

Chapter 5 Master Plan for New Port

5.1 Demand Forecast

According to the cargo handling volume which is microscopically forecast, future cargo handling volume in the new port is estimated as follows; When cargo handling volume in Thrace is distributed to three existing ports, existing cargo handling facilities, commodities of cargo handled at present and factories behind the ports are taken into consideration. In order to make the existing ports' facilities use fully, cargo is distributed nearly up to capacities of existing ports. The cargo throughput in 2015 is 638,000TEU of container and 5,880,000 tons of bulk and general cargo. Out of 638,000TEU, 108,000TEU is transshipment container cargo.

Handling type	Export	Import	Domestic In	Domestic Out	Total
Dry Bulk	902 Grain, 636 Clinker, 266	305 Grain, 305	3,548 Sand, 2918 Cement, 630		4,755
Break Bulk		187 Timber, 187			187
General	151 Metal, 26 Machinery, 125	594 Pulp, 197 Iron, 152 Metal, 169 Machinery, 76	55 Metal, 55	83 Machinery, 83	883
<i>(Sub total)</i>	<i>1,053</i>	<i>1,086</i>	<i>3,607</i>	<i>83</i>	<i>5,825</i>
Container (000TEU)					638 Thrace, 530 Transit, 108

5.2 Requirements for the New Port

The new port has a possibility to share the container from/to Turkey and the transshipment container from/to the Black Sea so that the new port should comply with the following requirements with a view to consolidating its position as a competitive container port.

- (1) To be developed as the largest commercial port in the Thrace region for public infrastructure and distribution center in the region and nation and as a complementary port to Haydarpasa Port.

- (2) To comply with an urgent need for increasing the capacity of container. Coping with the rapid increase in container throughput in the Sea of Marmara, some part of new facilities should be completed in a short time after the commencement of construction. New container terminal should enter into service within 7 years.
- (3) To enable the port to accommodate Panamax ship of 50,000DWT class container vessel with capacity of 3,000TEU. A new container terminal should have a berth with a depth of 14 meters.
- (4) To be able to flexibly cope with future demand and to secure sufficient room for future expansion. Development plan should be flexible enough to cope with demand changes in the future and should have an adaptable stage-wise plan.
- (5) Not to deal with passenger. Existing ports in Thrace should be utilized as a passenger terminal not so as to invest unnecessary facilities.
- (6) To mitigate adverse effects on the environment. The possible effects on the current and the littoral sand moves should be minimized.

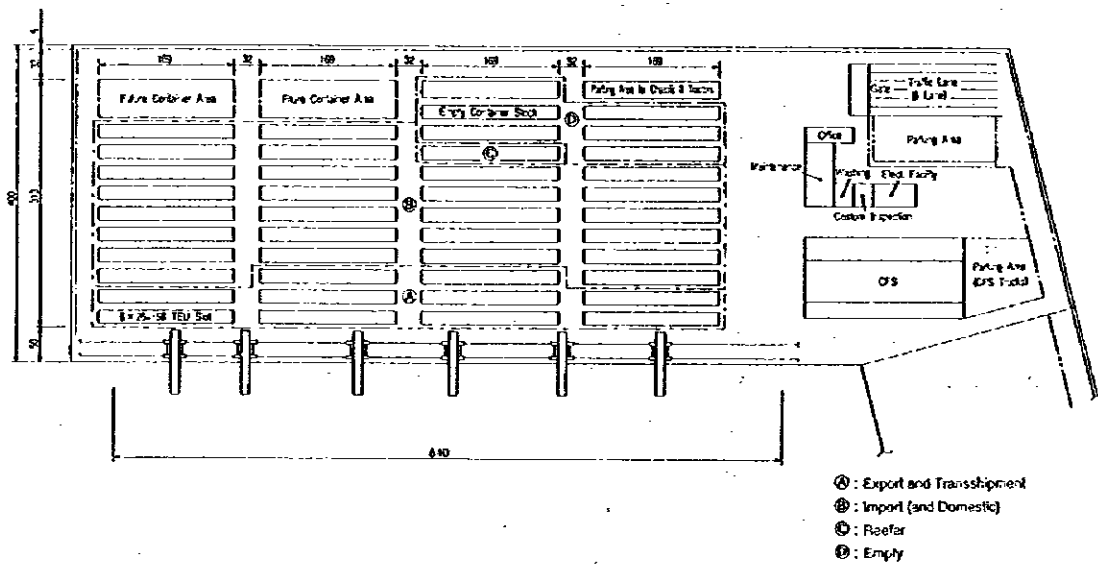
5.3 Development Plan for 2015

Total required berths are ten(10) and total length of berths is 2,064 meters including Ro Ro ramp. The container berth for main vessel is included in three container berths for feeder vessels. However, the berth length with 350m for main vessels has a depth of 14m. Reclaimed land is connected by causeway to access road with six(6) lanes. The access road should be linked to Trans-European Motorway through Corlu. Number of ground slots in the container yard is 6,708. Transfer crane system is adopted as a cargo handling system in the new container terminal. Master plan of the new port for 2015 is shown in following Table.

Master Plan of New Port

Facilities	Container Terminal	Conventional cargo Terminal
Terminal Area	44 ha	50 ha
Berths	3 (d: 12~14m)	7 (d: 7.5~12m)
Handling Capacity	640,000 TEUs	6.6 mil. tons
Quaywall/Revetment	2,940 m	3,280 m
Breakwater	700 m	100 m
Reclamation	7.8 mil. m ³	4.5 mil. m ³
Storage Capacity	18,620 TEU	350,000 m ²
Cargo Handling Facilities	Gantry Crane 6 Transfer Crane 20 CFS 10,000 m ²	Grain Silo 45,000 tons Shore Crane 12

Note: d = berth depth



Layout of Container Terminal in the Target Year 2015

5.4 Preliminary Design

In the preliminary design of the planned port facilities, due consideration was given to the local operational consideration of constructions works as well as structural stability and the following factors were taken into full account with a view to selection of structural types conducive to lower construction costs.

- (1) Marine and weather conditions including wave characteristics, tides, water depth and wind
- (2) Foundation soil characteristics
- (3) Earthquake
- (4) Properties of filling material for reclamation
- (5) Needs for construction of bulk and container quay-wall and container yard
- (6) Protection from wave overtopping
- (7) Relative ease of construction methods
- (8) Preservation of water quality
- (9) Continuity of construction between master plan and short-term development plan

In the preliminary design of the proposed port facilities, following structural types were evaluated.

- (1) The structure type of breakwater is rubble mound type and its length is 700m..
- (2) The structure type of revetment is also rubble mound type with wave-breaker block in slope of sea side and placed concrete wall in top of rubble mound and top level is designed at +4.5 m.
- (3) The structure type of the container berths (-12m/-14m) is gravity type with concrete blocks and the berth lengths are 490/350m respectively.
- (4) The structure type of the grain berth (-12m) is gravity type with concrete blocks and it is 240m long.
- (5) The structure type of the general cargo berth (-11m) is gravity type with concrete blocks and it is 570m long.
- (6) The structure type of the bulk cargo (-7.5m) berth is gravity type with concrete blocks and it is 200m long.
- (7) The structure type of the causeway is rubble mound type with box culvert considering water flow and shallow foundation rocks because it is placed between coast and small ship berth. It is 420m long.
- (8) The pavement of container yard is performed with concrete (30 cm thickness) considering ease of execution and maintenance.

5.5 Cost Estimation and Stage Plan

The preliminary estimates of the project cost were worked out in respect of the master plan targeted for the year 2015. Preconditions for the cost estimation were as listed below.

- 1) Workable days per year are assumed to be 280 days, and 22~23 days per month.
- 2) Working hours per one day are assumed to be 8 hours except 1 hour rest.
- 3) Import tax for imported construction materials, and equipment mobilized from foreign countries are excluded from cost estimate.
- 4) Exchange rate is 1 US\$ = 78,400 Turkish Lira(TL) = ¥ 105.
- 5) Foreign portion consists of imported materials, construction equipment, salary allowance for the foreign experts and engineering fee. Local portion consists locally available materials, labor and construction equipment except category of foreign portion
- 6) The cost of utilities such as water, oil, electrical power, drainage and sewerage, etc. are calculated based on ratio 5% against the direct construction cost.
- 7) The unit costs of labor, construction materials and equipment are estimated based on the survey in 1996.
- 8) Price escalation and cost of land acquisition are excluded from the estimate.

The total project cost for the new port master plan is approximately US\$ 400 million, of which US\$ 146 million represents cargo handling equipment. Breakdown of project cost is as follows;

1) Container berths(-12m~-14m)	US\$ 34.6 mil.
2) Conventional berths(-7.5m~-12m)	US\$ 27.2 mil.
3) Révetment	US\$ 87.6 mil.
4) Breakwater	US\$ 36.6 mil.
5) Road & Causeway	US\$ 16.6 mil.
6) Reclamation	US\$ 20.3 mil.

7)Basin Dredging	US\$ 2.2 mil
8)Small Ship Berth	US\$ 2.8 mil.
9)Building	US\$ 7.7 mil.
10)Cargo Handling Equipment of Container Yard	US\$ 73.6 mil.
11)Cargo Handling Equipment of Conventional Terminal	US\$ 81.0 mil.

Requirement for the short-term development plan of the new port is to construct two container berths and container yard. Stage-wise development plan is shown in Table.

Stage Plan for Development of New Port

Year	1995~2000	2001~2005	2006~2010	2011~2015
-12m container berth		██████████		
-14m container berth			██████████	
-12m grain berth			██████████	
-11m berth				██████████
-7.5m berth				██████████
Inner harbor		██████████		
Road & causeway		██████████	██████████	
Breakwater			██████████	██████████

5.6 Preliminary Economic Analysis

(1) Methodology

An economic analysis is conducted to appraise the economic feasibility of the long term development plan for the new port facilities and the new port operation and management from the viewpoint of the Turkish national economy.

The projects will be defined and compared to the "With" and "Without" case. Benefits and costs of both "With" and "Without" cases will be calculated and evaluated. The economic internal rate of return (EIRR) based on a cost benefit analysis is used to appraise the feasibility of the project.

The prerequisites of analysis are as follows;

- 1) Base Year 1996
- 2) Project Life 30 years from the time of construction
- 3) “Without” case
 - ① No investment is made for construction of new port in Thrace
 - ② Then handling volume of container cargo from/to Thrace exceeds the handling capacity of Ambarli port, the containers which can not be handled in Ambarli port are assumed to be handled in Izmit bay ports and Gempport and transported by land.
 - ③ When handling volume of container cargo from/to Thrace and Izmit bay exceeds the handling capacity of Izmit bay and Gempport, the containers which can not be handled in Izmit bay and Gempport are assumed to be handled in Bandirma port and Izmir port and transported by land.
 - ④ No mother vessel of container will call.

The items of the costs of projects are 1)Construction costs, 2)Renewal costs, 3)Operation costs, 4)Maintenance costs.

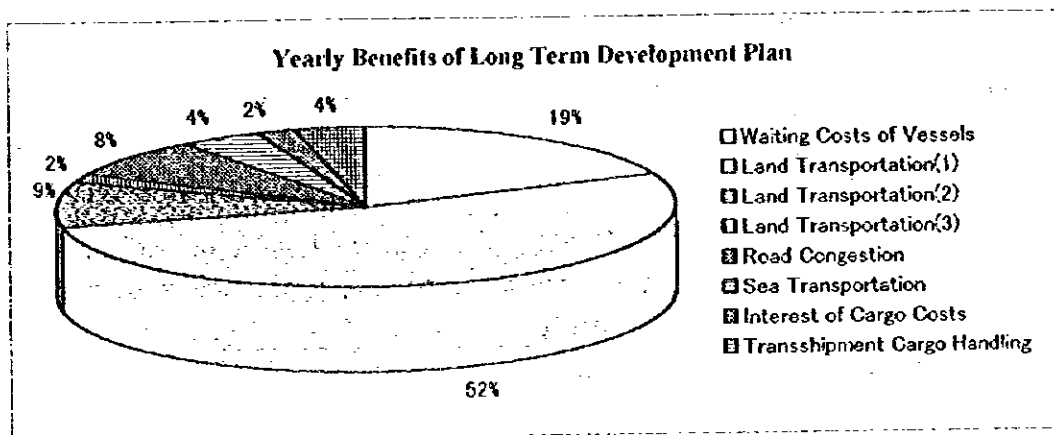
The items of the benefits are as follows.

- 1)Savings in waiting costs of ships.
- 2)Savings in land transportation costs.
- 3)Creation of productive opportunity by eliminating traffic congestion
- 4)Savings in sea transportation costs.
- 5)Savings in interest of cargo costs.
- 6)Earning of foreign currency from transshipment cargo handling

The share of benefits is shown in Figure.

(2)Evaluation of Long Term Development Plan

The EIRR of the long term development plan is 18.2 %. Even the worst case, where the project cost is assumed to increase by 10 % and the benefit reduced by 10 %, the EIRR for the long-term development plan is 15.5 %. According to the Prime Ministry State Planning Organization, the standard cut off line of EIRR in social infrastructure project is 11 to 12 % in Turkey. Therefore, this master plan development project is viable from the viewpoint of the national economy.



Note: 1. Total Value of Benefits is 191 mil. US\$.
 2. Land transportation(1) : Between Izmir port and Thrace region
 3. Land transportation(2) : Between Izmit Bay and Thrace region
 4. Land transportation(3) : Between Bandirma port and Thrace region

(3) Other Economic Effects

The effects excluded in the calculation of EIRR are as follows.

1) Promotion of Regional Economic Development

In the development plan, materials will be needed for port construction. This volume is not small, and will stimulate the development of related industries. The development of the port contributes to the improvement of the distribution mechanism and to the activation of industries in the hinterland.

2) Increase in Employment Opportunities and Income

Additional employment will arise directly from the project, both assumed employment for construction during construction period and employment for operations after the construction. The construction will provide employment for those people who would remain unemployed if the project does not take place. This employment is one of the major benefits of the projects.

3) Reduction of the Traffic Congestion in Istanbul

After the completion of new port, passage number of vehicles related to port cargoes through the Bosphorus Straits will be reduced.

5.7 Port Management and Operations

(1) Role of Public Sector in Port Development, Management and Operation

- ① The master plan must be drawn by taking the following matters into consideration.
 - The efficient utilization of national resources in the long term without causing losses from the prevention of external uneconomic results and those from the future expansion which may be inefficient.
 - The necessity of a port from the long term viewpoint of regional development.
- ② Since water area of the sea is common property for the entire nation and reclamation of this area should be allowed only in cases where the public clearly benefits, land reclamation and possession must be performed by public sector.
- ③ Furthermore, in case of need according to a master plan in the future, public sector can improve facilities or equipment on the basis of ownership of the land, although the berths are occupied by a private company.
- ④ Concerning the port operation, private sector is generally more sensitive to the customers' needs and can provide better service compared with public sector.

(2) Patterns of Port Development, Management and Operation

Possible patterns of development, management and operations for the New Port are shown in Table below.

Pattern		A	B	C	D	E	F	G	H
Master Plan						○			
Construction	Break-water	○							
	Dredging		○						
	Reclamation	●					○		
	Terminal		●						
Ownership		●	land terminal: ○ (land lease): ●				○		
Berthing Scheme			●		○ (Exclusive)		○ (Priority)		○ (Open)
Operator			●	●	○	●	○	●	○
Tug & Pilot					● or ○				

○ Public ● Private, Recommended Pattern ; "B"

(3) Development, Management and Operation for the New Port

Based on the analysis above and recent tendency of the privatization in Turkey, recommendations on the new port development, management and operation are as follows:

- ① Master plan for the new port must be drawn by public sector and public sector should administer the port from the viewpoint of people's welfare according to its master plan.
- ② For the above purpose, construction of infrastructure such as the breakwater, dredging and land reclamation must also be performed by public sector and ownership of the land should be retained by public sector.
- ③ Construction of the terminal including the superstructure and pavement, and its operation is recommended to be performed by private sector in order to encourage efficient cargo handling.

(4) Methods to Support Efficient Management and Operation

① Port Promotion

Since the new port is located somewhat far from Istanbul which is the major consumer city in its hinterland, port promotion activities such as establishment of port promotion strategy focusing on the most effective target groups of clients and active appeals in getting their understanding on real merits of utilizing the new port are one of the most important factors to attract port users and to secure adequate level of revenue.

② Tariff

In case of the new port, port tariff should be competitive to conquer the locational disadvantage and the customary commercial practices which ignore rational economic principles and to survive the heated competition between container ports in the East Mediterranean Sea and the Black Sea by attracting mother container vessels.

Since results of the financial analysis for the management body of the new port are very good, tariff for the new port can be lowered to some extent taking account of the above mentioned situation, although the tariff for import/export and domestic cargo is not

at high level compared with other ports in the Mediterranean Sea or in the world.

③ Personnel Evaluation and Training System

In order to support the effective personnel management of the port management body, proper personnel evaluation and transfer system, steady and encouraging promotion system and positive incentive mechanism built in the salary/wages system need to be introduced and attractive positions for able technocrats and engineers should be provided.

With respect to staff training, the port management body needs to develop its own training courses in order to make up for the lack of expertise in the new port and to improve container handling productivity. In addition, several staffs and operators could be sent to foreign ports or foreign specialists could be invited to acquire knowledge or skill based on the latest management and operation or cargo handling techniques.

④ Simplification and Modernization of Procedures and Documentation

To develop trade and to establish efficient container transport operations, procedures and documentation required for export/import container transport should be simplified and modernized in cooperation with all concerned organizations.

To reduce the waiting time of containers in the new port and to secure smooth door to door transportation, customs clearance needs to be simplified in accordance with the European Customs regulations.

Chapter 6 Short-term Development Plan for New Port

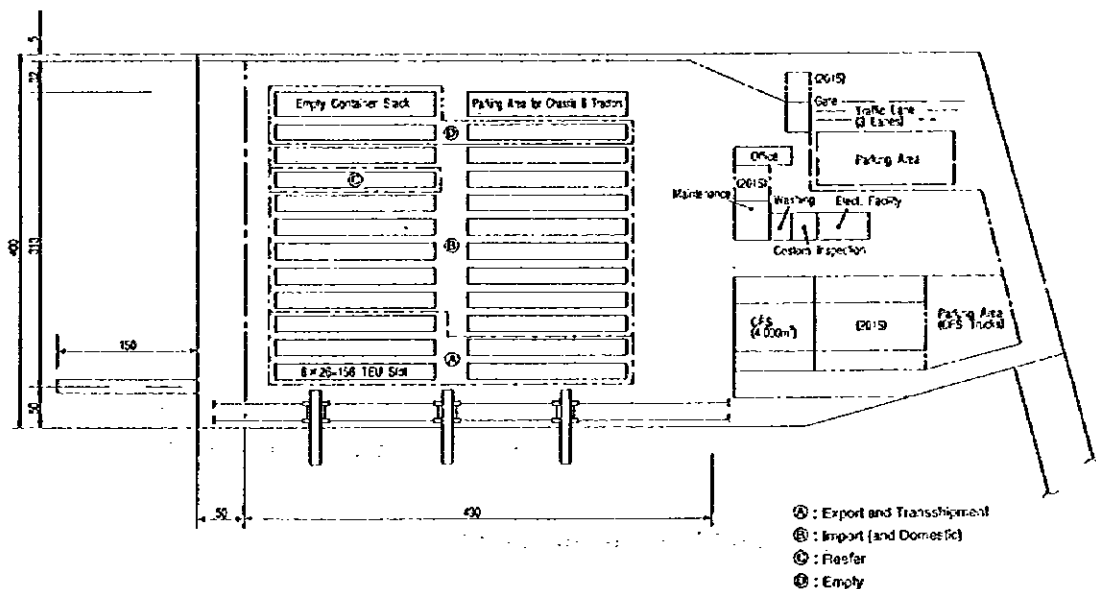
6.1 Short-term Development Project

Based on the cargo handling demands in 2005, 270,000TEU extra container handling capacity is necessary in Thrace region by 2005. To handle 270,000TEU per year, two(2) container berths should be constructed.

According to the planned traffic volume generated to/from the new port in 2005, two(2) lanes will be necessary in 2005. Grade separation of access road with two lanes and existing coastal road and two run-off roads from existing coastal road was recommended as a crossing treatment. Breakwater with a length of 150m is necessary to maintain the wave calmness in front of container berth more than 95% of the time.

Number of ground slots in the container yard is 3,588. As container handling facilities, three(3) gantry cranes and ten(10) transfer cranes are installed.

Two container berths, container yard, road including causeway to container yard and basin are required to be constructed by 2005. The general layout of short term development plan is shown in Figure. The reclaimed area is approximately 450,000m².



Layout of Container Terminal in the Target Year 2005

6.2 Structural Design

The following physical conditions, one of the key design factors, were established on the basis of existing data and the results of field surveys and investigations.

(1) Wind

The maximum wind speeds with a return period of 50 years in the wind directions that will influence the wind-generating waves was projected at 19.5m/sec in SSW and 17.5m/sec in SSE.

(2) Tide

The tidal range is approximately 30cm. Therefore CDL is set Mean Sea Level.

(3) Waves

The maximum significant wave height in any direction with a return period of 50 years was projected at 4.2m and wave height of return period of 10 years was estimated at 3.2 m.

(4) Geological Conditions

Sub-soil conditions are generally shelly sand and clay covering rock on average. Rock levels seem to be below around -15 m except for the areas near the shore. It appears that the rock surface is sloping towards the offshore.

(5) Seismic Conditions

Seismic conditions of the ports in Marmara are adopted at 0.08 in the seismic coefficient method.

The structural type of port facilities are summarized as follows;

- | | |
|-------------------------|--------------------------------------|
| (1)-12m container berth | :Gravity type |
| (2)Breakwater | :Rubble mound type |
| (3)Revetment | :Rubble mound type with wave-breaker |
| (4)Causeway | :Rubble mound type with box culvert |

6.3 Construction Planning and Implementation Plan

Main port facilities for short-term development plan consist of -12m container berths, container yard, small ship berth, causeway, temporary dock-road, revetment and

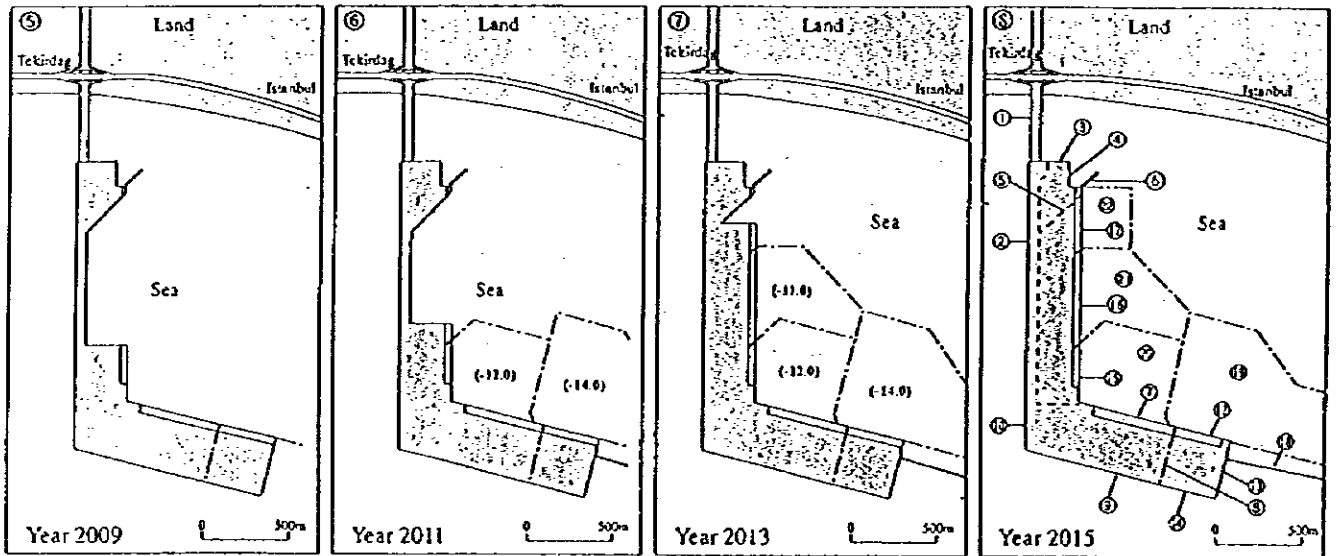
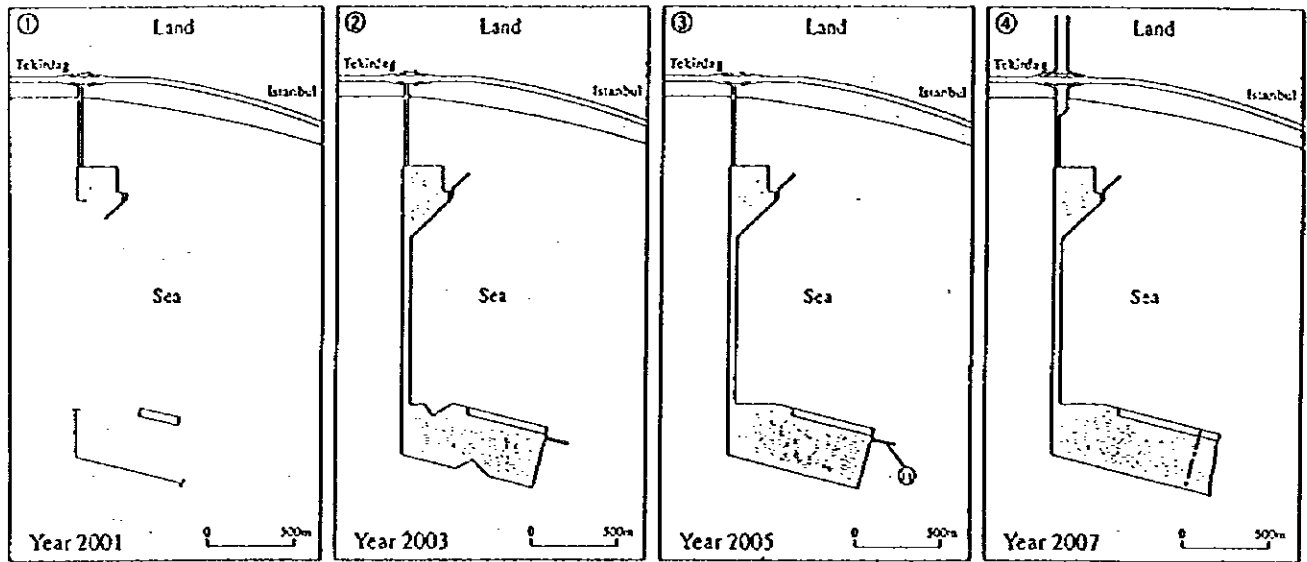
improvement of crossing of existing road., etc. These facilities may be able to be constructed with locally labor, local available equipment and materials due to lack of complexity.

The main port facilities for long-term development plan after the year 2005 consist of -14m container berth, container yard, grain berth, general cargo berths, dry bulk berths, breakwater, revetment, basin and channel, expansion of causeway and improvement of road., etc.

The time schedule of short-term and long-term development plan is shown in Figure. And the tentative time schedule of the project for financial arrangement, detail design, preparation of tender, construction supervision, operation and maintenance of the port facilities is also shown in Figure.

6.4 Cost Estimates

The cost estimate for the short-term development plan is summarized in Table. Total project cost for the short-term development plan amounts to US\$160 million, of which US\$61 million represents the foreign currency component. Of the total project cost, US\$59 million would go for the container berth and container yard with the breakdown into cargo handling equipment amounting to US\$32 million and civil works amounting to US\$26 million..

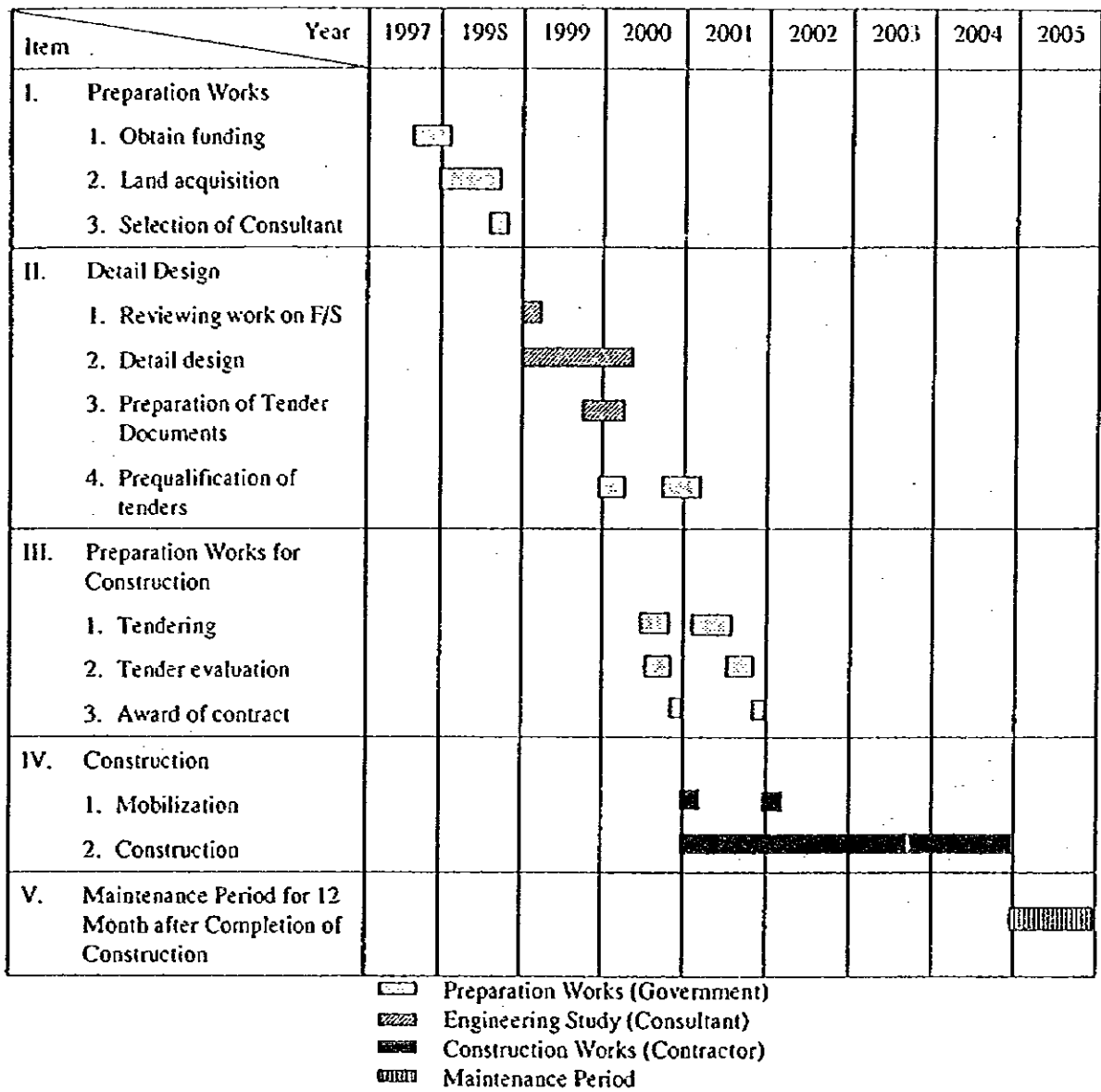


NO	Name of Facility	NO	Name of Facility	NO	Name of Facility
1	Causeway	9	South Revetment-1	17	(-7.5m) Dry Bulk Cargo Berth
2	Dockway	10	West Revetment	18	East Breakwater
3	North Revetment	11	Temporary East Breakwater	19	(-14m) Basin
4	Inner Ship Berth	12	(-14m) Container Berth	20	(-12m) Basin
5	Temporary Inner Revetment	13	East Revetment	21	(-11m) Basin
6	Inner Breakwater	14	South Revetment-2	22	(-7.5m) Basin
7	(-12m) Container Berth	15	(-12m) Grain Cargo Berth		
8	Temporary East Revetment	16	(-11m) General Cargo Berth		

Procedure of New Port Construction

Summary of Construction Cost for Short Term Development

Place	Work Item	Unit	Quantity	Unit Price		Amount		Total
				F.C	LC	F.C	LC	
(-12m) Container Berth	Included(-14m)Wharf(50m)							
	L=490+100+50m	Is	1			5,085,593	21,648,197	28,733,790
East/South Revetment	Le=400m							
	Le=850m	Is	1			5,699,378	24,200,934	29,900,310
Temporary Revetment	L1=290m Connecting							
	L2=810m, West revet't L3=430m, East Small L4=1030m, East Dockway	Is	1			5,312,024	29,065,979	34,378,003
Inner Ship Wharf	l=200m							
		Is	1			728,654	3,593,098	4,321,752
Inner Breakwater	l=100m							
		Is	1			190,616	1,111,130	1,301,746
Temporary East Break Water	l=150m							
		Is	1			458,605	2,536,084	3,002,689
Causeway	l=420m							
		Is	1			514,853	2,637,439	3,152,292
Road Tunnel								
		Is	1			79,412	581,811	681,223
						18,077,133	85,374,652	103,451,785
	Utilities	%	5%			903,857	4,268,733	5,172,589
	Total					18,980,990	89,643,385	108,624,374
Building Works								
		Is	1			874,600	4,719,200	5,394,000
	Total of Const'n					19,655,790	94,382,585	114,018,374
Contingency	Physical Contingency	Is	1			982,789	4,718,129	5,700,919
Handling Equipment	Handling Equipment	Is	1			32,625,000	0	32,625,000
								146,643,374
Consultant	Engineering Fee	Is	1			7,332,168	0	7,332,169
	GRAND TOTAL					60,595,747	99,080,714	159,678,482
						38.50%	61.50%	100%



Tentative Short Term Development Schedule

6.5 Economic Analysis

Methodology of the analysis is same as that of preliminary economic analysis. The prerequisites of the analysis are as follows.

- 1) Base Year 1996
- 2) Project Life 30 years from the time of construction
- 3) "Without" case
 - ① No investment is made for construction of new port in Thrace Region
 - ② Then handling volume of container cargo from/to Thrace Region exceeds the handling capacity of Ambarli port, the containers which can not be handled in Ambarli port are assumed to be handled in Izmit bay ports and Gemport and transported by land.
 - ③ No mother vessel of container will call.

The items of the costs and benefits of projects are same as preliminary economic analysis except waiting costs of ships..

The EIRR of the short term development plan and the sensitivity analysis are 14.8 % and 11.8% respectively. This value exceeds the standard cut off line of EIRR for social infrastructure project in Turkey, therefore, short term development plan is feasible from the viewpoint of the national economy.

The effects excluded in the calculation of EIRR are same as preliminary economic analysis.

6.6 Financial Analysis

(1) Purpose and Methodology

The purpose of the financial analysis is to examine the viability of the project itself and the financial soundness of the port management body during the project life (here the project means the short-term development plan). The viability of the project itself is analyzed using the FIRR by means of the Discounted Cash Flow Method. The financial soundness of the port management body is appraised based on the projected financial statements.

(2) Prerequisites

The fundamental infrastructure is developed and managed by the public sector and the superstructure is developed and operated by the private sector. The financial analysis is implemented from the viewpoint of each of the above management bodies. Prerequisites are shown in Tables below.

Prerequisites of Financial Analysis

	Infrastructure	Superstructure
Facilities	Breakwater Channel and Basin Land (excluding Paving) Quaywall Revetment Causeway	Yard Pavement Cargo Handling Equipment Building Utilities Navigation Aids
Construction / Management Body	Public Sector	Private Sector
Revenue	Land Lease Fee (Total repayment of the principal and interest of the loans for funds of the infrastructure construction / 27 years + Average other expenses per year for personnel, maintenance, maintenance dredging, administration cost and tax)	Cargo Handling Charge (for transshipment cargo Malta Port's tariff is applied since Turkish Ports do not have this tariff) Terminal Service Charge (ditto) Storing Charge (ditto) Other Service Charge (ditto) (each of the above charges are discounted by 10% for the first 10 years from the present tariff)
Expenditure	Initial Investment & Reinvestment Costs for the Infrastructure Personnel Cost Administration Cost Maintenance and Repair Cost Maintenance Dredging Cost Depreciation Cost Corporate Income Tax	Initial Investment & Reinvestment Costs for the Superstructure Land Lease Charge for the Infrastructure Personnel Cost Maintenance & Operation Cost Administration Cost Depreciation Cost Corporate Income Tax Charge on the Benefiting Right
Project Life	29 years : 4 years of construction and 25 years of management	17 years : 2 years of construction and 15 years of operation

Note: Cargo handling volume is estimated based on the demand forecast.
Base year; 1996

Fund Raising for Infrastructure Project

Type	Source	Covered Range	Repayment Term	Interest Rate	Amortization Pattern	Remarks
Long-term Loans	Foreign Countries	75% of the initial investment costs of the project	25 years (including a grace period of 7 years)	2.7% per annum	Fixed Amount Repayment of Principal	according to the terms & conditions of OECF loan
	International Governmental Finance Institution	25% of the initial investment costs of the project	15 years (including a grace period of 5 years)	11.0% per annum	Fixed Amount Repayment of Principal	
	Government Resources	only in case of cash shortage				

Fund raising for Superstructure Project

Type	Source	Covered Range	Repayment Term	Interest Rate	Amortization Pattern	Remarks
Long-term Loans	International Governmental Finance Institution	civil work costs of the superstructure project	15 years (including a grace period of 5 years)	11.0% per annum	Fixed Amount Repayment of Principal	
Long-term Loans	Supplier Credits	basically 85% of the initial investment costs for cargo handling equipment	10 years (excluding a grace period : Construction period)	8.9% per annum	Fixed Amount Repayment of Principal	
Short-term Loans	Domestic Bank	only in case of cash shortage	1 year (with no grace period)	9.0% per annum		

Number of employees for container terminal operation in short term plan is shown in Table below.

Number of Employees at Container Terminal in Short Term Plan

Section	Number of employees
Container Terminal Manager	1
Administration Department	24
Operation Department	151
Maintenance Department	80
C.F.S. Department	191
Total	447

Number of employees for developing and maintaining infrastructure facilities is estimated to be 2 to 10 according to its stage.

(3) Appraisal of the Project

The results of the FIRR calculation including sensitivity analysis are summarized in Table below .

Sensitivity Analysis

Case 1 : The revenue decreases by 10%

Case 2 : The project cost increases by 10%

Case 3 : The revenue decreases by 10% and the project cost increases by 10%

Results of FIRR Calculation for the Short Term Plan

	original	reve.10% down	cost 10% up	reve.10% down cost 10% up	weighted ave. interest rate
Infrastructure Project	5.6%	-	5.6%	-	4.8%
Superstructure Project	23.2%	19.6%	19.9%	16.3	9.8%

Since FIRR exceeds weighted average interest rate of the funds in all cases of both projects, these projects are deemed to be financially viable. Especially for the superstructure project, FIRR is much higher than the weighted average interest rate, which is caused by the sufficiently high tariff and exemption of the initial investment for the infrastructure.

The indicators which show "Profitability", " Loan Repayment Capacity" and "Operational Efficiency" are on appropriate levels, except for the one which shows "Loan Repayment Capacity" in the infrastructure project for the term from 2009 to 2016. However, temporary cash shortage caused by this unsatisfactory result in the infrastructure project can be covered by the internal resources of the management body and will be made up by cash excess in the following year. Therefore, it can be judged that financial soundness of both management bodies can be secured.

(Reference Data 1-Financial Analysis for the Whole Project in One Body)

The whole project in one body including the infrastructure and superstructure development by a private sector can be financially analyzed by using the basically same prerequisites for the superstructure project as mentioned above. Results of the FIRR calculation are shown in Table below.

Results of the FIRR Calculation for the Whole Project

	original	reve.10% down	cost 10% up	reve.10% down cost 10% up	weighted ave. interest rate
Infrastructure + Superstructure Project	12.2%	10.4%	10.60%	8.8%	10.55%

FIRR does not exceed the weighted average interest rate in Case 1 and 3 of the

sensitivity analysis and the debt service coverage ratios, which show “Loan Repayment Capacity”, come short of 1.75 for the term from 2005 to 2013. Judging from these results, it is difficult to deem the project to be financially viable.

(Reference Data 2- Financial Analysis for the Master Plan Project)

The master plan project, including the short term and long term development, is financially analyzed in the same manner as above.

According to the results of the FIRR calculation below, FIRR exceeds the weighted average interest rate in all cases of both projects and these projects are deemed to be financially viable.

Other financial indicators are on appropriate levels as a whole, except for the one which shows “Loan Repayment Capacity” in both projects for a certain term. However, temporary cash shortage caused by this unsatisfactory result can be covered by the internal resources of the management body or short term loan and will be made up by cash excess in the following year. Therefore, it can be judged that financial soundness of both management bodies can be secured.

Results of FIRR Calculation for the Master Plan

	original	reve.10% down	cost 10% up	reve.10% down cost 10% up	weighted ave. interest rate
Infrastructure Project	4.83%	-	4.83%	-	4.78%
Superstructure Project	23.1%	20.2%	20.5%	17.8%	9.5%

6.7 Preliminary Environmental Impact assessment

The Undersecretariat for Environment was promoted to the rank of Ministry of Environment (MOE) in August 1991. “Environment Law” gives general guidelines for the protection of the environment. Article 10 of the Law requires the preparation of an environmental impact assessment (EIA) report to evaluate the potential impacts on the environment that arise from a project. The types of projects for which an EIA report will be required and the specific topics that should be covered for different cases are described in the EIA Regulation issued by the MOE.

Environmental factors to be considered in relation to the development of the new port are categorized into eight groups: (a) water quality; (b) coastal hydrology; (c) bottom contamination; (d) marine and coastal ecology; (e) air quality; (f) noise and vibration; (g) visual quality; and (h) socio-cultural impacts. As a result of screening following factors are selected for a detailed study.

- Changes in current patterns which may be caused by reclamation and construction of breakwater
- Change in water quality of the area surrounding the new port
- Coastal hydrology on the east and west coast of the new port
- Air pollution which may be caused by future port traffic
- Turbidity of water by dredging
- Impacts on roads by traffic generated from the new port
- Impacts in borrow area

Field surveys covered currents, water pollution, shore line configuration, sediment contamination, air pollution, terrestrial flora and fauna, aquatic species and fishing activity and cultural assets.

In-situ air sampling and measurement studies were conducted at three different locations. SO_2 , NO, NO_2 , O_3 , CO, HC, F, Cl, HCl, HF and H_2S were measured. The comparison of the measured parameters with currently-effective air quality standards in Turkey revealed that none of the parameters have violated the current legislation.

In terms of sea and river water surveys, a detailed comparison of all the measured parameters with currently effective standards and literature values is as follows; 1) measured pH are well within the range, 2) DO levels in all comply with the standard, 3) transparencies in the shallow stations are fairly close to standard and one in deeper stations are safely higher than minimum transparency required by the legislation, 4) color, odor and taste were all in natural levels. 5) SS do not indicate pollution. Most of the parameters measured in the Hacimuratli river exceeds standards. The river is a heavily polluted body, however, the measurements were done at a time when water level and flow in the stream is very low.

A total of 439 vascular flora taxa were identified in the study area. It is found that most of the plant species in the surveyed area are widespread in Turkey and they are not critically endangered. In terms of fauna species, subjected to this survey cannot be considered as a permanent habitat for most fauna species.

There exists no cultural and historical properties within the limited borders of the project area. However, there are several tumli and archaeological sites near the area. These locations must be carefully considered during the design of auxiliary port facilities such as access roads and similar other infrastructural development.

To assess the impacts of the port development, wind induced currents and the dispersion of water pollution and shoreline configuration are identified by means of computer simulation. Adverse effects on air pollution and marine/aquatic species are also studied. As a result no significant adverse effect is shown in the preliminary EIA.

Chapter 7 Conclusion and Recommendations

7.1 Conclusion

(Findings on the present ports)

Owing to the economic growth in Turkey and international containerization, container cargo throughput at the several ports in the Sea of Marmara have rapidly increased since 1990 and reached 300,000 TEUs in 1995. Ports at the Sea of Marmara are required to develop competitive container terminals with enough capacity, deeper berths, efficient productivity and quality services.

(International Transport Environment)

According to the possible scenarios in terms of Turkey's economy, Eastern Europe and CIS's economy and the relationship between Turkey and EU, international trade, maritime cargo movement and container throughput were estimated. Export and import of Turkey increase by 8.4% and 6.7% respectively in the medium case. The container throughput of Turkey in 2015 is 6.4 million TEU in the medium case and the projected container throughput handling in the Black Sea ports excluding Turkey in 2015 is 850 thousand TEU.

(Bottlenecks)

The biggest and aged port, Haydarpaşa which is located in the center of Istanbul and has no expansion room is seriously congested with many waiting vessels. In addition, the trucks generated from the port have been causing traffic jams on the road surrounding the port.

Consequently, many bottlenecks are identified to develop a modern container port such as 1)insufficient container yards; 2)lack of container berth; 3)poor cargo handling equipment; 4)curved fairway and narrow entrance; and so forth. Operational problems of the port are recognized such as 5)productivity of cargo handling; 6)customs clearance procedure.

One of the most serious problems of container handling facilities in the region of Izmit is that the facilities tend to sprawl along the bay in a small size. Small scale terminal is difficult to equip with large scale and modern equipment with high efficiency, thus it can not be competitive with the ports in the neighboring country and can hardly attract mother vessels. This forever relegates the status of the port to that of feeder port. This would affect the national economy through high transportation cost.

(Demand Forecast for Marmara Ports)

The forecast total Turkish cargo volume in 2005 and 2015 become 1.75 times and 3.1 times of 1995, and cargo volumes are 21 million tons and 37 million tons. Marmara sea ports forecast cargo volume of 2005 and 2015 are 2.2 times and 4.1 times of 1995. Marmara sea ports hinterland is divided into four independent hinterland areas. Container cargo projection volume of Thrace area of 2005 and 2015 is 270 thousands and 580 thousands TEU respectively.

(Cargo Handling Capacity of Marmara Ports)

At Izmit area, container cargo will be handled at Haydarpaşa, Derince, Gemlik (GEMPORT), and other private port such as BELDE and SEDEF. Shortage of container handling capacity is about 433,000 TEU. This amount shall be handled by the new container terminal built at Derince or another place.

At Thrace area, container handling capacity of existing port is about 50,000 TEU. Shortage of container handling capacity is about 638,000 TEU including transshipment containers. This amount shall be handled by the new container terminal in the New port. There is a large cargo demand for dry bulk cargo. Dry bulk cargo shall be handled by existing ports and also the New port.

At Balkesir area, Bandırma port will handle all demand of this area including container cargo utilizing the new container terminal and extended berth for bulk cargo. At Canakkale area, Gelibolu port and Canakkale port can handle all demand of this area.

(Necessity of Port Development)

Cargo handling capacity in Thrace and Izmit regions will not be sufficient for the cargo volume in 2015. Though container cargo demand in Izmit will be larger than that in Thrace, container cargo volume of 638,000 TEUs in Thrace and 433,000 TEUs in Izmit will exceed the capacity of ports respectively. To handle the cargo, it is necessary to increase the capacity of ports in Thrace and Izmit regions by 2015.

(Site Selection for New Port in Thrace)

Two places in Thrace region, Tekirdağ port and Military owned coastal area were examined as the site for new port construction. Military owned coastal area is superior as a site for the new port in terms of space for a new port, room for future extension, environmental affect and settlement for access road.

(Master Plan of Marmara Ports for 2015)

Master plan for container terminals is as follows;

Principle for Container Terminal Arrangement

Region	Container Demand in 2015 (TEU)	Principle for Arrangement of Container Terminal
Izmit	1,342,000	<input type="checkbox"/> Improvement of Haydarpasa port <input type="checkbox"/> Practical use of existing and under-construction private ports <input type="checkbox"/> <i>Construction of Derince new container terminal</i>
Thrace	688,000	<input type="checkbox"/> Construction of a new container port <input type="checkbox"/> Practical use of an existing private ports
Balkesir	127,000	<input type="checkbox"/> Improvement at the depth of Bandirma port
Canakkale	20,000	<input type="checkbox"/> Use of new pier of Canakkale port

Note: Arrangement with Italic will be commenced after 2005.

The most urgent matter in the master plan is to increase container cargo handling capacity, priority should be given to the followings;

- (1)Improvement of Haydarpasa container terminal
- (2)Construction of new container port in Thrace region
- (3)Conversion to container terminal at Bandirma port

(Demand Forecast for the New Port)

The cargo throughput in 2015 is 638,000TEU of container and 5,880,000 tons of bulk and general cargo. Out of 638,000TEU, 108,000TEU is transshipment container cargo.

(Requirements of the New Port)

The new port should comply with the following requirements with a view to consolidating the position as a competitive container port.

- (1)To developed as the largest commercial port in the Thrace region for public infrastructure and distribution center in the region and nation and as a complementary port to Haydarpasa Port.
- (2)To comply with an urgent need for increasing the capacity of container.
- (3)To enable the port to accommodate Panamax ship of 50,000DWT class container vessel

with capacity of 3,000TEU.

(4)To be flexible to cope with future demand and to secure sufficient room for future expansion.

(5)Not to deal with passenger.

(6)To mitigate adverse effects on the environment.

(Master Plan of the New Port for 2015)

The new port will developed as the largest commercial port in the Thrace region and a complementary port to Haydarpaşa port. The total project cost is approximately US\$ 400 million, of which US\$ 146 million represents cargo handling equipment. Master plan of the new port for 2015 is as follows;

Master Plan of New Port

Facilities	Container Terminal	Bulk & General cargo Terminal
Terminal Area	44 ha	50 ha
Berths	3 (d: 12~14m)	7 (d: 7.5~12m)
Handling Capacity	640,000 TEUs	6.6 mil. tons
Quaywall/Revetment	2,940 m	3,280 m
Breakwater	700 m	100 m
Reclamation	7.8 million m ³	4.5 million m ³
Storage Capacity	18,620 TEU	350,000 m ²
Cargo Handling Facilities	Gantry Crane 6 Transfer Crane 20 CFS 10,000 m ²	Grain Silo 45,000 tons Shore Crane 12

Note: d = berth depth

(Short-term Development Plan)

The proposed project for the short-term development plan is as follows;

1)Container terminal

Berth	2 (berth depth = 12 m)
Terminal Area	34.5 ha
Capacity	320,000 TEUs
Estimated Coast	US\$ 64.7 million

2)Breakwater

US\$ 3.0 million

3)Revetment

US\$ 64.2 million

4)Dock road including causeway

US\$ 3.8 million

5) Inner harbor	US\$ 5.6 million
6) Other	US\$ 18.2 million

Number of ground slot in the container yard is 3,588. As container handling facilities, three(3) gantry cranes and ten(10) transfer cranes are installed.

(Implementation Plan)

Main port facilities for short-term development plan consist of -12m container berths, container yard, small ship berth, causeway, temporary dock-road, revetment and improvement of crossing of existing road., etc. These facilities may be able to construct with local labor, local available equipment and materials due to without complexity.

(Cost Estimate)

Total project cost for the short-term development plan amounts to US\$160 million, of which US\$61 million represents the foreign currency component. Of the total project cost, US\$59 million would go for the container berth and container yard with the breakdown into cargo handling equipment amounting to US\$32 million civil works amounting to US\$26 million..

(Management and Operation)

Public sector should administer the new port from the viewpoint of people's welfare according to its master plan. For this purpose, construction of infrastructure must be performed by public sector and ownership of the land should be retained by public sector, while construction of the terminal including the superstructure and pavement, and its operation is recommended to be performed by private sector in order to encourage efficient cargo handling.

(Economic Analysis)

The EIRR of the long-term development plan 18.7 %. The EIRR for the short-term development plan results is 15.7 %. Both development plan have sufficient viability. Even the worst case, where the project cost is assumed to increase by 10 % and the benefit reduced by 10 %, the EIRR for the short-term development plan is 12.6 %. These values exceed the opportunity cost of capital and the EIRR is still in a feasible range. This development project is viable from the viewpoint of national economy.

(Financial Analysis)

FIRR is assessed at 5.6% in the infrastructure project and 23.2% in the

superstructure project. Due to the sufficiently high tariff and exemption of the initial investment for the infrastructure, the superstructure project especially turns out to be very feasible. After conducting a sensitivity analysis, the FIRR's are still in a feasible range.

The indicators which show the financial soundness of each of the port management bodies are on appropriate levels, except for the one which shows "Loan Repayment Capacity" in the infrastructure project for the term from 2009 to 2016. However, since temporary cash shortage caused by this unsatisfactory result will be made up by cash excess in the following year, it can be judged that financial soundness of both management bodies can be secured, based on the assumption that the temporary cash shortage can be covered by the internal resources of the management body.

(EIA)

Field surveys covered currents, water pollution, shoreline configuration, sediment contamination, air pollution, terrestrial flora and fauna, aquatic species and fishing activity, and cultural assets. Biological survey showed that the projects area is rather poor in term of the biological abundance.

Initial environmental examination is adopted to study changes in currents pattern, impacts on water quality, coastal hydrology, traffic load on access road, air pollution, cultural aspects, visual impacts, and effects on flora and fauna. To assess the impacts of the port development, wind induced currents and the dispersion of water pollution and shoreline configuration are identified by means of computer simulation. Adverse effects on air pollution and marine/aquatic species are also studied. As a result no significant adverse effect is shown in the preliminary EIA.

(Overall Evaluation of the Project)

As one of the most important elements to develop ports in the Marmara area in consistent with the economic growth of the region, a new port have been proposed to be constructed at the military owned coastal area in the Thrace region with improvement plans at other ports in the Marmara region. No other feasible site than the site chosen could not be found and the site was practically the best choice. The development of the new port have been clarified to be feasible from technical, economical, financial and environmental aspects. One of the superior points of the plan is that it has a enormous room for future expansion. In order to secure the future expansion works, it is very important that the public sector controls the port infrastructure like land, revetments, breakwater so on. Moreover since the construction of such port infrastructure needs a large amount of

investment and it requires a long period to call in the invested resources by the operation, the public sector itself is also financially recommended to invest and possess the infrastructures.

7.2 Recommendation

With a view to securing successful realization of the proposed port development schemes under efficient port management and operation, timely actions on the part of the Government of Turkey is recommended as follows.

(Preparation of Port Statistics)

During our study, we encountered problems in port planning. Specifically, it was very difficult to gather statistics on cargo handled at ports and data concerning existing port facilities, especially those pertaining to private port facilities. Ports continuously grow and develop, in line with the national economy. Therefore, it is very important to develop ports based on long term development plans that contain the most accurate forecasts of future events as possible. The above mentioned information is fundamental in making a port development plan. It is strongly recommended to consolidate legal and institutional frame for obtaining and maintaining these statistics.

(Formulation of National Long Term Port Development Plan)

It was observed that small scale private ports had been established or were going to be constructed. Especially for a container port, which is a capital-intensive industry where scale merit can be expected in terms of efficiency, this trend would have a deleterious effect on the international port competition and finally on the national economy. Turkish government is recommended to draft a long term port development master plan authorized as national plan and to examine strictly any application for port development from the private sector whether it is consistent with the master plan or not, so that a sprawl of container terminals will not occur.

(Guidance to the private sector in Marmara area)

Since the master plan for ports development in Marmara area has been prepared and a new port is proposed to be constructed to fulfill the requirement of the master plan, it is important that the government of Turkey is recommended to induce private sector not to attempt to construct any small scale container terminal within the same hinterland as the new port. Small scale and inefficient container terminal, in general, never can compete against one which has a large scale and more efficient. A large scale and efficient

terminal attracts more ship services and more frequent ship services are more convenient for the exporter or consignee. To attempt constructing any small scale terminal is quite possible to turn out unsuccessful. It means such attempt could be a waste of resources and unnecessary environmental disturbance. These national losses should be avoided beforehand.

(Review of Industrial Development Plan in Thrace)

As described in chapter 2, part 1, in Thrace region, some official industrial installation plans exist. But those industrialization plans in Thrace Region are planned without considering the new port. If the new port project goes forward, it is recommended that those plans be reviewed. The Free Trade Zone, in particular, is worthy of consideration and it is recommended that some FTZs be planned along the access road to the port. Though it can not be said that Thrace region, where the new port is planned, is highly developed, the region is blessed with favorable conditions and has high potential even in the present situation. For instance, the highway route No.E80 leads to Europe and the international airport connects the region to the world. If the new port comes into operation, the region will be fully fitted out with air, land and sea transportation. Moreover the region is in the vicinity of the biggest consumption area of Turkey, Istanbul.

(Practical Use of Port Hydraulic Research Center)

The configuration of the port plan proposed in this report is unprecedented in Turkey. Based on Japanese experience, serious technical problems are not anticipated, however, it is desirable to conduct some experimental and numerical model simulation studies. But as such studies are beyond the scope of the study, it is recommended that some experimental studies and numerical model simulation studies be conducted by utilizing the Port Hydraulic Research Center newly completed under the Japanese Technical Cooperation by JICA. The themes recommended to be studied are as follows.

(1) the relation between the calmness in front of berths and the length of the breakwater. The sea depth where the breakwater is constructed is rather great and construction cost of the breakwater is high. Therefore the minimum length of the breakwater should be decided through a careful experimental study.

(2) the relation between the crown height of the revetment and the magnitude of the wave overtopping, especially at the corner connecting the revetment and breakwater. Because the revetment is constructed at rather deep sea and wave energy would be larger and also the crown height of the revetment considerably affects the total investment, even liner part

of the revetment is also recommended to confirm whether the crown height of the revetment is appropriate or not through the experimental study.

(3)stability of rubble mound in breakwater and revetment. Because the stability of breakwater and revetment are indispensable to port function. It is also recommended to confirm whether the weight of armor stones of sloping breakwater and revetment is appropriate or not through the experimental study.

(4)sea current estimation. One of the merits of the configuration proposed is that the sea current along the seashore would not greatly affect the area, then the environmental impact would be minimum. It is recommended to confirm the configuration's effect on the sea current.

(5)in connection with the above, it is necessary to study the sand drift phenomena such as seashore erosion and siltation of channel and basin, as well as countermeasures, if necessary.

(Participation of Private Sectors)

Port is a basic infrastructure in a public water area for a nation's imports and exports so that the public sector should administer the port from the viewpoint of people's welfare according to its master plan. However, commercial activities related to the port are basically supported by private sectors in the field of terminal operations, stevedoring, harbour services and other ancillary services. Therefore, participation of the private sectors in these fields needs to be encouraged under the administration of public sector.

Based on this concept of public port, for the new terminal, public sector should provide only basic port infrastructures and invite the private sector to build superstructures and to operate its own terminal though ownership of the land would be retained by public sector. Introduction of private operators into terminal operation will encourage efficient cargo handling.

(Establishment of Port Authority)

In order to develop and operate ports properly, it is recommended that an port authority as a port managing body be established for each port in Turkey. The relevant municipality might participate in the authority.

(Simplification and Modernization of Procedures and Documentation)

In order not only to develop trade in this country but also to establish efficient container transport operations, it is strongly recommended that the procedures and documentation required for container transport be simplified and modernized, in cooperation with all concerned organizations by extending the present computer system in TCDD ports.

Especially to reduce the long waiting time of containers in the new port and secure smooth door to door transportation, relevant customs law and legislation should be changed and customs clearance in which empty containers are taxed needs to be simplified.

(Port Sales)

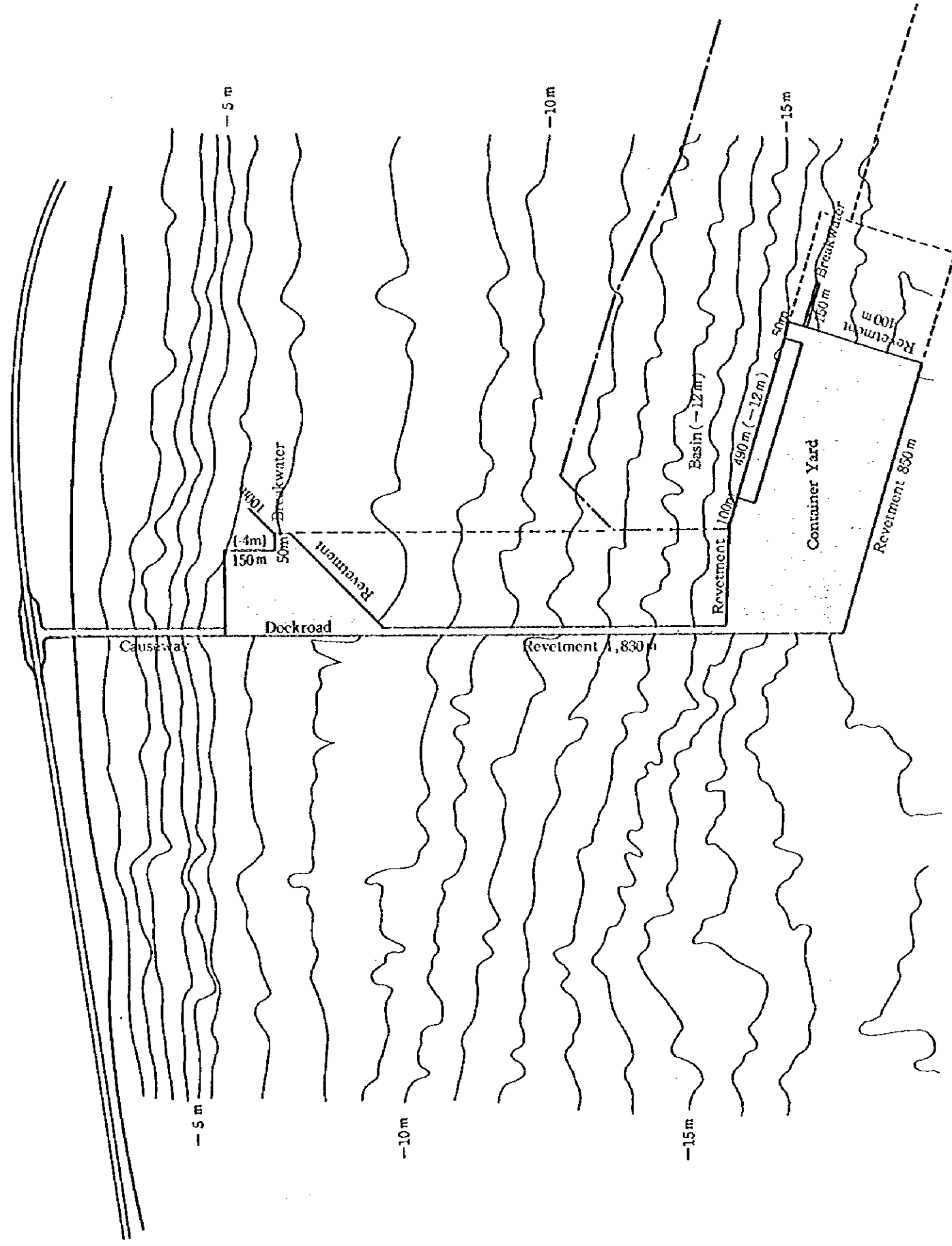
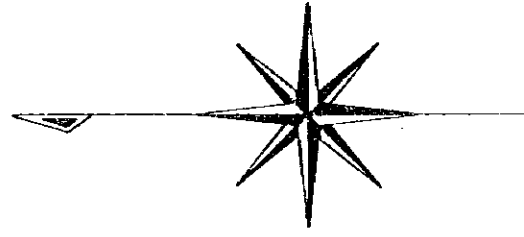
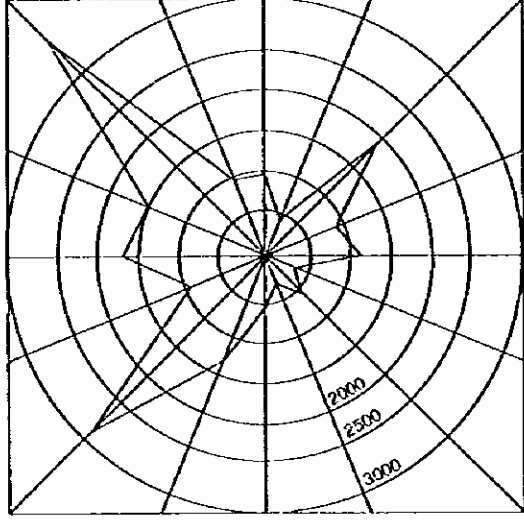
Since the new port is located somewhat far from Istanbul which is the major consumer city in its hinterland, port promotion activities are one of the most important factors to attract port users and to secure adequate level of revenue. In order to accomplish this aim, effective actions such as establishment of port promotion strategy focusing on the most effective target groups or clients and active appeals in getting their understanding on real merits of utilizing the new port are recommended.

(Establishment of Competitive Port Tariff)

In addition to streamlining cargo handling and installing proper port facilities, to conquer the above mentioned locational disadvantage and the customary commercial practices which ignore rational economic principles and to attract mother container vessel and survive the heated competition between container ports in the East Mediterranean Sea and the Black Sea, port tariff of the new port should be competitive. Based on the results of the financial analysis, tariff for the new port can be lowered to some extent taking account of the above mentioned situation, although the present tariff is not at a high level compared with other ports in the Mediterranean Sea or in the world.

(Financial Arrangement)

Timely implementation of the project is crucial to relieve congestion of existing container terminals such as Haydarpasa of Istanbul. It is strongly recommended for DLH to begin making preparations and financial arrangements for the implementation of short-term development plan of the project immediately after the present feasibility study.



Scale: 1/15,000

FIGURE General Layout of Short Term Development Plan for New Port

JICA