

Chapter 13

Management and Operation for the Proposed Port Activities

Chapter 13 Management and Operation for the Proposed Port Activities

13.1 Overall Administration System

13.1.1 Required Functions for Iranian Commercial Ports

To be logistics centers for the national citizens, to support development of the national economy and to function as strategic centers in the international transportation network, the Iranian ports should be "attractive and profitable ports for users".

It is thought that (1) highly efficient, (2) cost saving, (3) safe and reliable services are priority requirements in becoming an attractive port for users.

The most important function of a port is to serve as a terminal where sea and land transportation meet. Efficiency and safety are thus vital in the transfer of cargo and passengers. For cargo handling, quickness, reliability and cost effectiveness are strongly required.

13.1.2 Government and PSO, Decentralization

PSO can be called an independent organization, because

- (1) PSO has its own special account,
- (2) PSO has the competence to control national water area and a part of land area.

PSO is, however, under strict control of Government and the parliament, because

- (1) PSO needs permission from the parliament when changing its tariff by more than 30 %.
- (2) Government gives PSO subsidies for large scale development work.

In general, ports are important public infrastructures for the national economy. Therefore, it is necessary that ports be under administration of Government to a certain degree.

On the other hand, the participation of Government should be reduced especially in the field of port operation and investment for efficient port management and operation. Financial system based on economic principles should be established to realize financially sound port management and operation. It is important that PSO becomes financially independent from Government and has the competence to decide investments to realize more efficient and financially sound port management and operation. This will contribute to development of the national economy.

Therefore, the ports should be under the control of Government to a certain degree, but the ports should become independent in the field of port operation and investment as far as possible.

An example of the relationship between Government and the port management entity

(PSO) is shown below.

- (1) Port management entity (PSO) should be financially independent from Government.
- (2) Port management entity (PSO) should have competence to decide its tariff.
- (3) Permission of parliament should be needed to decide its yearly budget.
- (4) Permission of parliament should be needed to decide the laws concerning its activities.
- (5) Port management entity (PSO) should have a council which consists of the heads of the authorities concerned as a decision-making organization.
- (6) The head of Port management entity (PSO) should be chosen by the above-mentioned council.

Proper institutional system should be created referring to the above-mentioned example as far as circumstances permit.

Concerning the tariff, in particular, if modification of a part of the tariff is considered to contribute to proper and efficient port operation, such as modification of storage charge as mentioned below, PSO should have the competence to implement such a revision.

13.1.3 PSO head office and Port Authorities

The port authorities currently conduct port related activities according to direction of PSO head office. PSO head office strictly controls personnel, budget and procurement affairs of the port authorities.

To provide the port users with higher quality services in the future, it is desirable that each port competes with each other and devises the contents of the port service. This will contribute to development of the national economy by raising the quality of port services.

Therefore, it is desirable to gradually transfer some of the competence, which PSO head office has currently, to the port authorities.

(1) Procurement System

PSO should possess basic port infrastructure and facilities including major quay cranes to control the ports properly even after privatization, and PSO will conduct maintenance work of these port infrastructure and facilities.

Iranian ports should be able to repair cargo handling equipment quickly, especially in the case of container cargo handling equipment such as gantry cranes. To become hub ports in this area it is very important in operating modern container terminals to minimize idling time of cargo handling equipment, thus more effective procurement activities for spare parts of maintenance works are required in order to avoid possible delay of cargo handling for highly time conscious container vessels.

It is desirable that each port be able to purchase their necessities such as spare parts for cargo handling equipment through a more simplified procedure. PSO head office should transfer its competence concerning procurement procedure and revision of the

budget to the port authorities as far as possible.

(2) Finance

Each port should become a more independent entity to provide the port users with higher quality services in the future. It is desirable that the port authority or the complex of the port authorities become financially more self-supporting to have more competence to decide a part of tariff and investment. The port authorities of advanced ports in major countries have this self-supporting accounting system. Studying such a system is recommended.

(3) Personnel

PSO head office has the competence to decide personnel affairs of the port authorities, such as appointment, movement and promotion at present.

It is desirable that each port be able to evaluate and appoint its own personnel to cope with the particular problems of each port. It is not rational that PSO head office decides all personnel affairs because the procedure usually takes a long time and the system can hardly reflect the actual condition of each port site.

Therefore, each port authority should have the competence to decide personnel affairs of staffs who are in charge of controlling port site activities.

However, smooth relationship between PSO head office and port authorities is necessary. In this sense, it is realistic that some posts are appointed by PSO head office.

The sample recommendation on roles of the PSO head office and the port authorities concerning personnel affairs are shown below.

- 1) The Port Director and the Deputy Port Directors should be chosen by PSO head office (the Board of Directors).
- 2) Employment and dismissal of all port authority staff who are lower than the above mentioned class is decided by PSO head office.
- 3) The director of each division should be chosen by the Managing Director of PSO head office.
- 4) Promotion and movement of port authority staff who are lower than the director of each division is decided by each Port Director.
- 5) Personnel transfer between the port authorities is decided by PSO head office based on mutual agreement.

Proper personnel system (appointment, movement and promotion) should be created referring to the above mentioned recommendation as far as circumstances permit. In addition to this, personnel transfer between PSO head office and the port authorities should be increased. To realize development of port management and operation, PSO head office and the port authorities should cope with this theme in cooperation with each other. On the other hand, ports are unique spots where sea transport and land transport meet. Expert knowledge is needed to control port

management and operation. All PSO staff should be well versed in actual condition of the ports. They all should be highly qualified and have experience in port operation and management. Therefore, persons who have experience at port operation site should be sent to PSO head office under an appropriate transfer scheme.

(4) Port promotion

As mentioned later, PSO does not conduct conspicuous port promotion activities. PSO should conduct the activities aggressively. Currently PSO head office makes a port promotion plan and conducts it. It is desirable, however, that each port competes with one another to heighten the quality of services. Therefore, port promotion activities should be conducted by the port authorities in future. Abbas port, Anzali port, and Imam Khomeini port authorities, in particular, should conduct these activities at an earlier stage, because these ports compete with neighboring ports.

(5) Construction Work

At present, large scale construction works are planned by PSO head office, detail design and supervision of them are contracted out by PSO head office. (The port authorities can make contracts of construction works.) In the future, PSO head office should transfer the jobs concerning construction works except planning, budgeting and formulation of design criteria, to the port authorities to reduce the procedures. At the ports which need large-scale development such as Anzali port and Imam Khomeini port, this transference is more important.

(6) Operation of the Ports

PSO head office controls port operation activities of each port at present. In future, PSO head office should transfer the jobs concerning port operation to the port authorities to operate their ports more flexibly. Specifically, the issuance of the licenses for cargo handling works to private entities and permission of land use in the port area should be assumed by the port authorities.

(7) Items which should be under control of PSO

While administrative competence should be transferred to the port authorities as far as possible, PSO must retain control of certain areas because ports are a strategic and important infrastructure of Iran. Major items of which PSO should be in charge are listed below.

- 1) Formulation of nation-wide port development policy and plan
- 2) Examination of development plan of individual port
- 3) Permission of exclusive use and reclamation of public water area
- 4) Permission of large-scale development activities in port area
- 5) Revision of (a part of) port tariff
- 6) Formulation of budget of Iranian ports

- 7) Formulation of port related law and regulation
- 8) Formulation of technical standards for construction work of ports
- 9) International affairs

13.2 Major Iranian Ports Management System

13.2.1 Basic Policy for Port Management and Operation

Alternative(A) and Alternative(B) in Table 13.2.1.1 are considered the best selections for PSO.

Under alternative(A) and (B), early introduction of privatization in cargo handling operation is recommended. As is commonly understood, public sector is normally not flexible in providing personnel or investment in response to the actual fluctuation of demand. In this sense, full involvement of port authority in cargo-handling services is not always suitable for increasing efficiency of such services under a competitive market, and increased situation of cargo flow in particular.

Therefore, it is sound for Iranian ports to privatize cargo-handling function as soon as possible and improve their efficiency through competition among private companies. This will be a better solution to realize an efficient cargo handling system and to contribute to improvement of the Iranian economy in future.

To realize above-mentioned introduction of privatization, however, PSO has to make great efforts to attract more cargo so as to activate the port related private entities which will absorb PSO's operational staff.

Table 13.2.1.1 Alternatives of Terminal Operation

Alternative	Present			Short Term Plan (- 2000)		Long Term Plan (- 2010)	
	Major ports on Persian Gulf	Major ports on Caspian Sea	Major ports on Persian Gulf	Major ports on Caspian Sea	Major ports on Persian Gulf	Major ports on Caspian Sea	
(A) Owned by Provide service for Cargo handled by	Public	Public	Public	Public	Public	Public	
	Open	Open	Open	Open	Open	Open	
(B) Owned by Provide service for Cargo handled by	Public & Private	Public & Private	Private	Private	Open & Exclusive	Private	
	Public	Public	Public	Public	Public	Public	
	Open	Open	Open & Exclusive	Open	Open & Exclusive	Open	
	Public & Private	Public & Private	Private	Private	Private	Private	

Note: Exclusive; The type of operation which allows only limited companies to use berths.

Open & Exclusive; In principle the berths are open to public use, but exclusive use berths will be partly introduced.

13.2.2 Anzali Port Authority (ANPA)

If cargo-handling service is privatized, the sections for cargo verification, cargo handling, warehouse will be separated from ANPA. Eventually the organization for mooring, water supply, repair work of cargo handling equipment, should also be separated. Towage and pilotage can be separated if there is enough demand.

However, the organization which conducts management of port infrastructure and facilities should be left under their administration. The following management activities will be done by ANPA in such a case.

- (1) Permission of usage of port infrastructure and facilities, berth allotment.
- (2) Permission of usage of port area.
- (3) Calculation, billing and collection of usage charges of port infrastructure and facilities.

Environmental affairs will become an important issue. In ANPA, sections in charge of conducting monitoring and assessing environmental impact should be established in the future.

There is a possibility that ANPA could become financially independent and conduct port promotion activities by themselves in future. ANPA should start to study these issues. It should conduct these activities at the earliest possible stage because Anzali port competes with neighboring ports.

13.2.3 Exclusive Use Terminals

(1) Container Terminal

Container terminals, at Anzali port in particular, are better suited to the introduction of an exclusive use terminal system. In this case, it is very important to determine how to select the best entities for appropriate operation of the terminal. Examples of criteria for selection of such companies are shown as follows.

- 1) Companies which are able to perform efficient container cargo handling to fit customer demand.
- 2) Companies which can collect an adequate quantity of container cargo while keeping sound financial position.
- 3) Companies which can provide reliable services throughout their leasing term

(2) General Cargo Terminal

General cargo terminals are normally used by various users and handle a smaller amount of cargo compared with container terminals. Naturally, these terminals

should be open to public use.

(3) Bulk Cargo Terminal

In the case of terminals for bulk cargo such as grain, iron powder and aluminum powder, on-land facilities can be used by a specified entity, while the berth will be used by many shipping companies. Therefore, the berths should be open to public use. PSO may lease a limited area of land to the specified entities, and allow them to construct on-land cargo handling facilities if these facilities do not obstruct public use of the berths. In this case, the lease periods should be limited.

13.2.4 Owner of Port Infrastructure and facilities

ANPA should own major infrastructure and facilities such as water facilities (waterways anchorage), breakwater, wharves, open storage yard and transit sheds even after privatization of cargo handling services.

In addition to these, quay cranes fixed on the berths such as gantry cranes should be owned by ANPA so as not to obstruct public use of the berths. These cranes should be leased to private cargo handling entities in future.

Other equipment such as forklifts and movable cranes should be owned by private entities because this equipment can be flexibly provided by private entities and ANPA can save time for procurement procedures and maintenance work. However, items of equipment which ANPA owns at present should be retained until their service lives have expired.

13.3 Financial System and Port Tariff

13.3.1 Financial System

(1) General

PSO has a modern financial system as it uses normal financial statements. However, PSO is not financially independent from Government because its investment budget comes from the national general account.

The intervention of Government should be reduced especially in the field of port operation and investment for efficient port management and operation as much as possible. Financial system based on economic principles should be established to realize financially sound port management and operation.

It is important that PSO becomes financially independent from Government and has the competence to decide investments to realize more efficient and financially sound port management and operation. This will contribute to the development of the national economy.

To grasp and analyze financial situations accurately and quickly, it is necessary that PSO has more detailed financial statistics data - data by kind of cargo, by port etc.

(2) Anzali port authority (ANPA)

In future, port income is expected to greatly increase at ANPA. Therefore it is desired that ANPA has a self-supporting accounting system.

To put it concretely, in future, by the year 2010, ANPA should begin to allocate income for maintenance and repair expenditures.

The methods to raise investment funds are shown in Table 13.3.1.1.

Table 13.3.1.1 Methods to Raise Investment Funds

case	methods
A: Anzali port authority accepts subsidies from PSO head office budget.	Anzali port authority returns contributions from net income to PSO head office.
B: Anzali port authority allocates its own income for investment.	Anzali port authority returns no contribution. Approval by PSO head office conditions investment planning.

It is desired that PSO targets case A temporarily, then shifts to case B as soon as profits get higher and the basis for a self-supporting accounting system is established.

On the other hand, ANPA should make efforts to restrain increase of fixed expenses such as personnel expense. Especially, too much personnel employment causes unsound financial conditions. To reduce personnel expense, following methods are effective.

1) Efficient port management and operation.

By introduction of new equipment or improvement of staff's ability, required number of personnel for port management and operation (per fixed quantity) decrease.

2) Introduction of contract work

By changing work provided by ANPA to contract work by private entities, staff in charge of that work can practice other work. This supports privatization. (Contract expense is easier to reduce than personnel expense.)

3) Reconsidering the service previously provided by ANPA

In exchange for the start of new work such as port promotion activities in future, previous unnecessary work should be abolished.

(3) Fund raising

Under a self-supporting accounting system, investment funds should be mainly raised from port income. Maintenance and repair expenditures of port equipment and facilities should be all raised from port income.

However, when a relatively large initial investment is necessary, for example - construction of new facilities and equipment, port income alone may be insufficient to meet the required investment. In this case, ANPA should obtain interest-free loans by external financing.

But, needless to say, even interest-free loans should be applied for only under the following conditions.

- 1) The objective investments are essential to Anzali port.
- 2) Loan repayment will not seriously hamper the port authority's financial situation.

If necessary, ANPA should consider regular loans if repayment will not be a problem.

13.3.2 Port Tariff

(1) General

Financial system based on economic principles should be established to realize financially sound port management and operation. PSO should set its tariff at a proper level to obtain sufficient income to maintain sound financial condition and to make the necessary investments.

On the other hand, tariff should be set taking levels of neighboring ports into consideration to attract more port users. PSO should always study tariffs of neighboring ports and major hub ports in the world.

For reference, PSO tariff rates are compared with those of a representative Asian port (Port A) and Central American port (Port B) in Table 13.3.2.1.

Under the PSO tariff, costs to shipping companies are approximately 9.1 times higher than at Port A and 8.6 times higher than at Port B.

Oppositely costs borne by cargo owners under the PSO tariff are 10.0 % of those at Port A and 11.9 % of those at Port B.

Consequently, PSO should vigilantly monitor and analyze tariffs of neighboring ports and major hub ports in the world, and revise its tariff when necessary.

Tariffs related to shipping companies must be reduced to a lower level. If the tariff structure is not competitive with other ports, it will be difficult to attract more users.

On the other hand, tariffs related to cargo owners must be raised so that PSO can gain enough income for port development, maintenance, management and operation. However, needless to say, when PSO raises the tariff level, competitiveness with other ports should be checked carefully.

(2) Privatization and Tariff

With the introduction of privatization, the income structure will be changed drastically. After privatization, the consignees will pay charges such as cargo handling charge to the private entities, then the private entities will pay port charge and duties such as charge for transit sheds to PSO (the port authorities).

The consignees will pay the port authorities the port duties such as wharfage.

The shipping companies will pay the port duties such as port-entering duties and dockage to the port authorities.

If pilotage, towage and line handling services are privatized, the shipping companies will pay these charges to the private entities.

Table 13.3.2.1 Tariff Comparison

Presuppositions	
Container Ship	25,000 GRT
Staying in Port	2 days
Unloading Container(Import)	10,000 Tonnage
Loading Container(Export)	5,000 Tonnage
(Loading and Unloading at Berth)	

Tariff for Shipping Company	PSO		Port A (An Asian Port)		Port B (A Port in Central America)	
	Tariff Rate	Tariff	Tariff Rate	Tariff	Tariff Rate	Tariff
Entering Port Mouth	6 cent/GRT	1,500 US\$	- cent/GRT	0 US\$	- cent/GRT	0 US\$
Entering Port	10 cent/GRT	2,500 US\$	4.12 cent/GRT	1,030 US\$	5 cent/GRT	1,250 US\$
Pilotage	40 cent/GRT	10,000 US\$	4.12 cent/GRT	1,030 US\$	- cent/GRT	0 US\$
For Dredging	41 cent/GRT	10,250 US\$	- cent/GRT	0 US\$	- cent/GRT	0 US\$
Loading and Discharging	22 cent/GRT	5,500 US\$	- cent/GRT	0 US\$	- cent/GRT	0 US\$
Side Wharfrage	10 cent/GRT/day	5,000 US\$	0.2 cent/GRT/hour	1,200 US\$	6 cent/GRT/day	3,000 US\$
For Lighthouses, Signs	4 cent/GRT	1,000 US\$	3.09 cent/GRT	773 US\$	- cent/GRT	0 US\$
Gabage collection	3 cent/GRT	750 US\$	- cent/GRT	0 US\$	- cent/GRT	0 US\$
Total		36,500 US\$		4,033 US\$		4,250 US\$
Tariff for Cargo Owner						
Berth Charge on Cargo(Unloading)	180 Rls/ton	900 US\$	- US\$/ton	0 US\$	40 US\$/TEU	40,000 US\$
Berth Charge on Cargo>Loading)	95 Rls/ton	238 US\$	- US\$/ton	0 US\$	40 US\$/ton	20,000 US\$
Dues on Cargo(Inward)	45 Rls/ton	200 US\$	1.0048 US\$/ton	10,049 US\$	- US\$/ton	0 US\$
Dues on Cargo(Outward)	10 Rls/ton	25 US\$	0.9756 US\$/ton	4,878 US\$	- US\$/ton	0 US\$
(Cargo Handling)					- US\$/ton	
Port Crane(Unloading)	22,000 Rls/Unit	11,000 US\$	106.7 US\$/ton	106,700 US\$	60 US\$/TEU	60,000 US\$
Port Crane>Loading)	22,000 Rls/Unit	5,500 US\$	106.7 US\$/ton	53,350 US\$	60 US\$/TEU	30,000 US\$
Port Dues(Import)	-	-	0.2512 US\$/ton	2,512 US\$	-	-
Port Dues(Export)	-	-	0.2439 US\$/ton	1,220 US\$	-	-
Total		17,863 US\$		178,709 US\$		150,000 US\$
Grand Total		54,363 US\$		182,742 US\$		154,250 US\$

13.4 Cargo Handling Operation

13.4.1 Role of cargo handling operation at port for cargo transportation from origin to destination

The cargo handling operation is just one step operation on the way from origin to destination for cargo transportation.

Then, cargo handling system and operation could be considered separately.

It is not right recognition that the cargo handling operation at port consists of cargo handling from/to ship and from/to truck and/or rail wagon.

One of required roles of cargo handling operation at port is to connect smoothly and economically different cargo handling system (sea-side and land-side) and to establish the most economical transportation system.

Considering later handling operation including final handling at destination, each cargo handling operation at port shall be done.

Of course, if necessary, it shall be considered to store provisionally the cargo to be handled from/to ship and from/to truck and/or rail wagon at the port site.

13.4.2 Role of port authority for cargo handling operation at the port

Regardless of cargo handling operator, most of handling operators will plan to handle the cargo easily and economically without any consideration for later handling to be done by another cargo handling operator.

Then all cargo handling operation at port shall be carried out under control of port authority.

Port authority shall consider the economical cargo handling operation in total and the pollution of the environment at port.

13.4.3 Cargo Handling Operator

All cargo handling operation at each stage at port carried out by private company or third-sector to achieve the economical and efficient cargo handling operation.

In this case, large or expensive cargo handling equipment will be lent by port authority and minor cargo handling equipment will be owned by itself.

Furthermore, port authority shall consider to bring up plural private cargo handling operators to increase their competition power.

13.5 Engineering System

This subsection deals with the possible engineering system for efficient management and economical port operation on the proposed port activities in respect of the technical aspect, "engineering". The engineer should have responsibilities in various technical activities including, site investigation, planning, design, construction supervision and periodical maintenance. Giving training to young engineers is one of important duties of senior engineers.

13.5.1 General Background Concepts

Imam Khomeini port forms an important element in the economic and social development of Iran. Accordingly, port study should not only concern the port itself but also consider the wider economic, social and physical factors in determining the role of the port in the overall regional and national development plans.

Factors that may be involved are, for example:

- space and land requirements;
- economic development of the hinterland of the port;
- port related industrial development;
- existing and expected cargo flows and composition per trade;
- type and size of vessels per trade;
- land and water transport links with the hinterland;
- access to and from the sea;
- physical development potential;
- nautical and hydraulic aspects;
- safety and environmental impact;
- economic and financial analyses;
- existing structures and facilities.

The above list of typical aspects serves to illustrate that port study is a complex and multidisciplinary activity. The different aspects or disciplines are very much interrelated and no conclusion in one field can be drawn and maintained without taking cognisance of the findings in other fields.

There is a great diversity in sizes, types and functions of ports. In one type one may distinguish, for example, coastal ports and river ports, natural tidal harbors and enclosed docks.

In terms of function there are multi-purpose ports (e.g., general cargo, container, ferry, bulk ports) like Imam Khomeini port, dedicated ports (handling one specific cargo e.g., ore, oil or ro-ro), leisure ports, fishing ports and naval ports, etc.

Many port planning studies as the Master Plan study for Imam Khomeini port does seek to increase the capacity and/or efficiency of existing facilities, prior to start to design new ones. Consideration should always be given to optimization of existing

facilities by improved operational control of both port and through transport systems or by relatively minor improvements/modernization of those facilities. Worldwide experience has often shown that substantial increases thoroughly can thus be achieved economically and that major infrastructure improvements can be avoided or postponed.

If the demands cannot be met by optimization it is necessary to consider plans for expansion or development of new facilities within our adjacency to the port.

Port planning will generally start with an economic assessment to establish cargo flow forecasts by commodity and origin/destination. Regional and national development studies and, possibly, marketing studies for particular commodities will be required as a basis for the forecasts. Statistics on cargo and ship movements at existing ports are also required.

Then the engineers will commence the required technical studies in physical layout plan, traffic circulation study, cargo handling system analysis together with various alternative studies. Finally, design of facility will be carried out for construction purpose together with the tender documents.

It is important that the manager of engineering group keeps always the various factors, as shown in previous list, in his or her mind.

13.5.2 Organization with respect to Engineering Aspects

During several visits to Iran, the Study Team was kindly allowed by PSO to participate in the PSO technical sessions, one of which was, with about to, the balance between the cargo demands and scale of facilities and the other was about the general wave characteristics generating in the Caspian Sea and the Persian Gulf. Each session was held for two hours during which earnest discussions were held. A group of external economists and an engineering consultant led those meetings and provided PSO personnel with basic ideas and recent topics. Of course all the questions were not always answered, however it was understood by the participants that there were many ways to conduct economic and engineering analyses and that each person had different knowledge, ideas and experience.

If this session can also introduce the modern technologies developed in other countries, discussions will be more attractive and meaningful.

Another impression of the sessions was that few young personnel participated in the discussion, most of them kept silent. This may imply that the grade of discussions was high too sophisticated for young economists and engineers to understand.

The Study Team was also allowed by PSO to visit the construction site of fishing ports near Bushehr port. According to PSO counterparts, PSO was requested by the central government to watch and evaluate the progress of these two port constructions managed by another governmental agency.

The port basin of both ports was protected by rock-mound breakwaters, however, the port basin of one of them was nearly filled up with fine materials due to siltation. Since the main body of breakwater was seriously damaged, silty sand could easily invade into the port basin through the loosened mound of rocks.

Damage to port basin or channel by siltation has unfortunately occurred at many ports in the past. It is assumed that this type of defect could be minimized by conducting study of siltation together with analyzing occurrences at other ports.

In order to solve various technical problems, PSO employed the consultants in addition to PSO technical personnel. This can be justified since PSO should maintain a large number of technical personnel if no consultant was employed.

In order to carry out an appropriate future major port development, PSO's organization with respect to engineering aspects can be improved further. The followings are suggestions on such improvement based on the experience of the Study Team working with PSO.

- (1) It is recommended to continue the PSO technical sessions. However they might be better to be classified by technical fields and length of experience of participants.
- (2) Technology of other countries should be introduced especially the technical analysis by computers. Wave calmness, siltation and ship navigation are most useful programs.
- (3) It is recommended that PSO provides opportunities for young engineers to visit other countries and observe the modern port technology.
- (4) Use of consultants should be continued. However PSO head office should have its own technical standards and common design criteria for planning of safety and economical port.
- (5) If communication between the departments is enhanced, technical knowledge of PSO personnel will be improved.
- (6) If communications between the young engineers and senior engineers is maintained more than present situation, valuable experience can be transferred to the next generation.

Please refer to subsection 2.4 "Engineering System" for more information.

Chapter 14

Economic Analysis

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Chapter 14 Economic Analysis

14.1 Purpose and Methodology of Economic Analysis

14.1.1 Purpose

The purpose of the economic analysis is to appraise the economic feasibility of the Short Term Plan for the new port facilities of the port from the viewpoint of the national economy.

Therefore, the purpose of this chapter is to investigate the economic benefits as well as the economic costs which will arise from the project and to evaluate whether the net benefit of the project exceed those which could be obtained from other investment opportunities in Iran.

14.1.2 Methodology

(1) EIRR

The economic internal rate of return (EIRR) based on a cost-benefit analysis is used in order to appraise the feasibility of the project. The EIRR is a discount rate which makes the costs and benefits of the project during the project life equal.

(2) "With" and "Without" Analysis

The EIRR value is obtained from the annual economic benefit-cost value. The economic benefits are obtained from the difference between the "With the project" case (hereinafter referred to as "With" case) and "Without the project case (hereinafter referred to as "Without" case).

(3) Measurement of Costs and Benefits

In estimating the costs and benefits of the project, "economic pricing" is applied. Economic pricing means that costs and benefits are appraised in terms of international prices (border prices).

The general procedure of the economic analysis is shown in Figure 14.1.2.1.

14.2 "Without" Case and "With" Case

In the cost-benefit analysis, the benefits and the project costs are defined as the difference between the "Without" and the "With" cases. Therefore, it is very important to define the difference between the "Without" and the "With" cases in the economic analysis in order to evaluate the feasibility of the development project. In this study, the following conditions are adopted as the "Without" case considering the existing situation.

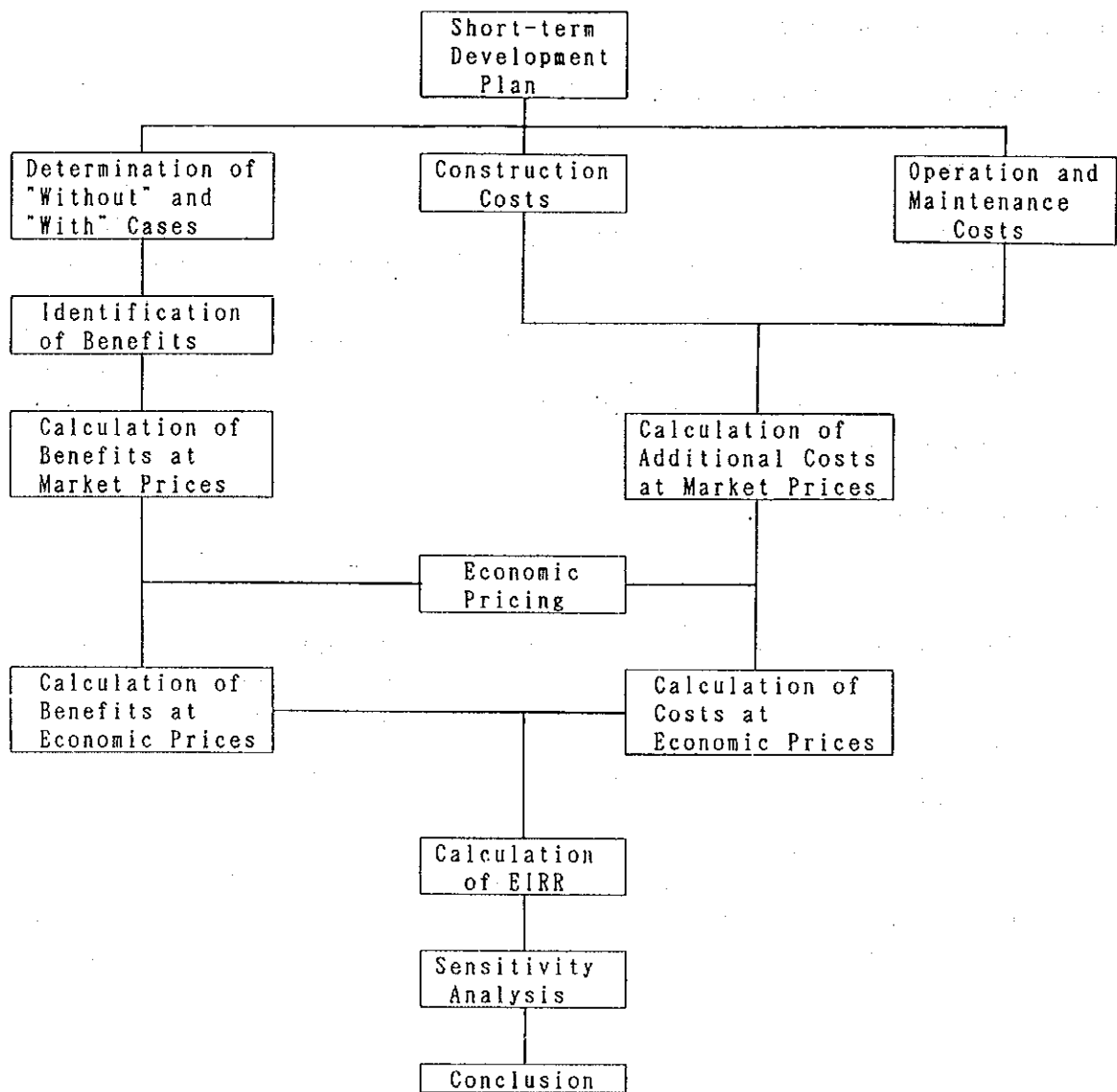


Figure 14.1.2.1 Flow Chart of Economic Analysis

14.2.1 "Without" Case

In this Study, after having discussed various possibilities, the following conditions are adopted as the "Without" case.

- (1) No investment is made for the new berth.
- (2) Rehabilitation plans are executed at the existing berth.
- (3) Excess portion of potential cargo flow over handling capacity of the existing facilities will be lost.

The most serious problems at Anzali port is the rising water level of the Caspian Sea. Facilities of Anzali port are gradually being submerged in 1999. The berth and cargo handling conditions of "Without" case are assumed that it is impossible to use.

14.2.2 "With" Case

In the "with" case, it is assumed that the short term plan for the port development is completed and efficiency of loading and unloading, available berth length and so on at the post are improved. The conditions of "With" case are assumed as follows.

Table 14.2.2.1 Berth Condition of "With" Case

With Case		
New Berth Number	Depth (m)	Number of Berth
G.C.Berth	-6.5	3
Oil Berth	-6.5	1

14.3 Prerequisites of Economic Analysis

14.3.1 Base Year

The base year means the starting year of the calculation of economic costs and benefits. In this Study, 1994 is set as the base year taking the construction and investment schedule of the project into account.

14.3.2 Project Life

The period of the calculation for the economic analysis is assumed to be thirty years after completion of the construction work. The target term of economic analysis is 1995 to 2029 accordingly.

14.3.3 Scope of the project

The scope of the project (Short Term Plan) for the economic analysis consists of the following.

- (1) New berths are constructed at Imam Khomeini port.
- (2) Modernization plans are carried out at the existing berths (including procurement of additional cargo handling equipment)

14.4 Economic Prices

14.4.1 Methodology

The purpose of the economic analysis is to examine the value of the project, that is, to see if it represents an optimum allocation of resources in the national economy.

In general, the value of goods quoted at market prices does not always represent the true value of those goods from the viewpoint of the national economy. The local currency portion of the goods and materials at market prices often include customs duties, and the labor cost at market prices is often influenced by the minimum wage system in the country. Therefore, "economic pricing" should be conducted for the economic analysis in order to exclude these influences.

There are several ways for "economic pricing" to be conducted. In this study, the prices of domestic goods and services are modified to border prices in an effort to determine a more rational valuation. These border prices are generally intended to represent the international market values, or the world prices, of these goods and services.

The market prices are changed to border prices by various conversion factors such as "Standard Conversion Factor", "Conversion Factor for Consumption" and so on.

14.4.2 Transfer Items

In general, all costs and benefits are divided into traded goods, non-traded goods labor and transfer items. Labor is further divided into skilled and unskilled labor.

(1) Traded Goods(CIF,FOB)

Traded goods are expressed at CIF (cost, insurance and freight) prices for imports and at FOB (free on board) prices for exports, which are border prices themselves.

(2) Non-traded Goods and Services(SCF)

Since the local currency after deducting the costs of the traded goods, labor and transfer items are considered as non-traded goods, the economic prices of these goods are calculated by multiplying the Standard Conversion Factor(SCF). The SCF is used to determine the economic prices of certain non-traded goods and services that cannot be directly valued at border prices. By using the SCF, price differential between the domestic market and the international market caused by import duties and export subsidies can be avoided.

SCF is expressed by the following formula:

$$SCF = \frac{I + E}{(I + Di) + (E - De)}$$

where, I : Total amount of imports in CIF
 E : Total amount of exports in FOB
 Di : Total amount of import duties
 De : Total amount of export duties

In this study, the SCF of 0.862 is adopted according to the past records of trade and customs as shown in Table 14.4.2.1.

Table 14.4.2.1 Standard Conversion Factor(SCF) (Mn.\$)

Items	1987	1988	1989	1990
I	13,236	11,519	14,666	20,526
E	11,916	10,709	13,081	18,768
Di	3,261	2,363	5,668	8,143
De	0	0	0	0
SCF	0.885	0.094	0.830	0.828

SCF Average=0.862

Source : IRI Customs

(3) Conversion Factor for Consumption(CFC)

This conversion factor is used to convert the market prices of consumption goods into the border prices. The conversion factor for consumption goods is usually calculated in the same manner as the SCF, replacing total import and export by those of consumption goods only.

(4) Conversion Factor for Labor

1) Skilled labor

The economic cost of skilled labor is obtained by multiplying its market prices by the Conversion Factor for Consumption(CFC), assuming that the market mechanism is functioning properly. The CFC is used for converting the prices of consumer goods from domestic market prices to border prices. The CFC is usually calculated in the same manner as the SCF, replacing figures of the formula mentioned above by that of consumer goods only.

In this study, the CFC of 0.791 is adopted according to the past records of trade and customs as shown in Table 14.4.2.2.

Table 14.4.2.2 The Conversion Factor for Consumption(CFC) (Mn.\$)

Items	1987	1988	1989	1990
Ic	12,171	10,685	13,456	17,454
Ec	1,081	860	980	1,123
Dci	2,739	1,985	4,761	6,840
Dce	0	0	0	0
CFC	0.829	0.853	0.752	0.731

CFC Average=0.791

2) Unskilled labor

For the economic analysis, cost of unskilled labor should be measured in terms of their opportunity costs, that is, the value of lost marginal production that the employment of laborers for a given project would create for other purposes.

When a project is executed, the inflow of unskilled labors to the project is mainly from the agricultural sector which is relatively elastic in its use of labor and where wages are normally lowest. Therefore, it is often assumed in a simplified manner that the economic cost of unskilled labor is equal to the per-capita income of the agricultural sector. According to the data from 1989 to 1992 prepared by Statistic center 1991, the average income of a rural family in 1990 is 1.251 Mn.RIs, and it can be considered as a proper indicator of marginal productivity, that is, the opportunity cost of unskilled labor. The average worker's cost of construction 1991 is 1.547 Mn.RIs according to the Ministry of Labor and Social Affairs.

$$\begin{aligned}
 \text{The Conversion Factor} &= \frac{\text{Opportunity Cost}}{\text{Worker's Cost of Construction}} \times \text{CFC} \\
 \text{for Unskilled labor} &= \frac{1.251 \text{ Mn.RIs}}{1.547 \text{ Mn.RIs}} \times 0.791 = 0.64
 \end{aligned}$$

14.5 Costs of the Project

The items that are considered as costs of the project are; construction costs, procurement costs of equipment, operation costs (including administration and personnel costs) and renewal investment costs.

14.5.1 Investment Costs

In the economic analysis, investment costs have to be divided into the foreign currency portion and the local currency portion. Moreover, the local currency portion can be divided into non-traded goods, skilled labor and unskilled labor. Since the foreign currency portion is shown in CIF prices, there is no need for conversion into economic prices. The labor costs (skilled and unskilled) should be converted into economic prices by using the conversion factors. The annual construction costs at economic prices are shown in Table 14.5.1.1, 14.5.1.2.

14.5.2 Maintenance and Operation Costs

The maintenance and operation costs are shown in chapter 15. Since these costs are expressed in market prices and contain various indefinite elements, the conversion factors should be applied.

(1) Maintenance Costs

In this study, 1% of the construction costs of structures and 2% of the procurement costs of equipment are to be considered as annual maintenance costs. The maintenance costs in economic prices are calculated in the same manner as the investment costs.

(2) Operation Costs

The operation costs consist of administration, operation and personnel costs. These are shown in Chapter 15 in market prices and they should be converted to economic prices by using CFC, since personnel costs, which comprise the bulk of the operation costs, can be regarded as costs of skilled labors.

14.5.3 Renewal of Investment Costs

The facilities and equipment will be renewed according to their economic lives. As described hereunder, and also indicated in Chapter 15, cargo handling equipment will be renewed throughout the project life.

Table 14.5.1.1 Investment Cost in Economic Prices (Anzali Port)

(UNIT 1,000US\$)

Work	Cost of Investment in Market Prices	Foreign Portion (CIF)	Local Portion			Overall Conversion Factor	Investment Costs in Economic Prices
			Non-Traded Goods (SCF)	Skilled Labor (CFC)	Unskilled Labor (CFL)		
1995							
Eng. Service	4,088	0.8	0.02	0.16	0.02	0.96	3,911
1996							
Preparation	8,008	0.5	0.35	0.12	0.03	0.92	7,334
1997							
Dredging/Reclamation Wharves Breakwater Facilities on Land Pavement Utilities Others	44,950	0.5	0.35	0.12	0.03	0.92	41,166
1998							
Dredging/Reclamation Wharves Breakwater Seawall Facilities on Land Pavement Utilities Others	38,500	0.5	0.35	0.12	0.03	0.92	35,259
1999							
Breakwater Pavement	16,030	0.5	0.35	0.12	0.03	0.92	14,681
Grand Total	111,576						102,350

Table 14.5.1.2 Total Costs in Economic Price (Anzali Port)

Unit: 1,000 US\$

	Years	Costs			Total
		Container	Dry Bulk	Berth	
		Investment	Maintenance	Operation	
1	1995	3,911			3,911
2	1996	7,334			7,334
3	1997	41,166			41,166
4	1998	35,259			35,259
5	1999	14,681			14,681
6	2000		1,279	2,047	3,326
7	2001		1,279	2,047	3,326
8	2002		1,279	2,047	3,326
9	2003		1,279	2,047	3,326
10	2004		1,279	2,047	3,613
11	2005	287	1,279	2,047	3,613
12	2006		1,279	2,047	3,326
13	2007		1,279	2,047	3,326
14	2008		1,279	2,047	3,326
15	2009		1,279	2,047	3,326
16	2010		1,279	2,047	3,326
17	2011	287	1,279	2,047	3,613
18	2012		1,279	2,047	3,326
19	2013		1,279	2,047	3,326
20	2014		1,279	2,047	3,326
21	2015	10,654	1,279	2,047	13,980
22	2016		1,279	2,047	3,326
23	2017	287	1,279	2,047	3,613
24	2018		1,279	2,047	3,326
25	2019		1,279	2,047	3,326
26	2020		1,279	2,047	3,326
27	2021		1,279	2,047	3,326
28	2022		1,279	2,047	3,326
29	2023	287	1,279	2,047	3,613
30	2024		1,279	2,047	3,326
31	2025		1,279	2,047	3,326
32	2026		1,279	2,047	3,326
33	2027		1,279	2,047	3,326
34	2028		1,279	2,047	3,326
35	2029	287	1,279	2,047	3,613
	Total	114,440	38,382	61,411	214,232

14.6 Benefits of the Project

14.6.1 Benefit Items

Considering the "With" and "Without" scenarios above, the following items are identified as the benefits of the Short Term Plan for Anzali port.

- (1) Saving in land transportation costs
- (2) Saving in interest of cargo costs.

Intangible Benefits

- (1) Development of port related industries.
- (2) Increase in employment opportunities.
- (3) Improvement of cargo handling safety and reduction of cargo damage.
- (4) Promotion of national economic development through the formulation of an efficient transportation system.

If the increased volume of cargo were to be handled only by the existing facilities, then the number of ships waiting for berth space would increase to the point where port congestion would become a serious problem.

Implementing the project will avert this problem, namely it will reduce the staying time of ships that is the time waiting for berth space and handling cargo, and this ships' cost reduction is a benefit of the project. This benefit can be calculated by multiplying the difference in ships' staying time between both cases by ships' staying costs (per unit time).

14.6.2 Calculation of Benefits

(1) Saving in Transportation Costs from/to Other Ports

Under the "Without" case, the excess cargo volume would be handled at the other ports. The additional transportation costs under this case are the benefits of savings in transportation costs between "Without" and "With" cases. The reduction of the transportation costs under the "With" case is one of the main benefits of the project. The reduction of the transportation costs is calculated by the following formula.

$$S = D \times V \times I$$

where; S : Saving in transportation costs
D : Difference of transportation costs between "Without" and "With" cases
V : Ships' staying cost
I : Percentage accruing to Iran

Benefits derived from savings of ships' staying costs due to the implementation of this project are calculated in Table 14.6.2.1.

Table 14.6.2.1 Calculation for Saving Transportation Costs

Anzali Port		Unit: 1,000US\$			
	Dry Bulk/Bag/Steel/General Cargo			Benefit	
	Volume	Cost/t	Total		
2000	651	25	16,275	16,275	
2001	757	25	18,925	18,925	
2002	863	25	21,575	21,575	
2003	970	25	24,250	24,250	
2004	1076	25	26,900	26,900	
2005	1182	25	29,550	29,550	
2006	1288	25	32,200	32,200	
2007	1394	25	34,850	34,850	
2008	1501	25	37,525	37,525	
2009	1607	25	40,175	40,175	
2010	1713	25	42,825	42,825	

(2) Saving in Interest of Cargo Costs

In accordance with the implementation of the project, the total ships' staying time under the "With" case, interest of cargo costs will be decreased. In this study, the benefits of savings in interest of cargo costs is calculated by the following formula.

$$S = (Q \times D \times V \times I) / 365$$

where; S : Saving in interest of cargo costs

Q : Value of cargo

D : Reduction of staying time between "Without" and "With" cases

V : Value of cargo in US\$

I : Interest rate

According to the above benefits derived from savings of interest of cargo costs due to the implementation of this project are calculated in Table 14.6.2.2.

Table 14.6.2.2 Calculation for Saving Interest of Cargo Cost

Anzali Port		Unit: 1,000US\$			
	Dry Bulk/Bag/Steel/General Cargo			Benefit	
	Volume	Staying	VxI/365		Total
2000	651	0.7	0.19	87	
2001	757	0.7	0.19	101	
2002	863	0.7	0.19	115	
2003	970	0.7	0.19	129	
2004	1076	0.7	0.19	143	
2005	1182	0.7	0.19	157	
2006	1288	0.7	0.19	171	
2007	1394	0.7	0.19	185	
2008	1501	0.7	0.19	200	
2009	1607	0.7	0.19	214	
2010	1713	0.7	0.19	228	

14.6.3 Uncountable Benefits

1) Development of Port Related Industries

Without the implementation of the development project, Imam Khomeini port will be operating at a capacity that simply maintains the existing cargo flow. Industries in the hinterland require the development of the port as a prerequisite to their smooth operations. Therefore the value added by such industries is an economic benefit of this project.

2) Increase in Employment Opportunities

As for the additional employment arising from the project, employment for construction during the construction period and for operation after the facilities are completed are considered.

There is excess supply of unskilled labor in the region, and the construction will provide employment for those people who would remain unemployed if the project does not take place.

Also, with the activation of port related industries, employment opportunities for the local population are expected to increase.

3) Improvement of Cargo Handling Safety and Reduction of Cargo Damage.

The existing yards are too narrow for safe and efficient cargo handling. Furthermore, there are no sufficient back-up facilities (warehouses, transit shed, etc.). It is very difficult to assess the benefits of increased safety and reduction of damage in cargo handling in monetary terms. However, by construction of new terminal and related facilities, safe cargo handling will be ensured, and the cargo damage that seems to occur frequently will be substantially reduced.

14.7 Evaluation and Conclusion

14.7.1 Calculation of EIRR

The economic internal rate of return (EIRR) based upon a cost-benefit analysis is used to appraise the economic feasibility of project.

The EIRR is the discount rate which makes the costs and benefits of a project during the project life equal. It is calculated by using the following formula.

$$\sum_{n=1}^m \frac{R_n}{(1+r)^{n-1}} = 0$$

Where, R_n : Profits in the n-th year

r : Discount rate

m : Period of project life

Annual costs and benefits in economic prices and the calculation for the EIRR are shown in Table 14.7.1.1 and the results is as follows : EIRR = 18.59%

14.7.2 Sensitivity Analysis

In order to estimate the EIRR, When certain conditions change, a sensitivity analysis is conducted.

Case A : The costs increase by 10%

Case B : The benefits decrease by 10%

Case C : Combination of the above A and B cases

The results of the sensitivity analysis are shown in Table 14.7.2.1, 14.7.2.2, 14.7.2.3

14.7.3 Results and Conclusion

From the above calculations, the EIRR of this project is in all cases more than 15%. There are various views concerning the appropriate EIRR level used to guide the judgement as to whether a project is feasible or not. The leading view is that the project is feasible if the EIRR exceeds the opportunity cost of capital. The results of the EIRR calculation, only taking into account the two major quantitative benefits, shows more than 10% under every probable case. Therefore, this Short-term Development Project is feasible from the viewpoint of the national economy.

Table 14.7.1.1 Calculation of EIRR for Short Term Plan (Anzali Port)

EIRR(%) = 18.589
UNIT 1,000 US\$

Years	Costs				Benefits (Saving Cost)			Cash Flow
	Container/Dry Bulk Invest	Terminal Mainte	Terminal Operation	Total	Save Trans Cost	Decrease Time Cost	Total	
1 1995	3,911			3,911				-3,911
2 1996	7,334			7,334				-7,334
3 1997	41,166			41,166				-41,166
4 1998	35,259			35,259				-35,259
5 1999	14,681			14,681				-14,681
6 2000		1,535	3,071	4,606	16,275	87	19,012	14,406
7 2001		1,535	3,071	4,606	18,925	101	21,676	17,070
8 2002		1,535	3,071	4,606	21,575	115	24,365	19,759
9 2003		1,535	3,071	4,606	24,250	129	27,029	22,423
10 2004		1,535	3,071	4,606	26,900	143	29,693	25,087
11 2005	287	1,535	3,071	4,893	29,550	157	32,357	27,464
12 2006		1,535	3,071	4,606	32,200	171	35,021	30,415
13 2007		1,535	3,071	4,606	34,850	185	37,710	33,104
14 2008		1,535	3,071	4,606	37,525	200	40,375	35,769
15 2009		1,535	3,071	4,606	40,175	214	43,039	38,433
16 2010		1,535	3,071	4,606	42,825	228	43,053	38,447
17 2011	287	1,535	3,071	4,893	42,825	228	43,053	38,160
18 2012		1,535	3,071	4,606	42,825	228	43,053	38,447
19 2013		1,535	3,071	4,606	42,825	228	43,053	38,447
20 2014		1,535	3,071	4,606	42,825	228	43,053	38,447
21 2015	10,654	1,535	3,071	15,260	42,825	228	43,053	27,793
22 2016		1,535	3,071	4,606	42,825	228	43,053	38,447
23 2017	287	1,535	3,071	4,893	42,825	228	43,053	38,160
24 2018		1,535	3,071	4,606	42,825	228	43,053	38,447
25 2019		1,535	3,071	4,606	42,825	228	43,053	38,447
26 2020		1,535	3,071	4,606	42,825	228	43,053	38,447
27 2021		1,535	3,071	4,606	42,825	228	43,053	38,447
28 2022		1,535	3,071	4,606	42,825	228	43,053	38,447
29 2023	287	1,535	3,071	4,893	42,825	228	43,053	38,160
30 2024		1,535	3,071	4,606	42,825	228	43,053	38,447
31 2025		1,535	3,071	4,606	42,825	228	43,053	38,447
32 2026		1,535	3,071	4,606	42,825	228	43,053	38,447
33 2027		1,535	3,071	4,606	42,825	228	43,053	38,447
34 2028		1,535	3,071	4,606	42,825	228	43,053	38,447
35 2029	287	1,535	3,071	4,893	42,825	228	43,053	38,160
Total	114,440	46,058	92,116	252,614	1,138,725	6,062	1,171,337	918,723

Table 14.7.2.1 Calculation of EIRR for Short Term Plan Case A (Anzali Port)

EIRR(x)= 17.159
UNIT 1,000 US\$

Years	Costs				Benefits (Saving Cost)			Cash Flow
	Container/Dry Invest	Bulk Mainte	Terminal Operation	Total	Save Trans Cost	Decrease Time Cost	Total	
1	1995	4,302			4,302			-4,302
2	1996	8,067			8,067			-8,067
3	1997	45,283			45,283			-45,283
4	1998	38,785			38,785			-38,785
5	1999	16,149			16,149			-16,149
6	2000		1,689	3,378	5,066	16,275	87	19,012
7	2001		1,689	3,378	5,066	18,925	101	21,676
8	2002		1,689	3,378	5,066	21,575	115	24,365
9	2003		1,689	3,378	5,066	24,250	129	27,029
10	2004		1,689	3,378	5,066	26,900	143	29,693
11	2005	316	1,689	3,378	5,382	29,550	157	32,357
12	2006		1,689	3,378	5,066	32,200	171	35,021
13	2007		1,689	3,378	5,066	34,850	185	37,710
14	2008		1,689	3,378	5,066	37,525	200	40,375
15	2009		1,689	3,378	5,066	40,175	214	43,039
16	2010		1,689	3,378	5,066	42,825	228	45,701
17	2011	316	1,689	3,378	5,382	42,825	228	48,363
18	2012		1,689	3,378	5,066	42,825	228	48,363
19	2013		1,689	3,378	5,066	42,825	228	48,363
20	2014		1,689	3,378	5,066	42,825	228	48,363
21	2015	11,719	1,689	3,378	16,786	42,825	228	59,033
22	2016		1,689	3,378	5,066	42,825	228	48,363
23	2017	316	1,689	3,378	5,382	42,825	228	50,693
24	2018		1,689	3,378	5,066	42,825	228	48,363
25	2019		1,689	3,378	5,066	42,825	228	48,363
26	2020		1,689	3,378	5,066	42,825	228	48,363
27	2021		1,689	3,378	5,066	42,825	228	48,363
28	2022		1,689	3,378	5,066	42,825	228	48,363
29	2023	316	1,689	3,378	5,382	42,825	228	50,693
30	2024		1,689	3,378	5,066	42,825	228	48,363
31	2025		1,689	3,378	5,066	42,825	228	48,363
32	2026		1,689	3,378	5,066	42,825	228	48,363
33	2027		1,689	3,378	5,066	42,825	228	48,363
34	2028		1,689	3,378	5,066	42,825	228	48,363
35	2029	316	1,689	3,378	5,382	42,825	228	50,693
Total		125,884	50,664	101,327	277,875	1,138,725	6,062	1,171,337

Table 14.7.2.2 Calculation of EIRR for Short Term Plan Case B (Anzali Port)

EIRR(X)= 17.011
UNIT 1,000 US\$

Years	Costs				Total	Benefits (Saving Cost)		Total	Cash Flow Benefits -Costs
	Container/Dry Bulk Invest	Terminal Mainte	Operation	Save Trans Cost		Decrease Time Cost			
1	1995	3,911			3,911				-3,911
2	1996	7,334			7,334				-7,334
3	1997	41,166			41,166				-41,166
4	1998	35,259			35,259				-35,259
5	1999	14,681			14,681				-14,681
6	2000		1,535	3,071	4,606	16,275	87	17,111	12,505
7	2001		1,535	3,071	4,606	18,925	101	19,508	14,903
8	2002		1,535	3,071	4,606	21,575	115	21,929	17,323
9	2003		1,535	3,071	4,606	24,250	129	24,326	19,720
10	2004		1,535	3,071	4,606	26,900	143	26,724	22,118
11	2005	287	1,535	3,071	4,893	29,550	157	29,121	24,229
12	2006		1,535	3,071	4,606	32,200	171	31,519	26,913
13	2007		1,535	3,071	4,606	34,850	185	33,939	29,333
14	2008		1,535	3,071	4,606	37,525	200	36,338	31,732
15	2009		1,535	3,071	4,606	40,175	214	38,735	34,129
16	2010		1,535	3,071	4,606	42,825	228	38,748	34,142
17	2011	287	1,535	3,071	4,893	42,825	228	38,748	33,855
18	2012		1,535	3,071	4,606	42,825	228	38,748	34,142
19	2013		1,535	3,071	4,606	42,825	228	38,748	34,142
20	2014		1,535	3,071	4,606	42,825	228	38,748	34,142
21	2015	10,654	1,535	3,071	15,260	42,825	228	38,748	23,488
22	2016		1,535	3,071	4,606	42,825	228	38,748	34,142
23	2017	287	1,535	3,071	4,893	42,825	228	38,748	33,855
24	2018		1,535	3,071	4,606	42,825	228	38,748	34,142
25	2019		1,535	3,071	4,606	42,825	228	38,748	34,142
26	2020		1,535	3,071	4,606	42,825	228	38,748	34,142
27	2021		1,535	3,071	4,606	42,825	228	38,748	34,142
28	2022		1,535	3,071	4,606	42,825	228	38,748	34,142
29	2023	287	1,535	3,071	4,893	42,825	228	38,748	33,855
30	2024		1,535	3,071	4,606	42,825	228	38,748	34,142
31	2025		1,535	3,071	4,606	42,825	228	38,748	34,142
32	2026		1,535	3,071	4,606	42,825	228	38,748	34,142
33	2027		1,535	3,071	4,606	42,825	228	38,748	34,142
34	2028		1,535	3,071	4,606	42,825	228	38,748	34,142
35	2029	287	1,535	3,071	4,893	42,825	228	38,748	33,855
Total		114,440	46,058	92,116	252,614	1,138,725	6,062	1,054,203	801,589

Table 14.7.2.3 Calculation of EIRR for Short Term Plan Case C (Anzali Port)

EIRR(%)= 15.633
UNIT 1,000 US\$

Years	Costs				Benefits (Saving Cost)			Cash Flow Benefits -Costs	
	Container/Dry Bulk Terminal		Terminal Operation	Total	Save Trans Cost	Decrease Time Cost	Total		
	Invest	Mainte							
1	1995	4,302			4,302				-4,302
2	1996	8,067			8,067				-8,067
3	1997	45,283			45,283				-45,283
4	1998	38,785			38,785				-38,785
5	1999	16,149			16,149				-16,149
6	2000		1,689	3,378	5,066	16,275	87	17,111	12,044
7	2001		1,689	3,378	5,066	18,925	101	19,508	14,442
8	2002		1,689	3,378	5,066	21,575	115	21,929	16,862
9	2003		1,689	3,378	5,066	24,250	129	24,326	19,260
10	2004		1,689	3,378	5,066	26,900	143	26,724	21,657
11	2005	316	1,689	3,378	5,382	29,550	157	29,121	23,739
12	2006		1,689	3,378	5,066	32,200	171	31,519	26,453
13	2007		1,689	3,378	5,066	34,850	185	33,939	28,873
14	2008		1,689	3,378	5,066	37,525	200	36,338	31,271
15	2009		1,689	3,378	5,066	40,175	214	38,735	33,669
16	2010		1,689	3,378	5,066	42,825	228	38,748	33,681
17	2011	316	1,689	3,378	5,382	42,825	228	38,748	33,366
18	2012		1,689	3,378	5,066	42,825	228	38,748	33,681
19	2013		1,689	3,378	5,066	42,825	228	38,748	33,681
20	2014		1,689	3,378	5,066	42,825	228	38,748	33,681
21	2015	11,719	1,689	3,378	16,786	42,825	228	38,748	21,962
22	2016		1,689	3,378	5,066	42,825	228	38,748	33,681
23	2017	316	1,689	3,378	5,382	42,825	228	38,748	33,366
24	2018		1,689	3,378	5,066	42,825	228	38,748	33,681
25	2019		1,689	3,378	5,066	42,825	228	38,748	33,681
26	2020		1,689	3,378	5,066	42,825	228	38,748	33,681
27	2021		1,689	3,378	5,066	42,825	228	38,748	33,681
28	2022		1,689	3,378	5,066	42,825	228	38,748	33,681
29	2023	316	1,689	3,378	5,382	42,825	228	38,748	33,366
30	2024		1,689	3,378	5,066	42,825	228	38,748	33,681
31	2025		1,689	3,378	5,066	42,825	228	38,748	33,681
32	2026		1,689	3,378	5,066	42,825	228	38,748	33,681
33	2027		1,689	3,378	5,066	42,825	228	38,748	33,681
34	2028		1,689	3,378	5,066	42,825	228	38,748	33,681
35	2029	316	1,689	3,378	5,382	42,825	228	38,748	33,366
Total		125,884	50,664	101,327	277,875	1,138,725	6,062	1,054,203	776,328

Chapter 15

Financial Analysis

1998

1999

Chapter 15 Financial Analysis

15.1 Purpose and Methodology of the Financial Analysis

15.1.1 Purpose of the Financial Analysis

The purpose of the financial analysis is to appraise the financial feasibility of the port facility development plan. The analysis focuses on the viability of the project itself and the influence on the soundness of the port management body during the project life.

The project in this study is defined as construction and repair in the short term plan.

15.1.2 Methodology of the Financial Analysis

(1) Viability of the Project

The viability of the project is analyzed using the Discount Cash Flow Method and appraised by the FIRR (financial internal rate of return). The FIRR is a discount rate that makes the costs and the revenues during the project life equal, and it is calculated using the following formula:

$$\sum_{i=1}^n \frac{B_i - C_i}{(1+r)^{i-1}} = 0$$

- n : project life
- B_i : revenues in the i-th year
- C_i : costs in the i-th year
- r : discount rate

Revenues and costs which are taken into account for the calculation of the FIRR are summarized as follows:

- Revenues: (i) Port operating revenue
- (ii) Residual value of the fixed assets at the end of the project
- Costs: (i) Investments for the project (Initial investments for the project and its re-investment)
- (ii) Operating expense such as maintenance, repair, personnel and other costs

When the calculated FIRR exceeds the interest rate of the funds for the investments of the project, the project is regarded as financially feasible.

(2) Financial Soundness of the port management body

The influence on the financial soundness of the port management body is appraised based on projected financial statements regarding the project (Income Statements, Cash Flow Statements and Balance Sheets). The appraisal is generally made from the

viewpoints of profitability, loan repayment capacity and operational efficiency, using the following ratios:

1) Profitability

Rate of Return on Net Fixed Assets:

$$(\text{Net Operating Income} / \text{Total Fixed Assets}) \times 100 \%$$

This indicator shows the profitability of the investments, which are presented as net total fixed assets. It is preferable to keep the rate higher than the average interest rate of the funds for the investments.

2) Loan Repayment Capacity

Debt Service Coverage Ratio:

$$(\text{Net Operating Income} + \text{Depreciation Cost}) / (\text{Repayment of and Interest on Long-Term loans})$$

This indicator shows whether the operating income can cover the repayment of principal and interest on Long-Term Loans. It must be more than 1 and it is preferable that it is over 1.75.

3) Operating Efficiency

Operating Ratio:

$$(\text{Operating Expenditure} / \text{Operating Revenue}) \times 100 \%$$

Working Ratio:

$$((\text{Operating Expenditure} - \text{Depreciation Cost}) / \text{Operating Revenue}) \times 100 \%$$

The operating ratio shows the operational efficiency of the organization as an enterprise, and the working ratio shows the efficiency of the routine operations of the port. When the calculated operating ratios are less than 70 - 75 %, and the working ratios are less than 50 - 60 %, the operations are considered as being efficient.

15.2 Prerequisites of Financial Analysis

15.2.1 Project Life

Considering the conditions of the long-term loans and the service lives of the port facilities, the project life for the financial analysis is determined as the construction period and 30 years after construction.

15.2.2 Base Year

For the estimation of expenditures and revenues analyzed quantitatively here, constant prices at 1994 are predominantly used. Neither price inflation nor increases in nominal wages are considered during the project life.

15.2.3 Cargo handling volume and number of vessels

The cargo handling volume and number of vessels at the projected wharf in 2000 is estimated based on the demand forecast in Chapter 3 as shown in Appendix 15.1.

15.2.4 Fund raising

Funds for construction are all raised by foreign loans. Funds for repair and renewal investment are all raised by Government subsidies. Short-term loans for cash shortage are raised by domestic funds.

The following conditions apply to the above funds.

(1) Foreign funds

Loan period: 30 years, including a grace period of 3 years

Interest rate: 3% per annum

Repayment: fixed amount repayment of principal and interest

(2) Domestic funds

Domestic funds are raised by non-interest loans from Government.

Loan period: 10 years (grace period: none)

Repayment: fixed amount repayment of principal

15.3 Revenue and Expenditure

15.3.1 Revenue

The revenues from the port activities are calculated based on the assumed tariff and on the cargo-handling volume and number of vessels. The assumed tariff is of a lower level than the current one because it is considered that the container operating cost per 1 TEU will decrease with increase of container cargo volume, and the cost included in current tariff will also decrease. The revenue per year during the project life is shown in Appendix IV-6.1.

15.3.2 Expenditure

1) Cost for initial investments

The initial investments of the project are estimated in Chapter 12. These are summarized in Appendix IV-6.2.

2) Reinvestment

The facilities and equipments will be renewed based on their services lives. The funds for reinvestment will be financed by internal resources of PSO.

3) Operating expense

The annual operating expense for the project is assumed as follows.

a) Personnel

To cover personnel expense to cope with the establishment of a new organization or increase of cargo volume, 39.6% of the annual operating revenue is allocated based on the actual data of income and expenditure. (With the advance of privatization, this expense may change to other expenses such as contract expense, however, it is calculated as personnel expense in this estimate.)

b) Maintenance and Repair

The annual maintenance and repair costs for the port facilities are calculated as follows:

Infrastructure: 1% of the original construction cost

Cargo handling equipment: 5% of the original construction cost

c) Other expense

To cover expense such as cost for fuel and general administration, 8.4% of the annual operating revenue is included to the operating expense based on the actual data of income and expenditure.

d) Depreciation costs

The annual depreciation costs of the port facilities and equipments are calculated by the straight line method based on their service lives as shown in Appendix IV-6.2. Residual values after all depreciations are estimated as zero.

4) Tax and Contribution to Government

Income tax ratio is assumed as zero. Contribution to Government is assumed as 50% of income after tax.

15.4 Sensitivity Analysis

Sensitivity analysis is conducted to examine the impact of unexpected future changes. The following three cases are envisioned:

Case A: The income decreases by 10%

Case B: The project cost increases by 10%

Case C: The income decreases by 10% and the project cost increases by 10%

15.5 Evaluation and Conclusion

15.5.1 Results of the FIRR calculation and Appraisal

The results are shown in Table 15.5.1.1 and the FIRR calculation and its details are shown in Appendix IV-6.3.

Weighted average interest rate of the funds, which is the floor limit, is 3% in this study. FIRR exceeds this rate, even in Case C of the sensitivity analysis, therefore we can judge this project to be financially feasible. (See Table 15.5.1.)

Table 15.5.1.1 Result of FIRR Calculation

Original Case	7.0%	
Sensitivity Analysis A	5.5%	Revenue 10%Down
Sensitivity Analysis B	5.7%	Cost 10%Up
Sensitivity Analysis C	4.1%	Revenue 10%Down, Cost 10%Up

15.5.2 Financial Soundness of the Port Management Body

The projected financial statement for the project and financial indicators are shown in Appendix IV-6.4

(1) Profitability

Rate of Return on Net Fixed Assets maintains a higher rate than the average interest rate of the funds for the investments after 2006.

(2) Loan Repayment Capacity

Debt Service Coverage Ratio keeps over 1.75 after 2009.

(3) Operational Efficiency

Operating Ratio keeps below 70% after 2008 and Working Ratio keeps below 60% after 2005.

(4) Appraisal

Based on the above indicators, it can be judged that financial soundness of the port management body can be easily secured.

15.5.3 Conclusion

As mentioned above, financial analysis of the short term plan shows good level both in terms of the viability of the project and financial soundness of the port management body. However, ANPA should make efforts to reduce expense and to secure forecast cargo volume by port sales.

Chapter 16

Environmental Assessment

MEMORANDUM

TO : [REDACTED]

FROM : [REDACTED]

SUBJECT : [REDACTED]

DATE : [REDACTED]

CLASSIFICATION : [REDACTED]

CONTROL NUMBER : [REDACTED]

FILE NUMBER : [REDACTED]

STATUS : [REDACTED]

APPROVAL : [REDACTED]

REVISIONS : [REDACTED]

REFERENCES : [REDACTED]

COMMENTS : [REDACTED]

DISTRIBUTION : [REDACTED]

REMARKS : [REDACTED]

APPROVED : [REDACTED]

DATE : [REDACTED]

SIGNATURE : [REDACTED]

Chapter 16 Environmental Assessment

An environmental study comprised of three steps, Preliminary Environmental Survey(PES), Initial Environmental Examination(IEE) and Environmental Impact Assessment(PES), is conducted as part of the feasibility study. The procedure of the environmental study in this study is shown in Figure 16.1.1.1.

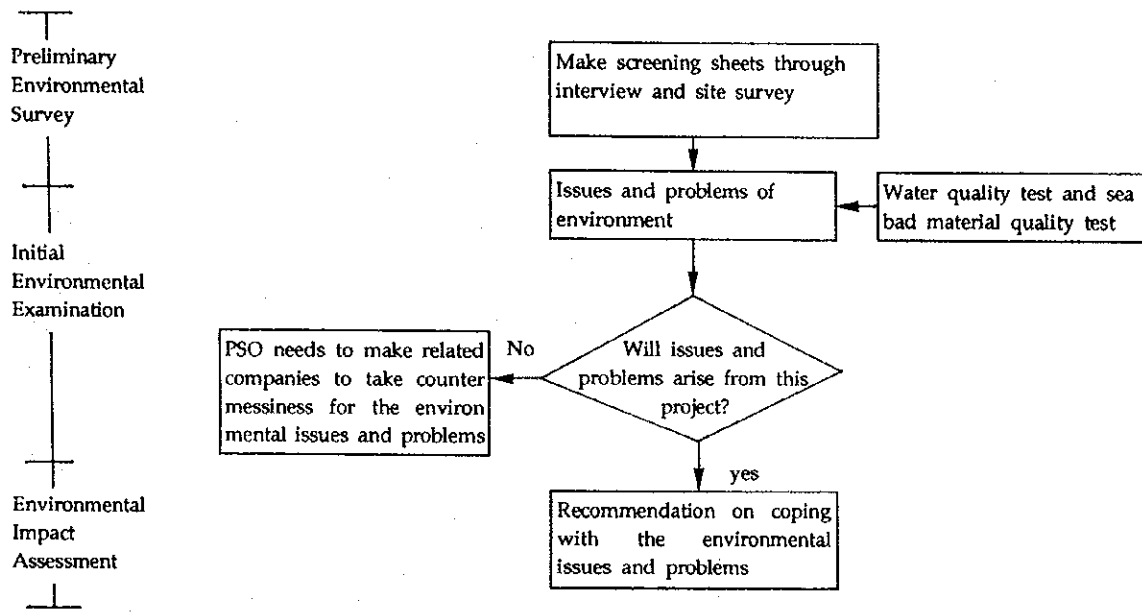


Figure 16.1.1.1 Procedure of the Environmental Consideration

16.1 Present Condition

According to the results of the screening, and water and sea-bed quality studies, each Iranian port has different environmental conditions. The environmental problems at Anzali Port are coastal erosion caused by the rising water level, relocation of the residential area for expansion of the back up area of the port, and the inflow of waste water and wastes from the urban areas and industrial plants in the hinterland.

Water quality test and sea bed material quality test were performed in this study. Results of these test are as follows (Figure 16.1.2 shows the location of environmental test points):

(1) Water Quality Test

1) Colon Bacillus(E.coli) (exceed 2,400 mpn/100 ml at 9/11 points)

No treatment is given to the household waste water or waste water from the fish market. Presence of E. coli suggests presence of other bacteria (pathogenic virus, bacteria, parasites, etc.). There are bathing and fishing grounds in the neighborhood at Anzali port. Serious problems would be created by the outbreak of contagious diseases.

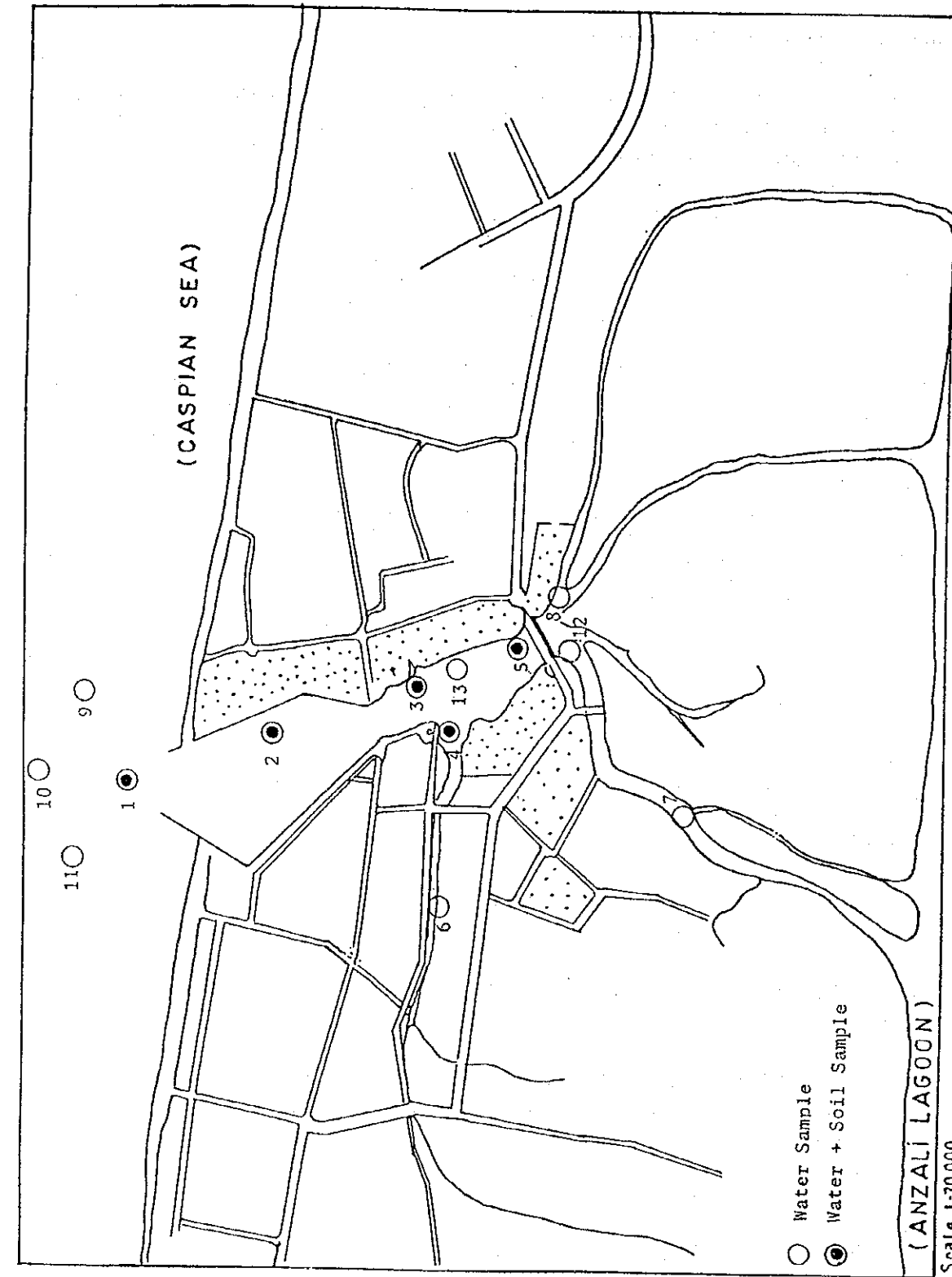


Figure 16.1.1.2 Location Map of Environmental Study
(Water Quality Sea-bed Material)

2) Oil Pollution(at 11/13 points)

Oil Pollution is detected at most of the points, levels are particularly high near gas stations. Oil pollution has an adverse effect on small fish while oily smells lower the commercial value of fish. Waste water contaminated by oil should be treated.

3) Others

Many wastes (including refuses such as vegetables) are discarded in the water channel, and flow into Anzali Port. Organic matters contained in the wastes deteriorate the water quality. Collection and treatment of wastes are recommended.

(2) Sea Bed Material Quality Test

Slightly high levels of cadmium and lead were detected. Mercury was also detected. We did not reach conclusions based on the current study because of the following reasons.

1) The studied points and sampling were limited

2) The analytical method and equipment for the test could not be checked

3) Sturgeons inhabiting the nearby waters are not only valuable but also support the livelihood of many people. They are therefore considered.

(3) Others

There are no special problems regarding the water quality at present such as thermal discharge and strongly acid or alkaline waste water. However, if the current state of discharge of untreated waste water continues, the water quality will deteriorate. Therefore, environmental consideration such as the construction of a final sewage plant is needed. Similarly, the quality of sea bed materials should also be considered.

16.2 Prerequisites of Evaluation of the Environmental Conservation

The relation between the environmental problems which are extracted from the result of the screening and the Master Plan is identified. Each extracted problem is then scrutinized to determine whether an environmental impact assessment(EIA) is necessary. The screening sheet and scoping sheet of Anzali Port are attached to Appendix.

1) Resettlement

According to the Master Plan layout for Anzali Port, the back-up area will be located the east of the existing port facilities. The residents at the site of the back up area need to be re-located. Therefore, this item should be studied in an EIA.

2) Traffic and public facilities

Anzali Port is surrounded by city areas. All trucks and trailers pass through the city

to transport the cargo between the port and inland. With the increased cargo volume in the Master Plan stage, the number of trucks and trailers is expected to increase in future. Problems concerning traffic congestion, vibration and exhaust gas are expected to emerge causing a big problem for the environment. Countermeasures for these problems should be studied.

3) Health and sanitation

Drainage water at Anzali City flows into a swamp in the south of Anzali Port, and then, flows to the Caspian Sea through the passage in the port. With the population increase in Anzali, the water contamination is a serious environmental problem. Relevant companies should be forcefully persuaded to take appropriate countermeasures.

4) Erosion at the coastal Zone

Erosion of coastal area which is one of the biggest problems at Anzali Port is caused by the rising water level in the Caspian Sea. This problem is not directly related to the Master Plan. PSO needs to press related companies to take countermeasures for maintaining the access roads of port.

5) Water pollution

In the Master Plan, there are reclamation works which will cause water pollution. This situation is an environmental problem. Therefore, countermeasures should be studied in an EIA.

6) Noise and vibration

Noise and vibration which will arise from the increasing volume of traffic in future and construction work of the Master Plan are problems in this project. Therefore, countermeasures should be studied in an EIA.

16.3 Result of the Environmental Assessment

Results of the environmental assessment of the items selected in the Initial Environmental Examination (IEE) at Anzali Port are summarized as follows:

-Relocation of residents due to expansion of the port:

There is no plan to expand the existing port area in the Short-Term Plan. For the Master Plan, it is necessary study sufficiently to the number of residents and the places of relocation.

-Increase in traffic congestion, vibration and exhaust gas due to increase in the traffic volume:

The traffic volume generated at the port in the Short Term Plan will be about 1.5 times more than the present volume (1993/94). There is no need to expand the width of major roads in the vicinity of the port except the road in front of the existing port gate. But large vehicles passing through the center of the city will create a dangerous situation. It is recommended that a by-pass, connecting the port and the outside of Anzali City, be constructed as soon as possible.

-Water pollution due to the reclamation work:

Since the reclamation in this Project is only about 350,000 m³ and a dike will be constructed to prevent sediment inflow, water pollution by reclamation is expected to be minimal and environmental contamination almost nil.

-Noise and vibration due to construction work

Vibration and noise are generated mainly at the time of pile driving work. The period of the pile driving in the Short Term Plan is only about 5 months and the working area is more than 200 meters away from the residential area, thus, its effect on the environment is expected to be minimal. However, there will be vibrations so the construction method with minimum noise and vibration should be adopted.

16.4 Preventive Measures

Based on the result of EIA, the effect of the present project in the Short Term Plan for the surrounding environment is expected to be minimal. There are no environmental problems concerning implementation of this project.

However, cadmium, lead, mercury were detected in the sea-bed material quality test. Therefore, routine inspection system for water and sea-bed material quality should be established, in addition, a simple test laboratory at Anzali Port is required.

With the expansion of port activities in the post Master Plan, the calling ships and working crafts operating in Anzali Port are expected to increase. We also expect an increase of residents and industrial plants in the surrounding area. Therefore, an oil treatment plant, a sewage treatment plant and a waste treatment plant should be constructed in the vicinity of Anzali Port in the post Master Plan.

Chapter 17

Objectives for Successful Utilization of the Plan

SECRET

CONFIDENTIAL - SECURITY INFORMATION

SECRET

Chapter 17 Objectives for Successful Utilization of the Plan

17.1 Monitoring and Review

Investment based on the long-term plan (or master plan) is a must for both economical construction and smooth operation of port. PSO recognizes meaning of the master plan since the completion of previous master plans for the major ports prepared by ADIBI-HARRIS in 1974. These plans are maintaining their key positions in the recent Iranian port development.

All the facilities specified in the master plan were reflected on the forecast data of cargo demand together with type of cargo. However actual figures may deviate from the forecasts due to changes in various social and economic factors.

For example, an imbalance of requirement presently appears at the wharf utilization of Imam Khomeini port. Some of the existing berths have a high berth occupancy rate, however, the rate at adjacent berths is extremely low. Although a detailed study to cope with this situation is required, following countermeasures may be useful.

- (1) Review of cargo forecast based on the latest data
- (2) Review of the master plan
- (3) Review of the implementation schedule

The should be conducted periodically. The implementation will be adjusted accordingly as follows.

- (1) Implementation in advance
- (2) Postponement of implementation
- (3) revision of previous scope of works
- (4) Modification of the existing facilities

Taking the above into account, not only maintaining a reasonable occupancy rate but also providing the facilities which port users require should be achieved. In order to modify and transfer the facilities to meet the new requirements, several important points should be taken into account during the master plan preparation, one of which is flexibility.

- (1) General arrangement of port facilities maintaining of flexibility to absorb possible changes in future demands
- (2) Flexibility in design criteria

"The flexibility" in port development can be generally achieved by taking following planning concepts into consideration, although these might be selected carefully by the port planners, port by port.

- (1) Fixed facilities including buildings should not be installed until it is absolutely

necessary.

- (2) Open space should be kept as wide as possible.
- (3) Future cargo handling system should be forecasted and taken into design criteria.
- (4) Water depth around waterfront structures should be able to be increased to accommodate large vessels in future.

PSO has taken these into account in the previous master plan of Iman Khomeini port. Five berths, No. 11 to No. 16, located at the most heavily used wharf are capable of supporting large live loads of container wharf crane (500 ton or more) although they have only two wharf cranes at present.

This decision made by PSO 20 years ago can be supported even at present since the containerization is a dominant trend of international maritime transport.

17.2 Consideration for Better Port Environment

The Study Team has conducted field investigation regarding both water quality and seabed material quality at Anzali port and Imam Khomeini port in December 1993. Water quality by the dissolved oxygen (DO) is 12 mg/l and 4.5mg/l at Anzali port and Imam Khomeini port, respectively. The former figure indicates good environment as far as oxygen content is concerned. The latter value is slightly beyond an acceptable level. It also should be noted that the existing channels of both ports provide fishery boats with access to the fishing banks.

PSO performed its best efforts to conform to the environmental preservation policies prepared by the Department of Environment (DOE). There are two basic duties levied on PSO regarding environment management in its premises, including the port wet basin and approach channel as follows.

- (1) To inform DOE of any contamination incident on the seawater except oil spill.
- (2) To manage and control any contamination including oil spill at its premises by any measure.

In order to get confirmation of the former, it is recommended that PSO will monitor the environmental condition of its premises. In case of any violation of DOE regulations, PSO shall immediately inform DOE. In order to conform to the latter PSO prepared rules (or instructions) to protect its premises, including various clauses such as:

- (1) Category of wastes
- (2) Oily water from engines
- (3) Oily water from engine room
- (4) Other like bilge

Note: DO is an important parameter to judge water quality in respect of organic materials contamination. Organic materials contained in water consume oxygen in the course of their stabilization, thus the higher contamination, the lower DO.

PSO Port Guard Department will carefully watch vessel discharges and take action if an incident arises. In case of serious violation of laws and/or rules, captain of the that vessel will be inquired and sent to court for judgment. This means that environmental problems caused by oil spill should be fully managed by PSO even without particular assistance of DOE. These regulations are prepared by DOE, Navy, PSO and other governmental agencies and include preventive measures for oil spill.

Next stage to come to PSO will be implementation of these rules at site. It is expected that PSO will perform necessary actions to prevent its premises from serious contamination with oil spillage.

These actions will also need to prolong the structure life.

17.3 Periodical Maintenance

PSO has conducted its efforts to provide the existing facilities with the required maintenance services. This can be seen at the waterfront facilities, namely the rehabilitation works of the Western Jetty and the Grain Jetty. However there are several damaged structures which require both periodical maintenance works and urgent rehabilitation.

(1) Steel Sheetpile wall and Steel Piles corrosion

Concrete protection works to them are presently inadequate. Coping wall should cover the exposed steel surface down to the low water level.

(2) Defects of concrete structures

Some of the existing marginal wharf consisting of concrete structures are seriously damaged that their reinforcement bars are exposed to air. Corrective measures should be conducted as soon as possible.

(3) Siltation at the port basin

Maintenance dredging should be performed to keep the required water depth of port basin and approach channels.

Maintenance works are required for not only ensuring port users of safety but also extending the life of existing facilities. It is recommended that the required maintenance works should be evaluated during the design stage by means of totaling the initial cost and maintenance cost.

In spite of PSO efforts, more economical maintenance works can be conducted if proper preparation works on objective structures are carried out. Findings and recommendations on this aspect are shown below.

(1) Inadequate identification of required maintenance works is observed. It is recommended to prepare a list of facilities together with possible damage.

(2) Insufficient inspection works is also observed. Monitoring the present usage and damage inspection should be conducted periodically. Inspection survey should be extended to underwater structures, under-surface of deck structure and embedded facilities in the earth.

Maintenance work on the structures can be divided into two categories, namely the routine maintenance and the urgent rehabilitation. The former consists of preventive measures, and required cost is minor, however the latter consists of corrective measures against large scale damage and required cost is large. According to past experience, if preventive maintenance is appropriately performed, the required cost for corrective maintenance works will be minimum.

17.4 Training System for Staff

17.4.1 Objectives

(1) Improvement of staff's capability

To be a port which can attract cargo and passengers, efficient management and operation are essential. At PSO and port authorities, employees in each division should control port activities appropriately to materialize efficient management and quick cargo handling operation, farsighted investment, profitable financial management and so on.

The objective of employee training is to improve the capability of each work, which in turn, will lead to efficient port management and operation.

Through training, employees should gain expert knowledge, leadership ability, skill to operate port equipment and so on. They should understand the current port condition and manage and operate the ports considering problems which are expected to occur in future. In addition, to gain more effect, they should make efforts to self-educate.

The concrete objectives by kinds of employees are as follows.

1) For all staff

Training courses for all staff begin at the time of employment and continue periodically.

By attending these courses, employees gain basic knowledge on general administration and leadership ability. Employees will gradually develop a broader understanding of the nature of ports which will help them to cope with problems of port administration.

2) For Secretaries (Staff mainly engaged in management or finance)

By attending training courses on general administration, financial management, accounts system, related laws and regulations and so on, secretaries gain a better understanding of port management, and will thus execute their duties more effectively.

3) For Engineers (Staff mainly engaged in construction or maintenance and repair)

By attending training courses on civil engineering, architecture, electrical engineering, mechanical engineering and so on, engineers gain a better understanding of port construction and maintenance, and will thus execute their duties more effectively.

4) For Operators (Staff mainly engaged in marine and port operation)

By attending training courses on navigation, cargo handling, operation of port equipment and so on, operators will attain a higher level of skill and thus the efficiency of port operations will be enhanced.

(2) Increase in the number of educated staff

It is desired that highly qualified employees (employees who have graduated from university or postgraduate courses, employees who have completed training courses) account for a certain percentage of all employees engaged at a port authority.

The number of educated staff at a (given) Japanese port (the port A) is shown in Table 17.4.1.1 for reference. At the port A, there are 151 personnel with university or postgraduate educations, representing 17% of all employees. In addition, there are 236 personnel who are also highly educated (graduates from special schools, marine specialist, other specialists). If the number of employees from the above two categories are added together, a total of 387 highly qualified personnel of 44% of all employees are employed at Port A.

At ANPA, the number of highly qualified employees (university-trained employees and postgraduate employees) is 12 personnel, in 1994' representing 1.9% of total employees.

Considering the above case, it is desired that educated employees account for about 40 % of total ANPA employees.

Table 17.4.1.1 The number of educated staff at the port A

	(Personnel)			
	Secretarys	Engineers	Labors	Total
High school-trained staff	91	135	487 (216)	713 a:(216)
Special school-trained staff	2	18 (4)	0	b:20 (4)
University-trained staff	67	56 (3)	0	c:123 (3)
Postgraduate staff	1	27	0	d:28
Total	161	236 (7)	487 (216)	884 (223)

Note: (): The number of specialists (marine specialists and other specialists)

: "151 personnel"=(c)+(d)

: "236 personnel"=(a)+(b)

17.4.2 Training Organs

(1) Necessity of Training Organs

As cargo volume increases and port equipment becomes more sophisticated, employees with extensive knowledge of the various port functions and port-related activities are indispensable to meet the demands of users.

To ment end, special training organs which will provide trainees with the opportunity to gain first-hand knowledge need to be established. The benefits of such a system would justify the high cost of introducing it. For example, trainees would be able to practice operating port equipment in a controlled environment and then utilize this experience during actual operations.

As mentioned, however, a considerable investment to secure large sites for port facilities, the latest equipment and so on would be required. If port authorities were to bear the cost by themselves, tariff levels would have to be raised which would further weaken their competitive position. Therefore, special training organs which can raise funds to provide training should be established.

(2) Kinds of Training Organs

Training organs should provide both theoretical and practical training. Through theory training, trainees will gain basic and special knowledge on port management and operation. Through practical training, trainees will operate port first hand equipment and attain a higher level of skill.

Special schools, junior colleges and colleges should be established to teach theory. Selected employees engaged in PSO should enter these schools and colleges and study special courses. PSO will then be able to employ highly educated personnel .the graduates from those schools and colleges.

Institutes for port operation training should be established for practical training.

(3) Sources of Revenue for Training Organs Management

Entrance and tuition fees, and subsidies from Government should be allocated for management expenditures of special schools, junior colleges and colleges.

The port training institutes should charge training fees and accept subsidies from Government; in addition, related organizations (PSO, marine public organizations, marine private companies) could serve as sponsors. This income would be allocated for management expenditures and the purchase of new equipment.

17.4.3 Training Programs

(1) Programs for all staff

An example of the programs for all employees is shown in Table 17.4.3.1.

Through these programs, improvement of their ability to understand present condition and problems of ports is expected.

In addition to the matters shown in Table 17.4.3.1, other programs that focus on

current problems related to ports should be prepared.

(2) Programs for Secretaries and Engineers

An example of the programs for secretaries and engineers is shown in Table 17.4.3.2. Through these programs, it is expected that they will gain special knowledge of various port functions.

In addition to the matters shown in table 17.4.3.2, if necessary, the selected employees engaged in PSO should study in colleges or universities to gain higher and the latest knowledge.

(3) Programs for Operators

There are various types of operation in port activities. marine operation, cargo handling and so on. Operators should have professional knowledge of each port function and attain a higher level of skill.

As an example of port operation, a program for cargo handling operators is shown in Table 17.4.3.3.

In addition to the matters shown in table 17.4.3.3, as daily training, skilled operators should guide unskilled ones to raise the efficiency level.

Table 17.4.3.1 Training Program for all staff

course	program	object
New staff training	Imparting basic knowledge of general administration and port management	newly employed staff
Middle staff training	Imparting advanced knowledge of general administration and port management, Heightening self-awareness as a middle staff	middle staff who have considerable work experience
Excutive staff training	Deepening staff's understanding of the problems related to port management, Improving management ability(command ability, problem settlement ability, etc.)	executive staff

Table 17.4.3.2 Training Program for Secretaries and Engineers

course	program
Secretaries Training	Administration, Port managemet, Related laws and regulations. Finance, Procurement, Accounting, etc.
	<Civil engineering> Policy of civil engineering, Port construction, Road construction, Bridge construction, River engineering, City planning, Rail way construction, soil enginring, etc.
Engineers Training	<Architecture> Policy of construction, Construction planning, Construction designing Execution of construction work, Appurtenant work, etc.
	<Electrical engineering> Electrical equipment, Illumination engineering, Electronics, etc.
	<Mechanical engineering> Mechanical material, Thermal dynamics, Mechanical designing, Water dynamics, etc.

Table 17.4.3.3 Training Program for Operators

Subject	Program
Theory	Port management, Related laws and regulation, Conveyance, Cargo handling, Electric engineering, Applied dynamics, Motor engineering, Mechanical engineering, Security and sanitation, Information processing, etc.
	<p><Operation> Operation of gantry crane, transfer crane, straddle carrier forklift. Inspection and maintenance, etc.</p>
	<p><Cargo handling> Stacking, Container vanning, handling of large sized cargo, Wiring, etc.</p>
Practical skill training	<p><Adjustment and maintenance> Inspection, adjustment, and maintenance of cargo handling equipment and tools, etc.</p>
	<p><Assembling> Palettes assembling, Wire-sling, Rope-sling</p>
	<p><Welding> Basic work of electric and arc welding</p>
	<p><Tallying and sorting> Tallying, sorting, marking</p>
	<p><Information processing> Basic programming of computer, Practice</p>
	<p><Security and sanitation> Tidying, Tools for security, Protector</p>

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