefits from effective utilization of port service and water-borne transport, the factories should select their location just behind the wharf. Naturally, the port should provide them with a sufficient amount of industrial land behind the wharf so that such industrial groups can secure effective production activities (this sometimes entails forming industrial complexes).

In this respect, the relation between ports and industrial sites is truly a close one. Needless to say, distribution function of port as well as production activities of industries need vital support by commercial activities performed in and around the port area. At the same time, port related commercial business can be promoted depending on the basic port activities or production level of industries located near the port.

The promotion of industrial and commercial activities is essential to realize stable economic growth of a nation. In this sense, contribution of port to economic development through its support of such activities is significant to the national economy.

(3) Port for fishing activities

Because of the very nature of fishing, ports have been closely connected with fishing activities since ancient time. Ports have provided fisheries with not only a physical base for its activities but a base for processing marine products and for the stevedoring of such products.

While the requirements of modern fisheries for detailed port function are often different from those of commercial port, basic background of the requirements is the same. Under the situation, many commercial ports have supported fisheries historically in offering people food with an invaluable source of protein.

It is fair to say that fishery ports continue to be very important on both domestic and international levels, and thus harmonized development of port function for both commercial and fishery requirements will be more significant in promoting national economic promotion in this respect.

(4) Port for marine recreation

Provision of a base for marine recreation activities is another unique function of port. In order to cope with increasing and diversifying trend of marine recreation demand such as yachting and cruising, ports should strive to provide not only moorings for

leisure boats or to offer coastal excursions in sightseeing boats but also other facilities such as stores, restaurants, hotels and sometimes even amusement centers for family use.

Port planners should understand the economic implication of attracting people to a port area through appropriate provision of such recreational function which may have wide range of effects on overall promotion of port related activities supported by the process of getting fair public acceptance and understanding on importance of port for national economic development.

(5) Port for passenger traffic

The role of ships has lost its position as a means of passenger transport to some extent through the development of alternative ways of transportation including airlines and bridges. However, there are still a substantial number of regions in the world which rely on ferries and regular boats as the main means of transportation. To serve these basic needs, port should provide people with safe and adequate facilities and services.

This kind of function of port is indispensable for people living in remote islands or land-locked countries where only rivers or inland sea is available for passenger traffic.

From a basic human needs point of view, public role of port is considered very important in this respect.

3.1.2 Basic Understanding on Port as a Socioeconomic Infrastructure and Its Function

As discussed in the above sub-section, ports play very important roles in various national and regional activities including physical distribution, the transport of people, industry, fishing, and marine recreation. At the same time, we should not forget that ports comprise not only port facilities but various related business entities and their diversified activities, and therefore, can create a huge number of job opportunities.

Under the circumstances, it is essential to clarify our basic conception of ports as a basis for planning works of a project. There are perhaps two different concepts concerning the functions of ports.

The first approach is to understand ports as industrial capital, in which physical distribution activities are emphasized as the major function of the ports. In other words, the ports are regarded as industrial capital which provide distribution services for the steady flow of cargo and people under market principles.

In the above concept, the ports are designed and managed mainly to fit the expected cargo flow demands generated by market forces so that the port management entities can get the appropriate income for running the ports under sound financial principles. This means that ports are planned and operated under the principle of independent

commercial profit, and therefore the prices of various port services are expected to be decided through economic balance between supply and demand of those services. The basic position of this approach is in the idea that the social mission of the port can be fulfilled through seeking the logic of the capital.

The second way is to recognize a port as an infrastructure of national or regional development. In this approach, the port function can cover such fields not only as supporting the economic activities of a nation or region, but also promoting socioeconomic growth in such areas. In other words, the ports are identified as social capital, and are expected to have a wider range of positive effects on the socioeconomic conditions of a nation, rather than as industrial capital as conceived in the former approach.

The port planning works under this concept normally begin by analyzing the relation of the expected port function with the future plans of the region or nation concerned. According to this approach, the final benefits to be derived from the port project are expected mainly through realization of any subsequent national or regional developments which will generate the indirect but more fundamental effects such as the increase of GNP or GDP, the creation of business or job opportunities, the raising of national and regional tax revenues, and finally the improvement of total quality of life of the citizen. In this sense, you can understand that even if investment for the port development projects may not be fully recovered by the direct income through the operation of that particular port, the total balance between cost and benefit will be secured by the nation's economic gains.

The ways of application of the above two concepts to actual port planning in the world ports greatly vary according to various historical and socioeconomic backgrounds. Since the port function intended by the port planner is governed substantially by his basic understanding of the social mission of the port, it is very important to establish the conceptual foundation appropriately to fit various conditions of the target port and its country.

While it is no easy task to decide which of the concepts is most suitable to port planning, we believe in general that the latter approach could contribute more to stimulating overall economic development in developing countries in particular. However, it is sometimes considered better to take the former approach for a particular function of port such as wharves and terminals which may be regarded as industrial capital under the concept. This approach is more effective in realizing the efficient operation of facilities and the rational procurement of funds for covering the essential costs of wharves and terminals.

Talking about the above subject in the context of privatization or commercialization of port, since a port should be considered as social capital or a national asset which is vital not only to national or regional development but also to economic security, basic policy on port development and management should generally be controlled under the public sector like national or regional governments, and should not be left

to the care of the private sector such as shipping or cargo handling companies. This does not always mean that we ignore the positive effects of free competition among private entities when considering national economic development. Actually, we know there are many countries who have fully enjoyed the fruits of the free market system in the course of economic development. We believe, however, that the very nature of a port, as a basic infrastructure, does neither allow nor accept full privatization of its core function. Generally speaking, basic port facilities should be planned, constructed, and owned by the government accordingly.

In this sense, it is very important to understand that the port facilities and its services are just for providing private business entities with well cultivated fields in which they can promote their economic activities freely under a liberalized competitive market. The government as an owner of the port should take full responsibility in securing effective provision of such a field ready for open public use.

3.2 General Perspectives on International Position and Socio-economic Condition of Iran

Considering the rather long time span of about 17 years (up to 2010/11) given to the study for port sector development and management strategy, it is normally not easy to establish definite future perspectives of socioeconomic conditions of the country, as a basis of the study, especially under active movement of international relations. On the other hand, however, it is considered almost impossible to make a meaningful proposal on such a broad theme as requested without establishing background of the study such as future position of national socioeconomic conditions or international cargo traffic trends.

Under the situation, general perspectives of the most basic factors of socioeconomic conditions including international position of this country are foreseen on the basis of overall observation of international trends as summarized as follows:

- (1) Drastic change in the social and political regime of the country is not foreseen and fundamentals of citizen's life will be generally stable at least for the next couple of decades.
- (2) Future international conflicts, if any, will not have a serious impact upon socioeconomic position of the country.
- (3) Steadily increasing trend of economic growth in the country can be expected for a considerable term under stable policy of the government.
- (4) Peaceful and stable relations with neighboring states will be maintained in general.
- (5) Present trend of the government's policy and investment concerning transport infrastructure including port facilities will generally be continued even after the year 2000.

3.2.1 Socio-economic Frame for the Target Year

(1) Population and its Distribution

Several source of population statistics such as Iran Year Book, World Bank Data and so on are available. However most of them have data only up to the 1986 census. From Iran Statistical Yearbook 1370 (March 1991- March 1992), issued by Plan & Budget Organization of the Islamic Republic of Iran, the total population as of 1991/92 is available.

On the other side The Second Five-Year Plan (S.F.Y.P) from March 1994 to March 1999 of the Islamic Republic of Iran have been obtained from the relevant office. the Economic-Council of Iran (E.C.I) already approved the major targets of socio-economic indices in the S.F.Y.P. and the population at the goal year (March 1999) will reach 67.3 million.

This translates into an average population growth rate of 2.34% from 1991-1998. For the purpose of the population forecast, some conditions are stipulated by the Study Team as follows.

- (1) The base year is 1991/92.
- (2) The target year is 2000/01 and 2010/11.
- (3) Authorized data which includes future years will be preferred.

After the carefully checking the several sets of data, we have adopted 2.34% as the average population growth rate from 1991/92 to 1998/99 and 2.0% from 1999/2000 to 2000/01 and 2010/11 for the population forecast.

Based on these assumptions, the forecasted population in 2000/01 and 2010/11 is given in Table 3.2.1.1, -2 and Figure 3.2.1.1.

Table 3.2.1.1 Population Forecast

	1991/92	1998/99	2000/01	2010/11
Population (1,000 persons)	57,234	67,300	70,019	85,353
Annual Growth Ratio (per cent)	2.44	2.34	2.0	2.0

Note: Average population growth rate from 2000/01 to 2010/11 refers to World Bank data.

(2) Population of Provinces

The data of population by province is available only from the 1986 census. After that, statistical data on provincial population is described only by the birth and mortality rates.

Forecast is conducted on the assumption that the annual increase of the latest year,

Table 3.2.1.2 Population Forecast

Year	Population (1,000 persons)	Growth Rate
1987/88	51,073	
1988/89	52,779	3.34%
1989/90	54,364	3.00%
1990/91	55,869	2.77%
* 1991/92	57,234	2.44%
1992/93	58,574	2.34%
1993/94	59,946	2.34%
1994/95	61,349	2.34%
1995/96	62,786	2.34%
1996/97	64,256	2.34%
1997/98	65,760	2.34%
** 1998/99	67,300	2.34%
1999/00	68,646	2.00%
2000/01	70,019	2.00%
2001/02	71,419	2.00%
2002/03	72,848	2.00%
2003/04	74,305	2.00%
2004/05	75,791	2.00%
2005/06	77,307	2.00%
2006/07	78,853	2.00%
2007/08	80,430	2.00%
2008/09	82,038	2.00%
2009/10	83,679	2.00%
2010/11	85,353	2.00%

Note: * from Iran Statistical Yearbook
 : ** from the S.F.Y.P

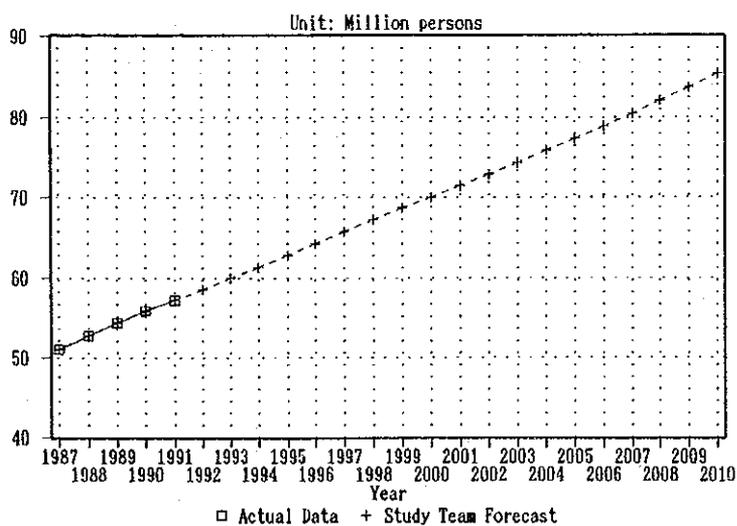


Figure 3.2.1.1 Population Forecast

1991-92 in each province will be constant every year. Practically speaking, the total population is already given as mentioned above, each province's population is estimated by multiplying increasing times and each increasing number and summing up by adjusting the total population by the object year. Results are shown as follows in Table 3.2.1.3 and Figure 3.2.1.2.

(3) Gross Domestic Product (GDP)

According to the future target value of gross domestic product(GDP) by The Second Five Year Plan (S.F.Y.P.), the average growth rate of GDP from 1994/95 - 1998/99 is about 7.08%. The GDP data are reported by the Central Bank of The Islamic Republic of Iran, and are available up to 1991/92.

Socio-economic condition reforms in Iran are proceeding now, and the GDP growth rate has begun to recover in the recent few years (12.2% in 1990/91, 11.05% in 1991/92).

However, the growth rate has dropped suddenly in last year (1992/93) mainly due to the fall of oil prices. The target values of GDP by E.C.I are assumed to be adequate.

There are no available data for the period of 1999-2010. However, considering the S.F.Y.P. policy that the income from other sources including export of non-oil goods will compensate the loss of the oil income, national product will increase continuously.

However, predicting the future economic condition of Iran will not be done so easy. because the financial condition of Iran depends heavily on the fluctuating oil income. Therefore, in considering the future socio-economic condition of Iran, the influence of the oil income (production & price of oil) must be recognized. The growth rate of GDP per-capita must also be considered. Hereinafter, four scenarios based on several economic conditions such as oil income and GDP per-capita in the target years in Iran will be examined.

For the purpose of above-mentioned simulation, some conditions are set by the Study Team as shown in Table 3.2.1.4.

The details of each scenario will be described in Chapter 3.3.

The average growth rate of GDP per-capita, 4.08%, 3.20%, 2.10% and 0.00% in the each case from 1994/95, will remain unchanged until the target years of 2000/01 and 2010/11.

Based on these assumptions, GDP values and growth rates in 1998/99, 2000/01 and 2010/11 are given in Table 3.2.1.5.

Table 3.2.1.3 Province Population

Province	1986/87*	1991/92* increase	1993/94** estimate	2000/01** estimate	2010/11** estimate
Total Country	49,445,010	1,365,294	59,946,000	70,019,000	85,353,000
Tehran	8,712,087	166,983	9,996,416	11,228,400	13,103,833
Markazi	1,082,109	27,692	1,295,099	1,499,407	1,810,424
Gilan	2,081,037	42,887	2,410,897	2,727,313	3,208,989
Mazandaran	3,419,346	91,640	4,124,184	4,800,294	5,829,529
East Azarbayejan	4,114,084	100,946	4,890,498	5,635,267	6,769,020
West Azarbayejan	1,971,677	60,001	2,433,167	2,875,849	3,549,737
Bakhtaran	1,462,965	43,226	1,795,432	2,114,349	2,599,833
Khuzestan	2,681,978	103,649	3,479,181	4,243,893	5,408,004
Pars	3,193,769	92,974	3,908,867	4,594,820	5,639,037
Kerman	1,622,958	57,209	2,062,974	2,485,056	3,127,586
Khorasan	5,280,605	144,214	6,389,809	7,453,805	9,073,513
Esfahan	3,294,916	73,488	3,860,140	4,402,327	5,227,691
Sistan & Baluchestan	1,197,059	55,463	1,623,646	2,032,846	2,655,767
Kordestan	1,078,415	29,912	1,308,479	1,529,167	1,865,117
Hamadan	1,505,826	46,357	1,862,375	2,204,392	2,725,041
Chaharmahal & Bakhtiari	631,179	26,726	836,739	1,033,920	1,334,088
Lorestan	1,367,029	49,599	1,748,514	2,114,450	2,671,510
Ilam	382,091	12,943	481,640	577,133	722,499
Kohgiluyeh & Boyerahmad	411,828	18,227	552,019	686,496	891,208
Bushehr	612,183	19,619	763,080	907,827	1,128,174
Zanjan	1,588,600	45,493	1,938,504	2,274,147	2,785,091
Semnan	417,035	9,202	487,811	555,702	659,053
Yazd	574,028	13,593	678,577	778,865	931,531
Hormozgan	762,206	33,251	1,017,952	1,263,274	1,636,726
			59,946,000	70,019,000	85,353,000

Note

* ; Statistical Center of Iran

** ; Estimation based on the annual increasing of 1991/92 by Study Team

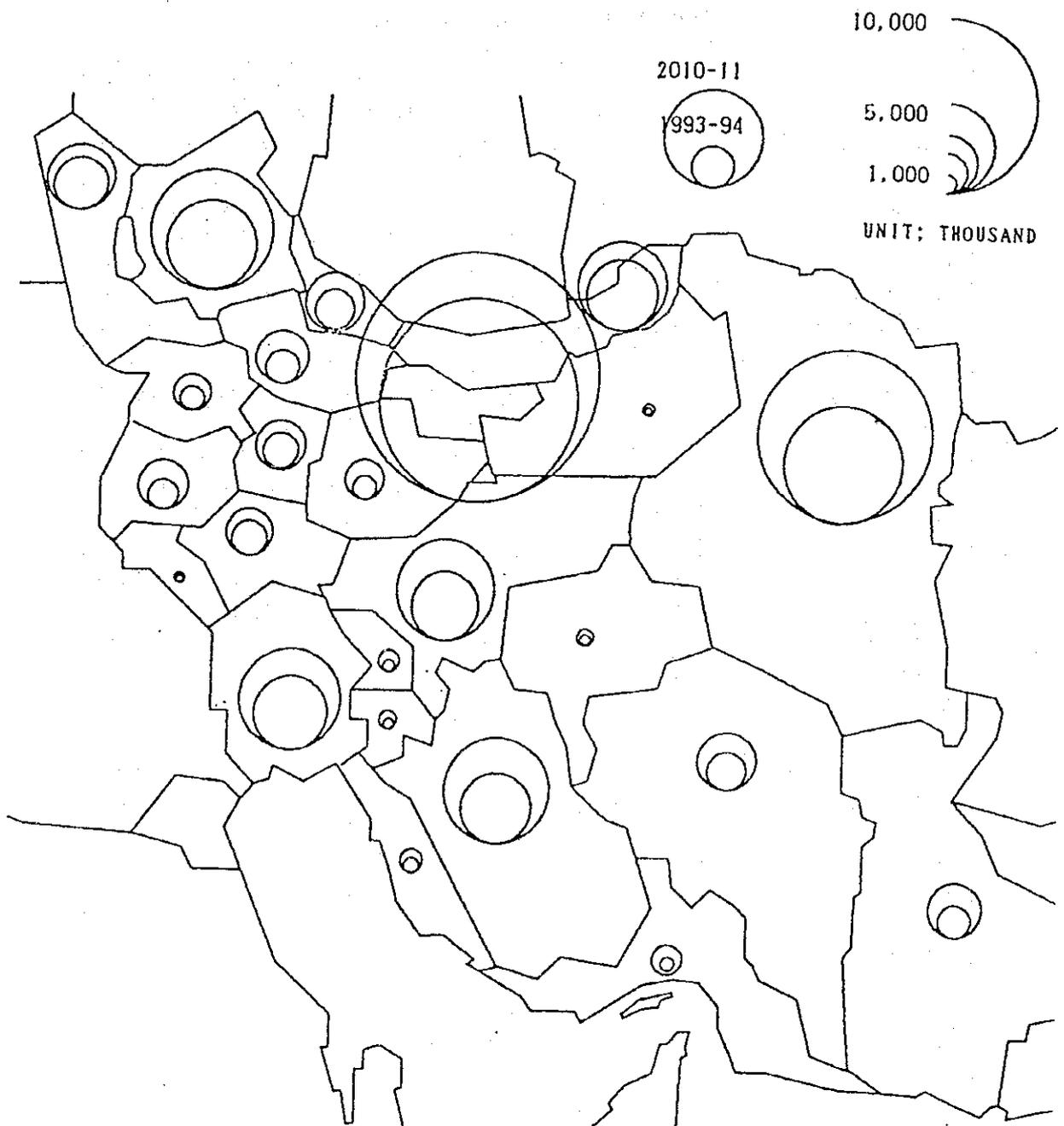


Figure 3.2.1.2 Population of Provinces Forecast for 2010/11

Table 3.2.1.4 Scenario for Economic Condition

Scenario	Economic Condition in Future	Year	Growth Rate of GDP per Capita (%)	Production of Oil (Thous. Bar/Day)	Oil Price (US\$)
Case - 1	High	1992~1993	4.28%	3,430 ~ 3,540	16.6 ~ 17.5
		1994~2000	4.08%	3,650 ~ 4,400	18.0 ~ 21.5
		2001~2010	4.08%	3,540 ~ 6,000	22.2 ~ 22.9
Case - 2	Medium High	1992~1993	4.28%	3,430 ~ 3,530	16.6 ~ 16.9
		1994~2000	3.20%	3,620 ~ 4,270	17.3 ~ 19.5
		2001~2010	3.20%	4,380 ~ 5,600	19.9 ~ 20.3
Case - 3	Medium Low	1992~1993	4.28%	3,430 ~ 3,500	16.6 ~ 16.8
		1994~2000	2.10%	3,570 ~ 4,020	16.9 ~ 18.0
		2001~2010	2.10%	4,100 ~ 4,900	18.2 ~ 19.9
Case - 4	Low	1992~1993	4.28%	3,430 ~ 3,470	16.6 ~ 16.8
		1994~2000	0%	3,510 ~ 3,750	16.9 ~ 18.0
		2001~2010	0%	3,800 ~ 4,200	18.2 ~ 19.9

Table 3.2.1.5 GDP Forecast, constant prices in 1982

		1991/92	1998/99	2000/01	2010/11
Gross Domestic Product	Case-1	12,181	18,727	21,105	38,366
	-2	12,181	17,951	19,891	33,224
	-3	12,181	17,014	18,453	27,690
	-4	12,181	15,335	15,955	19,449
Annual Growth Ratio	Case-1	11.45%	6.51%	6.16%	6.16%
	-2	11.45%	5.62%	5.26%	5.26%
	-3	11.45%	4.49%	4.14%	4.14%
	-4	11.45%	2.34%	2.00%	2.00%

3.3 Background and Perspectives on Future Status of Iran

The exact forecasting of future economic condition of a nation is normally not an easy task due to the unstable nature of world economy and its politics. However, it is useful to attempt to forecast the future economic condition to check the transportation of Iran.

3.3.1 Economic Frame Forecast

In this section we estimate the GDP product cost by sector, oil price, foreign trade frame and so on, according to four different levels of the annual growth rate of GDP per-capita. (See Section 3.2)

Case-1 Annual growth rate of GDP per-capita is 4.08%, the high growth level.

Case-2 Annual growth rate of GDP per-capita is 3.2%, medium high economic conditions.

Case-3 Annual growth rate of GDP per-capita is 2.1%, moderate economic conditions.

Case-4 Annual growth rate of GDP per-capita is 0.0%, the low growth level scenario.

Due to the general shortage of available economic data, systematic approach based on the complete set of data to estimate the GDP product cost by economic sectors in 2000/01 and 2010/11 is difficult. In this section, however, we forecast a future economic frame based on some conditions presumed by the Study Team.

(1) Setting of socio-economic frame in 2010/11

- GDP per-capita
- Population

These data have been set by the Study Team (Refer to Section 3.2).

(2) Future trade frame

Future trade frame is forecasted as shown in Figure 3.3.1.1.

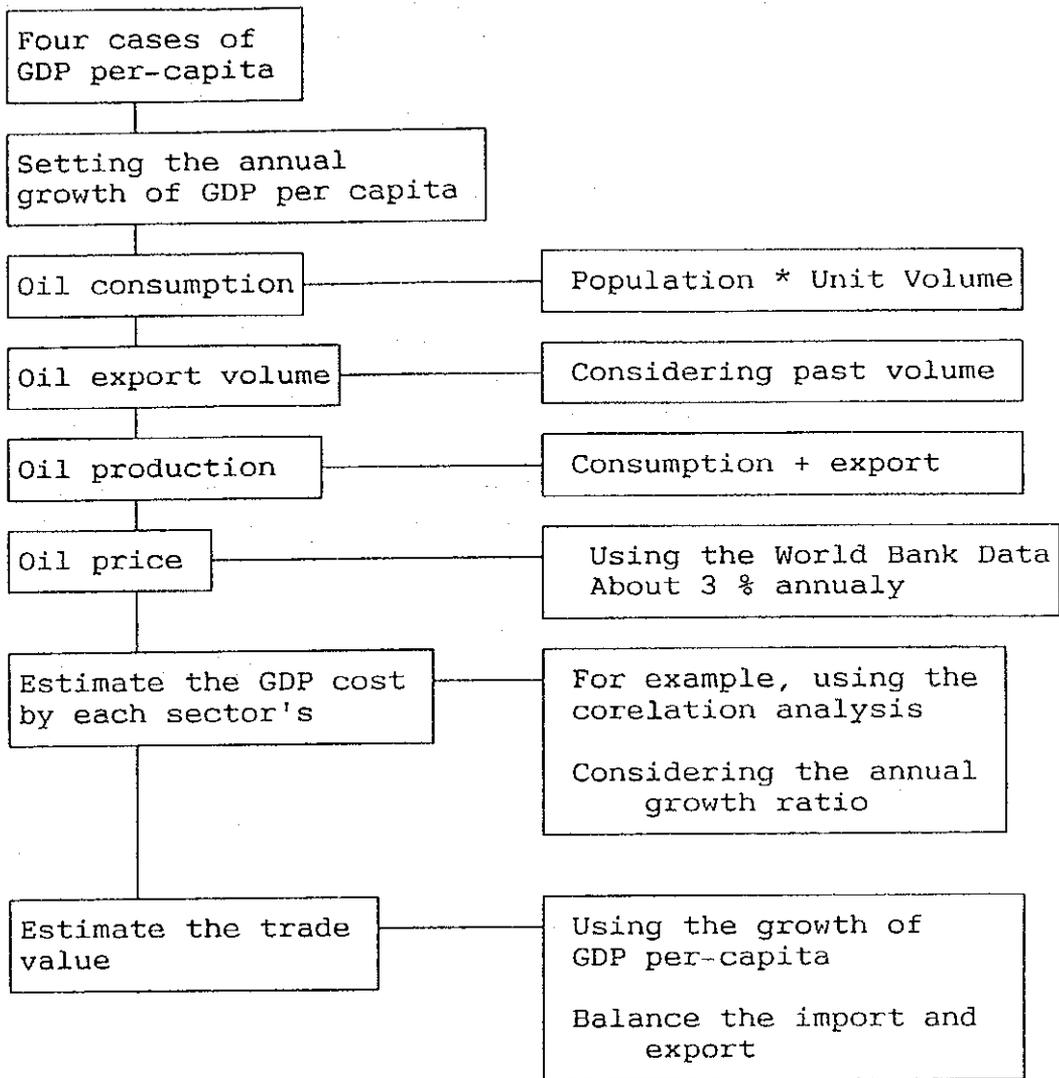


Figure 3.3.1.1 Forecast of the Future Trade Frame

In recent years 1.2 million barrel per day has been the consumption base and about 2.0-2.5 million barrels per day has been the exporting base in Iran. Future oil consumption is related to the growth of GDP and population. However, oil consumption per capita will not greatly increase because of the various factors including the increasing use of natural gas in the family, reducing the petroleum with car, changing the energy supply from petroleum to gas in the industrial structure and transportation.

Therefore, in the low case scenario, the oil consumption increases with population growth mostly and in the high case, the oil consumption increases with GDP growth. The volume will be assumed at 1.7-2.9 million barrels per day.

(Annual growth rate is 2%-5% and consumption per-capita is 1.0 ton-1.9 ton per year)

The future product volume is considered 6.0 million barrel per day maximum by past record, the export volume is estimated by subtracting consumption volume from product volume. The export volume is forecasted at 2.5-3.1 million barrel per day.

Table 3.3.1.1 Parameters of Oil (in 2010/11)

	(unit; Mn.Barrel)			
	Case-1	Case-2	Case-3	Case-4
Product Volume				
Total (Per year)	2,190	2,044	1,789	1,533
Consumption				
(Per day)	2.9	2.5	2.1	1.7
(Per year)	1,058	912	767	620
Export Volume				
(Per day)	3.1	3.1	2.8	2.5
(Per year)	1,132	1,132	1,022	913
Export ratio	52%	55%	57%	60%

Oil-Price				
(Barrel US\$)	22.9	20.3	19.9	19.9

These petroleum prices are estimated by the Study Team based on data of World Bank as shown in Table 3.3.1.2 and based on annual average growth rate of recent seven years between 1986-1992.(See Appendix 3.3 for more detailed data).

**Table 3.3.1.2 International Economic Parameters
(Average annual percentage, except interest rate)**

	1982-92	1992	1993	1992-2002	
				Baseline	Low case
G-7 GDP	2.7	1.6	1.9	2.7	2.0
World Trade volume	3.7	4.5	5.6	5.8	3.0
Export price of manufactures (US\$)	4.2	5.1	1.3	2.8	2.0
Price of petroleum (US\$)	-5.5	-0.2	-3.2	4.0	2.0
Non-oil commodity price (US\$)	-0.3	-4.5	3.3	4.0	1.0

Source; Global Economic Prospects and the Developing Countries (162 countries), The World Bank, p 10, 1993

3.3.2 Share of Production

Before estimating production shares and annual growth rate by sector, some conditions are assumed about the future economic frame considering the most influential aspect on the economic growth of a nation.

(1) Four cases are proposed in estimating oil prices as mentioned above.

(2) Since the functions of industrial, mining and energy sectors are very important, the growth rate of these sectors are set in higher level than others.

The target share of the industrial and manufacturing sector will be determined based on data of countries with similar economic structures.

(3) It is predicted that for exporting non-oil goods to the world, Iranian industrial sectors shall progress at the high rate. And for supplying raw materials, mining sector will move parallel to the industrial sector.

(4) As mentioned above, the policy of the Iranian government is to become independent from oil income and thus must focus on the promotion of non-oil export which is a highly significant and strategic factor in economic growth and development.

Table 3.3.2.1 and Figure 3.3.2.1 show the forecast share of each economic sector(Case-2). In the Table, it can be pointed out that as the growth rate of industry increases, the agriculture and oil sector's growth rate will decrease (See appendix 3.3 for more detailed data).

Table 3.3.2.1 The Value of Economic Sector (Case 2)

YEAR	GROSS DOMESTIC PRODUCT						
	AGRI- CULTURE	OIL	MINING	MANUFAC- TURING	ENERGY	CONST- RUCTION	SERVICES
1986/87	2,650.5	1,403.0	62.3	1,148.0	173.5	648.9	4,606.3
1987/88	2,715.8	1,598.7	65.5	1,275.6	193.2	549.8	4,377.6
1988/89	2,648.0	1,754.0	56.6	1,301.8	186.3	433.4	3,980.5
1989/90	2,746.0	1,889.5	58.6	1,417.9	206.7	425.9	4,055.3
1990/91	2,967.5	2,264.7	63.1	1,643.8	246.7	438.2	4,421.2
1991/92	3,120.2	2,516.7	68.4	1,940.3	285.0	508.3	4,825.2
1992/93	3,351.6	2,569.3	72.9	2,002.4	309.1	548.5	5,341.9
1993/94*	3,513.5	2,708.2	82.9	2,278.1	330.0	577.1	5,458.9
1994/95	3,703.6	2,790.8	90.6	2,452.2	352.7	610.9	5,767.8
1995/96	3,904.1	2,875.9	99.1	2,639.5	377.0	646.6	6,094.2
1996/97	4,115.4	2,963.6	108.4	2,841.1	402.9	684.4	6,439.1
1997/98	4,338.1	3,053.9	118.5	3,058.2	430.7	724.4	6,803.4
1998/99	4,572.9	3,147.0	129.6	3,291.8	460.4	766.8	7,188.4
1999/00	4,804.4	3,232.2	141.3	3,531.5	490.4	809.0	7,570.1
2000/01	5,047.6	3,319.7	154.0	3,788.7	522.5	853.4	7,972.0
2001/02	5,303.2	3,409.5	167.9	4,064.6	556.6	900.4	8,395.2
2002/03	5,571.6	3,501.8	183.0	4,360.6	593.0	949.9	8,840.9
2003/04	5,853.7	3,596.6	199.4	4,678.1	631.7	1,002.1	9,310.2
2004/05	6,150.1	3,694.0	217.3	5,018.8	673.0	1,057.2	9,804.5
2005/06	6,461.4	3,794.0	236.9	5,384.3	717.0	1,115.3	10,325.0
2006/07	6,788.6	3,896.7	258.2	5,776.4	763.8	1,176.6	10,873.1
2007/08	7,132.3	4,002.2	281.4	6,197.0	813.7	1,241.3	11,450.4
2008/09	7,493.3	4,110.5	306.7	6,648.3	866.8	1,309.5	12,058.2
2009/10	7,872.7	4,221.8	334.3	7,132.5	923.5	1,381.5	12,698.4
2010/11	8,271.3	4,336.1	364.4	7,651.9	983.8	1,457.5	13,372.5
2000/1994	5.3%	2.9%	9.2%	7.5%	6.8%	5.7%	5.5%
2010/2000	5.1%	2.7%	9.0%	7.3%	6.5%	5.5%	5.3%
SHARE OF GDP in 2010	22.7%	11.9%	1.0%	21.0%	2.7%	4.0%	36.7%

SOURCE: CENTRAL BANK OF I. R. I

*ESTIMATED BY THE STUDY TEAM FOR A PERIOD OF 1993-2010

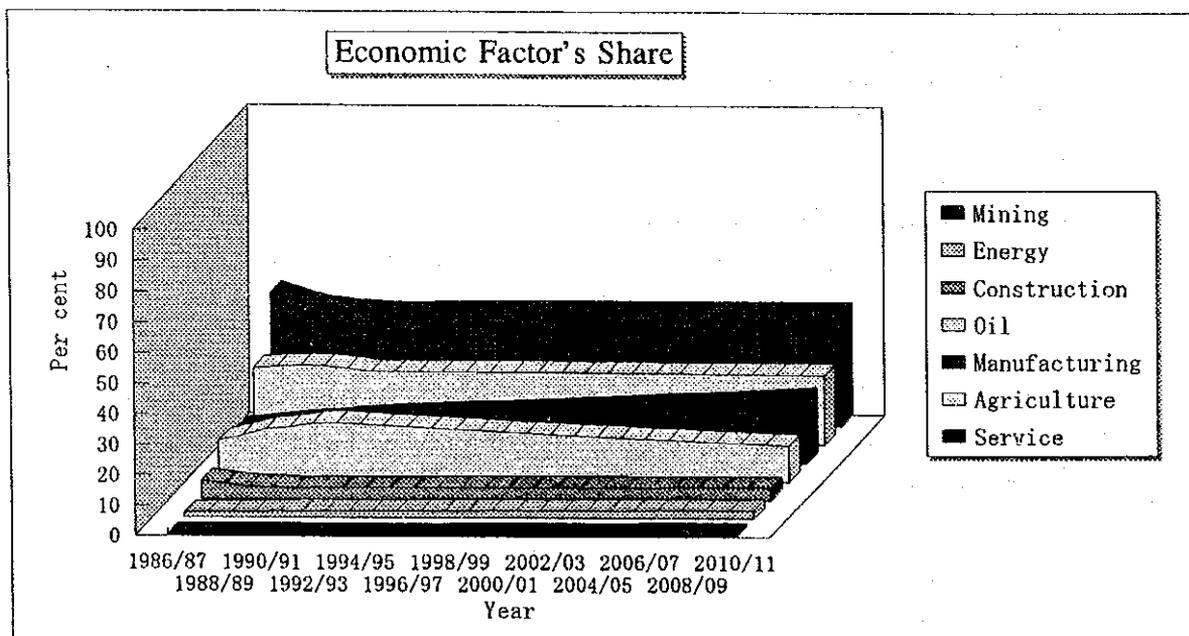


Figure 3.3.2.1 Economic Factor's Share (Case 2)

3.3.3 Target of Trade Frame

Here, the following proposals are made by the Study Team.

(1) Calculate the trade value

Followings are the proposed assumptions for forecasting future trade frame.

- i) Imported goods values are related to the annual growth rate of GDP.
- ii) The import-export balance is predicted to be equal in 2001/02.
- iii) The oil export value is already predicted as mentioned above. Only the annual change ratio is used for estimating future export value because the actual oil value data are different by source with calculating method.
- iv) There are deficits between 1993/94 and 2001/02, trade debt should be payed before 2010/11.

Based on these assumptions, average growth of non-oil goods value is 9.3% per year in case-2.

From the results shown in Table 3.3.3.1, import value for the year of 2010/11 is 43.38 billion dollars, and export value (non-oil) is 21.77 billion dollars.

Table 3.3.3.1 Future Trade Value

FUTURE TRADE FRAME (CASE-2) (VALUE MILLION DOLLARS)					
YEAR	EXPORT CRUDE OIL	EXPORT NON-OIL	EXPORT TOTAL	IMPORT TOTAL	*TRADE VALUE
1987/88	10,755.0	1,161.2	11,916.2	13,236.0	14,397
1988/89	9,673.1	1,036.4	10,709.5	11,519.0	12,555
1989/90	12,037.0	1,064.0	13,101.0	14,666.0	15,730
1990/91	17,441.0	1,327.0	18,768.0	20,526.0	21,853
1991/92	15,802.0	2,613.0	18,415.0	27,445.0	30,058
1992/93	15,300.0	2,800.0	18,100.0	23,200.0	26,000
1993/94	16,305.0	3,280.0	19,585.0	24,759.0	28,039
1994/95	16,822.9	3,920.2	20,743.1	23,521.1	27,441
1995/96	17,357.2	4,612.4	21,969.6	24,508.9	29,121
1996/97	17,908.5	5,360.2	23,268.7	25,538.3	30,898
1997/98	18,477.4	6,167.2	24,644.6	26,610.9	32,778
1998/99	19,064.3	7,037.6	26,101.8	27,728.6	34,766
1999/00	19,669.8	7,975.5	27,645.3	28,782.3	36,758
2000/01	20,294.6	8,985.4	29,279.9	29,876.0	38,861
2001/02	20,939.2	10,072.1	31,011.3	31,011.3	41,083
2002/03	21,604.3	12,652.6	34,256.8	32,189.7	44,842
2003/04	21,853.4	13,626.6	35,480.0	33,412.9	47,040
2004/05	22,105.4	14,644.3	36,749.7	34,682.6	49,327
2005/06	22,360.3	15,707.3	38,067.7	36,000.5	51,708
2006/07	22,618.2	16,817.5	39,435.7	37,368.6	54,186
2007/08	22,879.0	17,976.7	40,855.7	38,788.6	56,765
2008/09	23,142.9	19,186.8	42,329.6	40,262.5	59,449
2009/10	23,409.8	20,449.9	43,859.6	41,792.5	62,242
2010/11	23,679.7	21,768.0	45,447.7	43,380.6	65,149
2010/2000	1.6%	9.3%	4.5%	3.8%	5.3%
NON-OIL / TOTAL EXP =			47.9%		
* TRADE VALUE (EXCLUDING OIL, OIL PRODUCT)					

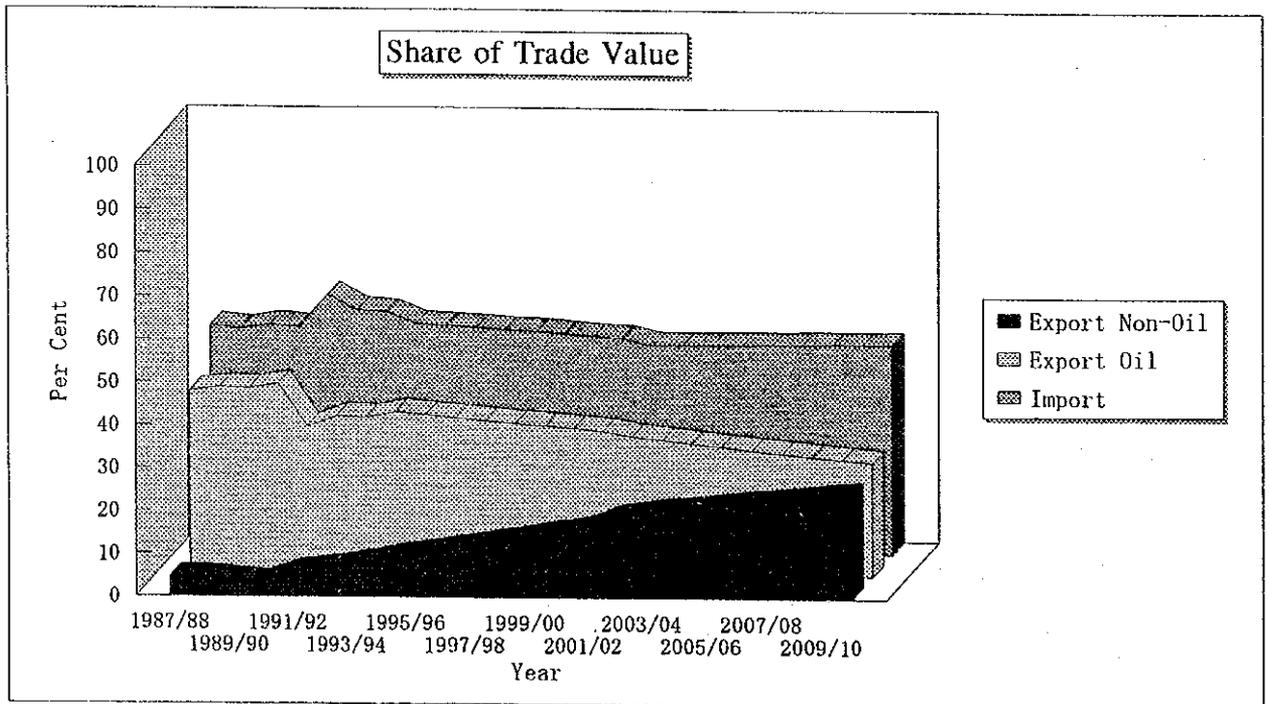


Figure 3.3.3.1 Future Trade Forecast

3.3.4 Basic Perspectives of Iranian Port

The long-term development plan for the period of about twenty years would be formulated considering the physical construction plan, improvement of cargo equipment plan, privatization plan etc.

(1) Land bridge Cargo

This is important for the CIS countries for their future foreign trade. There may be some trading patterns, as shown here below;

Between CIS countries and Europe

Between CIS countries and Asia

Between CIS countries and Middle East, Africa, Oceania

Between CIS countries and the Americas

1) Cargo to/from Europe

There are two possible routes considered, one is the over land routes by rail or trucks and in some cases using the Caspian Sea. The second route is the land bridge through Iran in ports both along the Persian Gulf and Caspian Sea coast.

High value & small volume cargo transported by trucks or airplane and raw materials, heavy and mass volume cargo, shall use the land-bridge. Prime examples of the latter are oil products, textile, mineral and so on.

2) Cargo to/from Asia, Middle East, North and South America

Cargo will be transported by land-bridge excluding some cargo to/from China which will be transported on-land directly.

The Iranian port will be expected to support the trade, for example, to supply the transport facilities, storage facilities, commercial facilities, information and so on.

This will be the first time for Iranian ports to play such a role and thus the first few years will serve as a test case for the PSO following the rapid construction of the total transport system.

(2) Free Trade Zone

The Kish Free Trade Zone is being operated and handling the cargo. The port will support their activities until the free trade zone can perfectly perform its functions.

Qeshm Island is initiating improvements in preparation for the new free trade zone for commerce and industry. Bandar Abbas will act as the side port to this zone for a while or main port in future.