1.13 Management and Operating System of the Container Terminal

1.13.1 Basic Ideas

There are common basic ideas required for management and operations of ports throughout the world. The basic ideas are speed, affordability, reliability and safety. They are especially important for container terminals, compared with other cargo terminals.

Since the services of container waterway transport through this terminal must confront severe competition from trucks and railways, the establishment of the four basic ideas is strongly urged to upgrade the management and operating systems of the terminal.

1.13.2 The Problems in Existing Management and Operations

We analyze the gaps between the existing management and operating systems of the ports in Bangladesh and the four basic ideas mentioned above to establish the optimum management and operating systems for the projected container terminal.

There are many obstacles to establishing efficient container transportation in the existing system. The problems common to the inland river ports, seaports and Kamalapur ICD are as follows:

(1) lack of an incentive in the pay system for employees to hard work
(2) employment system for labourers unsuitable for technical innovation
(3) small-scale private stevedoring companies unsuitable for container operations
(4) insufficient training system for container operations
(5) complicated procedures and documentation

The problems of the inland river ports are as follows:

(1) lack of an incentive for efficiency in the financial system of the BIWTA
(2) system of engaging handling contractors unsuitable for improvement of services
(3) inadequate planning system for berth assignment and cargo operations

(4) inefficient direct delivery/loading of cargo
(5) dangerous working areas
(6) inefficient system of toll collection

The problems of the seaports are as follows:
(1) long dwelling time of imported container cargo
(2) complicated arrangement for cargo operations
(3) inefficient management of container stacking yards
(4) dangerous stuffing/stripping operations at container stacking yards

Among the biggest problems of Kamalapur ICS is a lack of equipment and shunting engines.

1.13.3 Study of Possibility of Privatization by Field

(1) The Advantages and Disadvantages of Privatization

The advantages of privatization are that the system requires complete efficiency, promptitude and originality under the absolute criterion of profit. On the other hand, the disadvantages of the public sector are that the system lacks an incentive to efficiency, promptitude and originality.

The disadvantages of privatization are that the system may not be coordinated with the public interest and the economic policy of the government.

(2) Planning, Development and Construction of the Port

Taking into account the small financial resources of private companies and the necessity for cooperation with the development of ports and the government policies in Bangladesh, it is recommended that the public sector carry out these functions.

If the BIWTA carries out these functions, it should be considered that the accounts of container terminal will be separated from those of the BIWTA's other businesses in order to gain adequate funds for maintenance and re-investment of the facilities.

(3) Management of Vessels' Navigation

Since there are no big problems in the present system and these functions need compelling power on vessels, it is acknowledged the services in the terminal will be supplied by the public sector.

(4) Cargo Handling, Tallying and Related Documentation

These tasks require the greatest efficiency and speed out of all the tasks performed at the port. It is desirable that more than one private company should take part in the operations of the terminal, especially entire cargo operations including planning and related documentation work, taking into account the inefficiency of the public sector in Bangladesh.

However, it may be difficult for the private sector to fulfill the work in the early stage. When the private sector carries out these operations, financial support from the government and introduction of foreign advanced technology should be strongly urged for them.

1.13.4 Public and Exclusive Use of the Port Facilities

A public-use system, "first come, first served" may contribute to equality of port facilities among users and a high occupancy ratio of the facilities. However, under this system there will be congestion through cross-transport of containers inside the port.

Preventing this disadvantage, a preferential system has been adopted in almost all public container terminals in the world. In this system, some constant users are assigned a certain berth and a near-by stacking yard. Before vessels come to the ports, the terminal operator may stack this vessels' containers at a convenient place in advance and ensure steady loading/unloading of containers.

On the other hand, in an exclusive-use system, the same berth and the same yard/CFS will always be assigned to shipping companies for convenience of cargo operations and vessels' navigation. The advantages are less waiting time for berthing and safe and efficient operations in the terminals. Most of the world's exclusive-use terminals are leased to lessees, shipping companies or terminal operators, on a long-term basis.

This system are effective not only in securing the lessors' business but also in saving costs and time required for collecting and paying the charges.

Taking into account the projected cargo volume and the number of berths, an exclusive-use and lease system can be seen as saving costs and time for the management of the port in the last stage of the operations.

1.13.5 Combined-Responsibility Systems for the Port Users

All container operations in the port, such as planning, arrangement and practice of cargo handling, should be supplied on a combined-responsibility basis for the users, even if the operations are carried out by plural organizations in practice.

1.13.6 Simplification and Efficiency of the Procedures and Documentation

In order to prevent not only long demurrage of cargo but also inefficient management and operations in the port, it should be recommended that the procedures for vessels' arrival/departure and cargo operations be simplified and the formats and sizes of documents be common among the concerned organizations as much as possible. Manuals for documentation should be prepared in order to prevent confusion.

From the historical view of the degree and extent of computerization, when annual throughput of containers at a terminal exceeds approximately 120 thousand TEUs, almost all terminal office operations are computerized.

1.13.7 Training System and Foreign Experts

It will be necessary to establish a training system for staff and laborers and to employ foreign experts, especially during the early stages.

1.13.8 Tariff System

The tariff system of the port should be decided taking into account the competition from the other modes, the costs for the port and the users' ability to bear costs. Careful consideration should also be given to simplification of the structure and collection methods of the charges.

2.1 Demand Forecast

The result of the demand forecast for the Short-term Plan uses the same method as the Master Plan. So, in this part of the summary, the results of the forecast in 1995 for the same items as the Master Plan are mentioned.

2.1.1 Population and GDP in 1995

In this study, the growth rate of the population between 1987 and 2000 used is the same as that estimated by the B.B.S.

From the result of the forecast, the population of Bangladesh in 1995 will be about 126.3 million.

The future GDP of Bangladesh is estimated using the past trend of GDP. The estimated GDP in 1995 is about 573 billion.

2.1.2 Container Throughput at Seaports in Bangladesh

From the results of the estimation which is carried out the same method as Master Plan, the number of loaded containers and the volume of container cargo for export and import in 1995 are as follows:

The number of loaded containers in 1995 for export: 61 thousand TEU.
for import: 92 thousand TEU.

The volume of container cargo in 1995 for export: 685 thousand tons.
for import: 1,193 thousand tons.

2.1.3 Container Cargo Volume Coming to and from Dhaka Area

As already mentioned in the Master Plan, the ratio of the number of loaded container for import to and from the Dhaka area is estimated using the average of the ratio between the result of the O/D survey and the interviews at the Chittagong Port Authority. For the import, the ratio is estimated using the result of O/D survey. So, the ratio of the number of loaded containers for export and import to and from the Dhaka area is about 65 percent and 76 percent.

The container cargo volumes coming to and from the Dhaka area for export and import are estimated by the same method in the Master Plan. From the result of the estimation, the container cargo volumes coming to and from the Dhaka area for export and import in 1995 are as follows:

The container cargo volume in 1995 for export: 445 thousand tons.
for import: 906 thousand tons.

2.1.4 Traffic Modal Split of Future Container Traffic

(1) Methodology

The basic method of the estimation of the traffic modal split of future container traffic in the Short-term Plan is the same as that in the Long-term Plan. But on the Dhaka-Chittagong Highway, the Meghna-Gumti Bridge will not be completed until 1996. The container cargo transport by roads in 1995 on the Dhaka-Chittagong Route, therefore, will be carried by trucks as the loose cargoes. Accordingly, the marginal costs of the container cargoes transported by road per TEU are calculated as the cost of transporting costs of the loose cargoes by 3 trucks.

The Kamalapur ICD Project proposed by the ADB Report targets 33,800 TEUs for railways in 1995 between Dhaka and Chittagong. We adopt 33,800 TEUs as the target number of containers to be transported in 1995, because the target year is close at hand and this target number seems to have the possibility of realization. This consequently limits the railway capacity in 1995.

(2) Estimation of Marginal Costs

Marginal costs for container transport are calculated in the same manner as for the Long-term Plan, except for the traffic time of trucks traveling by road. The operating costs of vessels and trains are equal to those in the Long-term Plan. But the additional investment costs become higher than those in the Long-term Plan, because the number of containers to be handled in 1995 is smaller than that in 2005.

The calculated marginal costs are shown in Fig.2.1.1.

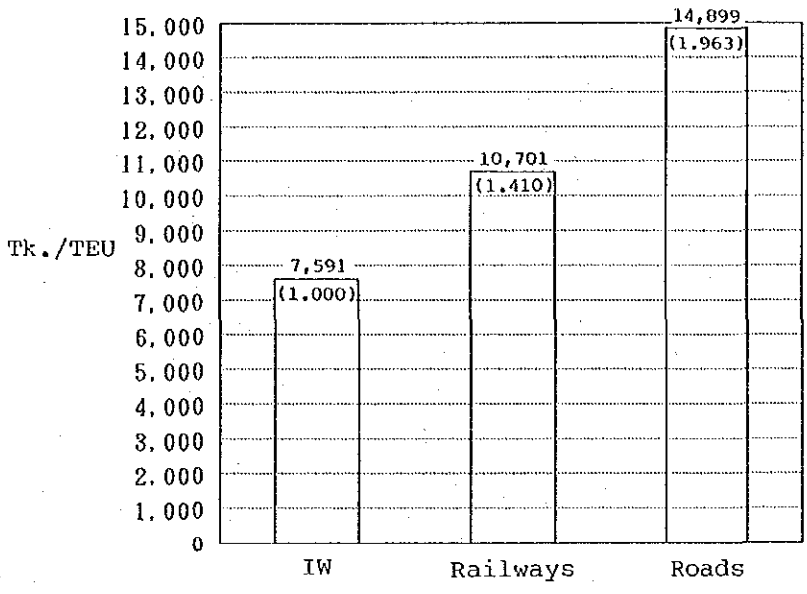

Fig. 2.1.1 Comparison of Marginal Costs by Traffic Mode in 1995

(3) Estimation of Traffic Modal Split and Container Throughput

The estimation of the traffic modal split and the container throughput are carried out in the same manner as for the Long-term Plan. Result of the estimation are shown in Table 2.1.1. As the numbers of containers by roads in the Table 2.1.1 are imaginary, the cargo volume is shown in parentheses in Table 2.1.1.

Table 2.1.1 Traffic Modal Split and Future Container Throughput at Dhaka in 1995

	Traffic modal split (%)	Container throughput (TEUs)		
		Import	Export	Total
Inland Waterway	45.4	34,401	34,401	68,802
Chittagong	(36.8)	(27,865)	(27,865)	(55,730)
Mongla	(8.6)	(6,536)	(6,536)	(13,072)
Railways	22.3	16,900	16,900	33,800
Roads	32.3	24,548 (319,860ton)	24,548 (157,022ton)	49,096 (476,882ton)
Total	100.0	75,849	75,849	151,698

2.1.5 Ratio of the Number of 20-Foot Containers to the Total Number of Containers

For coming to and from the Dhaka area, the ratio of the number of 20-foot containers to the total number of containers are estimated by the same method as in the Master Plan.

From the result of the estimation, the ratio of the number of 20-foot containers in 1995 is about 69.4 percent.

2.2 Short-term Plan for the Container Terminal Development

2.2.1 The Basic Concept of the Short-term Plan

The Short-term Plan is prepared as a first-phase plan with the target year of 1995 for the container terminal development at Dhaka Port. The Short-term Plan is made within the framework of the Master Plan described in Chapter 11 of Part I.

2.2.2 Number of Containers Handled at the Container Terminal

The number of containers handled at the container terminal in Dhaka Port is assumed according to the demand forecast and the modal split described in Chapter 1. The numbers divided into imports and exports, and loaded and empty categories are summarized as follows:

Unit: Thousand TEUs

Year	Import			Export			Total		
	Loaded	Empty	Subtotal	Loaded	Empty	Subtotal	Loaded	Empty	Total
1995	29.7	4.8	34.5	16.9	17.6	34.5	46.6	22.4	69.0

2.2.3 Required Scale of Main Facilities of the Container Terminal

(1) General

In order to determine the required scale of the main facilities in the Short-term Plan, the same methodology used in planning the Master Plan is adopted. Thus, computer simulation is also conducted in planning the Short-term Plan. When simulating container flow at the new container terminal in the target year of the Short-term Plan, the conditions described in Section 11.2.3 - Section 11.2.6 of Part I are also adopted.

(2) Berths

Principal dimensions of a berth are determined so as to accommodate the container ships studied in Section 10.1 of part I. Length per berth and water depth along a berth are determined to be 90 m. and 4 m. below the average LLW, respectively.

The optimum number of berths is determined by comparing alternative numbers and their respective costs comprising port costs and ship waiting costs. The ship waiting costs are computed using the computer simulation conducted through the period of the target year based on the conditions described in Section 2.3.2 of Part II. Thus, two is selected as the optimum number of berths. The total berth length is 180 m. The cargo-handling capacity of the berths is estimated as a total of 114 thousand TEUs per annum.

(3) Marshaling Yard

The required number of containers stored at the marshaling yard is determined taking account of the fluctuating number of containers dwelling at the yard by using the computer simulation mentioned above. According to the result, the required number of containers stored at the marshaling yard is determined to be 1,432 TEUs that is the optimum number.

(4) Container Freight Station

In order to determine the required area and number of bays, the result of the above simulation is also adopted. According to the result, one CFS shed is planned in the framework of the Master Plan, which proposes two CFS sheds. The total number of bays on each side and the area including office space are determined to be 25 and 4,410 sq. m.

(5) Apron

An apron where containers are loaded and unloaded onto or from container ships by gantry cranes is planned considering the installation of the cranes and efficient cargo-handling for relaying containers between the cranes and straddle carriers. Taking account of the comparatively narrow rail span of 10 m, the necessary width of the apron is estimated to be at least 35 m. The apron length is determined to be 195 m. based on the lengths of the berths and the marshaling yard.

(6) Access Road

In order to connect the container terminal with the nearest major road, namely the Dhaka-Mawa Road, an access road must be planned. According to the estimated traffic volume based on the result of the computer simulation, a two-lane access road will be sufficient to accommodate the

above traffic volume. The width of each lanes and the total width of the road's paved part should be 3.25 m. and 6.5 m., respectively. Generally, vehicles queue in front of a main gate of a container terminal to wait for gate procedures. For queuing vehicles in front of the gate, an additional lane is required to meet above number of arrivals in peak conditions. The lane length was determined to be 200 m. by using a computer simulation.

2.2.4 Layout of the Main Facilities of the Container Terminal

The main facilities of the container terminal, of which the required sizes are shown in Section 2.2.3, are arranged, and a required terminal area is computed (see Fig. 2.2.1 and Fig. 2.2.2). The required areas are summarized in Table 2.2.1:

Table 2.2.1 Required Terminal Area Unit: sq. m.

Total Area	79,700
(Length x Width)	(355 x 255)
Marshaling Yard	34,515
(Length x Width)	(177 x 195)
Apron	6,600
(Length x Width)	(195 x 35)
Backyard	
Sub-total	32,985
CFS	4,410
Head Office	800
Repair Shop	1,000
Open Yard	3,500
Others	23,275
(Length x Width)	(255 x 143)
Van Pool	5,600
(Length x Width)	(80 x 70)

In order to support container-handling operation in the container terminal, a backup area for warehouses, office space of shipping companies, shipping agencies and forwarders, etc., needs to be prepared adjacent to the container terminal. Though the area is expected to be used mainly for the private sector, land acquisition should be included in this project in order to avoid disorderly development and control land use around the container terminal. Moreover, land for future expansion should also be acquired all at once at the first stage, otherwise it will not be possible to go ahead with the next-phase of the plan. Thus, the project areas excluding the access road but including the port road for the Short-term Plan are summarized as follows:

- Terminal Area: 79,700 sq. m.
- Port Road: 6,695 sq. m.
- Backup Area: 29,780 sq. m.
- Area Reserved for Future Expansion: 67,150 sq. m.

- Total Area: 183,325 sq. m.

The area for land acquisition excluding the access road is calculated by adding bank slope around the terminal and detracting the jetty portion to be installed in the river to and from the above total area of 183,325 sq. m. Thus, the area to be acquired at the terminal site is summarized as follows:

- Length: 395 m. (1,3000 ft.)
- Width: Average:512 m. (1,680 ft.)

- Total Area: 202,240 sq. m. (50 acres)

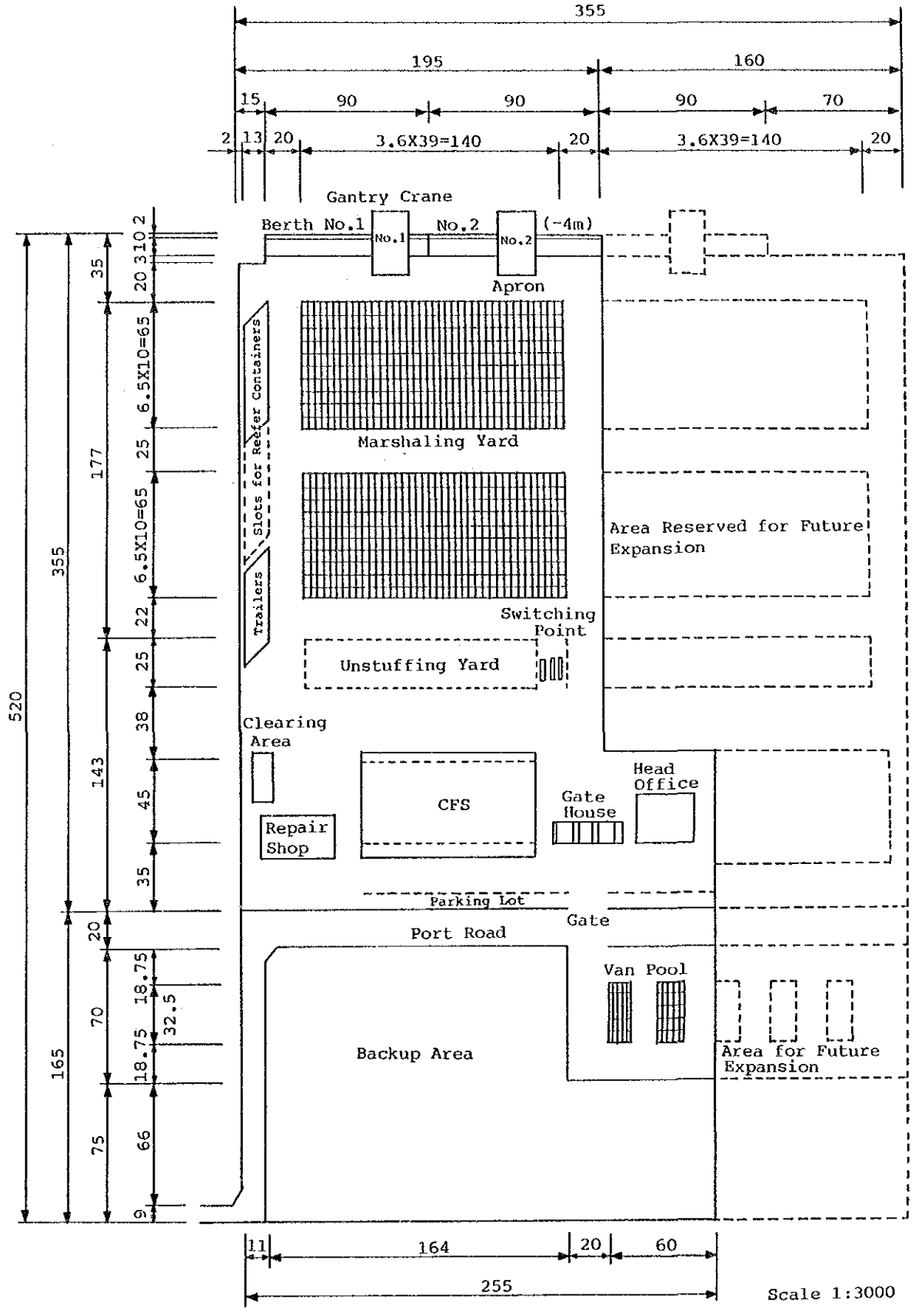

Fig. 2.2.1 Layout Plan of the Facilities of the Container Termainal for the Short-term Plan with the Target Year of 1995

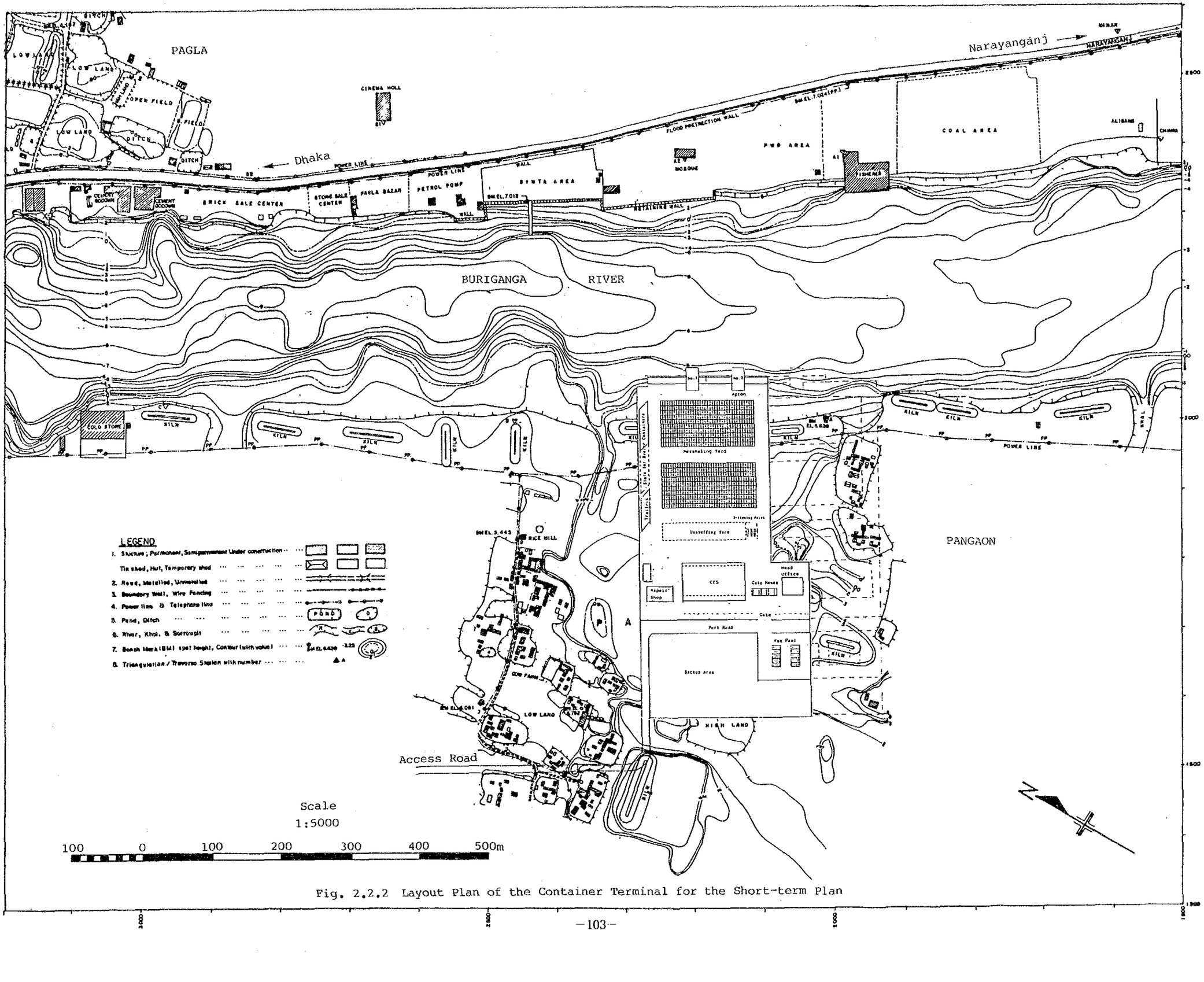

Fig. 2.2.2 Layout Plan of the Container Terminal for the Short-term Plan

2.3 Design, Construction and Cost Estimate

2.3.1 Design of Main Structures

(1) As stated in subsection 1.12.1, Paragraph (2), the Master Plan chose the open-type wharf supported on Cast-in-Site RC Pipe Piles as the most desirable structural type for the proposed wharf. It is showed that the double-deck open-type structure supported on in-situ concrete piles is more economical than the other structure such as steel pipe piles. Therefore, the double-deck open-type supported on in-situ concrete piles has been finally selected for the proposed wharf under the Master Plan.

(2) Pavements for Mashalling Yard and Roads, and Other Facilities

As well as for the wharf structure, the Short Term Plan makes provision for the same types of terminal facilities incorporating the same types of materials as those envisaged in the Master Plan.

2.3.2 Cargo Handling Equipment

The following cargo handling equipments are proposed for short-term development plan targeted for year 1995.

- gantry crane	2 nos	
- straddle carrier	5 nos	
- top lifters of 4.5t	2 nos	for empty container
- forklifts of 3t	10 nos	
- tractors	2 nos	
- trailers	6 nos	

2.3.3 Construction Plan and Cost Estimate

The schedule of the construction works is shown in Table 2.3.1.

The total cost based on exchange rates in September, 1995 is 1,578,725 thousand taka. The foreign currency portion is 680,910 thousand taka which is 43% of the total project cost in Table 2.3.2.

Table 2.3.3 shows the yearly investment plan for the short-term development plan according to the construction schedule.

Table 2.3.1 Construction Schedule for the Short-Term Development Plan

No	Description		Unit	Quantity	First Year												Second Year												Third Year												Fourth Year											
				Year / Month	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1	Construction Project	Preparation and Temporary Works	L.S	1																																																		
2		Pier	m	180																																																	
3		Revetment	m	195																																																	
4		Land Reclamation	m^3	1,116,000																																																	
5		Pavement of Marshalling Yard	m^2	34,515																																																	
6		Pavement of Port Road	m^2	32,985																																																	
7		Access Road	m	3,600																																																	
8		Container Freight Station	m^2	8,600																																																	
9		Head Office	m^2	2,200																																																	
10		Repair Shop	m^2	1,000																																																	
11		Fence & Lighting., etc	L.S	1																																																	
12		Installation of Handling Facilities	L.S	1																																																	
13	Engineering	Survey and Design	L.S	1																																																	
14		Construction Supervision	L.S	1																																																	

Embankment of Dyke

Improving Site Soils

Embankment of Access Road

Table 2.3.2 Project Cost of the Short-Term Development Plan

No	Name of Facility	Unit	Quantity	Construction Cost (¥1,000 Taka)				
				F.C	L.C	Sub-Total	Tax	Total
I	CIVIL WORKS							
1	Pier	m	180	39,443	93,697	133,140	10,031	143,171
2	Revetment	m	195	19,941	31,430	51,371	5,094	56,465
3	Land Reclamation	cu.m	1,116,000	39,122	108,721	147,843	0	147,843
4	Pavement of M-Yard	sq.m	34,515	17,110	40,866	57,976	23,510	81,486
5	Pavement of P-Road	sq.m	32,985	13,056	31,237	44,293	17,736	62,029
6	Embankment of A-Road	cu.m	406,000	10,658	19,631	30,289	0	30,289
7	Pavement of A-Road	sq.m	23,400	9,076	15,701	24,777	255	25,032
	Sub-Total			148,406	341,283	489,689	56,626	546,315
II	BUILDING							
1	C.F.S	sq.m	4,410	15,876	22,130	38,006	16,651	54,657
2	Head Office	sq.m	2,200	0	33,000	33,000	0	33,000
3	Repair Shop	sq.m	1,000	0	9,000	9,000	0	9,000
	Sub-Total			15,876	64,130	80,006	16,651	96,657
III	Utility							
	(I+II)× 20%	l.s	1	32,856	81,083	113,939	13,128	127,067
	Sub-Total			32,856	81,083	113,939	13,128	127,067
	Total (Direct Cost)			197,138	486,496	683,634	86,405	770,039
IV	ENGINEERING SERVICE	l.s	1	63,498	4,865	68,363	0	68,363
V	CONTINGENCY	l.s	1	26,064	49,136	75,200	0	75,200
	Total (Indirect Cost)			89,562	54,001	143,563	0	143,563
VI	HANDLING FACILITIES	l.s	1	394,521	0	394,521	234,102	628,623
VII	LAND-ACQUISITION	ha	30	0	37,500	37,500	0	37,500
	GRAND TOTAL			681,221	577,997	1,259,218	320,507	1,579,725

cf) Tax indicate only for foreign currency portion.

Table 2.3.3 Yearly Investment Plan

Unit: x1000 Taka

Item	Description	Unit	Quantity	Total Amount			First Year			Second Year			Third Year			Fourth Year		
				F.C	L.C	TOTAL	F.C	L.C	Sub-Total	F.C	L.C	Sub-Total	F.C	L.C	Sub-Total	F.C	L.C	Sub-Total
Civil Works	Pier & Revetment	m	195	74,509	125,127	199,636	0	0	0	23,220	31,613	54,833	20,813	34,912	55,725	30,476	58,602	89,078
	Landreclamation	cu.m	1,116,000	39,122	108,721	147,843	0	0	0	16,432	83,715	100,147	22,690	25,006	47,696	0	0	0
	Pavement of Marshalling Yard	sq.m	34,515	40,620	40,866	81,486	0	0	0	0	0	0	0	0	0	40,620	40,866	81,486
	Pavement of Port Road	sq.m	32,985	30,792	31,237	62,029	0	0	0	0	0	0	0	0	0	30,792	31,237	62,029
	Pavement of Access Road	sq.m	23,400	9,331	15,701	25,032	0	0	0	0	0	0	6,989	9,860	16,849	2,342	5,841	8,183
	Embankment of Access Road	cu.m	406,000	10,658	19,631	30,289	0	0	0	0	0	0	7,983	12,328	20,311	2,675	7,303	9,978
	Sub-Total			205,032	341,283	546,315	0	0	0	39,652	115,328	154,980	58,475	82,106	140,581	106,905	143,849	250,754
Building Works	Container Freight Station	sq.m	4,410	32,527	22,130	54,657	0	0	0	0	0	0	0	4,647	4,647	32,527	17,483	50,010
	Head Office	sq.m	2,200	0	33,000	33,000	0	0	0	0	0	0	0	6,930	6,930	0	26,070	26,070
	Repair Shop	sq.m	1,000	0	9,000	9,000	0	0	0	0	0	0	0	1,890	1,890	0	7,110	7,110
	Sub-Total			32,527	64,130	96,657	0	0	0	0	0	0	0	13,467	13,467	32,527	50,663	83,190
	Utility	l.s	1	45,984	81,083	127,067	0	0	0	0	0	0	0	0	0	45,984	81,083	127,067
	Total (Direct Cost)			283,543	486,496	770,039	0	0	0	39,652	115,328	154,980	58,475	95,573	154,048	185,416	275,595	461,011
	Engineering Service	l.s	1	63,498	4,865	68,363	30,730	0	30,730	14,354	1,153	15,507	10,107	956	11,063	8,307	2,756	11,063
	Contingency	l.s	1	26,064	49,136	75,200	0	0	0	11,488	11,648	23,136	10,915	9,653	20,568	3,661	27,835	31,496
	Total (Indirect Cost)			89,562	54,001	143,563	30,730	0	30,730	25,842	12,801	38,643	21,022	10,609	31,631	11,968	30,591	42,559
	Handling Equipments	l.s	1	628,623	0	628,623	0	0	0	0	0	0	0	0	0	628,623	0	628,623
	Land Acquisition	ha	30	0	37,500	37,500	0	0	0	0	37,500	37,500	0	0	0	0	0	0
	Total			628,623	37,500	666,123	0	0	0	0	37,500	37,500	0	0	0	628,623	0	628,623
	Grand Total			1,001,728	577,997	1,579,725	30,730	0	30,730	65,494	165,629	231,123	79,497	106,182	185,679	826,007	306,186	1,132,193

Amount of foreign portion include tax

2.4 Management and Operating Systems for Container Transport

2.4.1 Container Vessels

(1) Required number of Vessels

In 1995 ..... 4 vessels

In 2000 ..... 6 vessels

In 2005 ..... 6 vessels

(2) Operation

The greatest advantage of containerization is safe, quick and low-cost transportation of cargo from maker's factory to user's premises.

Nowadays, most international container carriers offer and carry out weekly service in order to meet the demands of their clients. Bangladesh shipping companies carrying containers to/from Dhaka container terminal must offer the "just-in-time service", other wise they will lose out in competition with the other inland transportation modes.

Therefore, planned cargo operations at the container terminal and planned navigation of the container vessels are required.

(3) Securing of container on board

The containers loaded in the holds of container vessels are automatically secured with cell guides provided in the holds, but other containers loaded on the vessel's hatch covers or weather decks should be secured by lashing or chocking using specially designed securing devices to prevent collapse of their piles due to ship's laboring during voyage.

(4) Management and operating systems

As mentioned in the Master Plan, the services of waterway transport will be confronted with severe competition from trucks and railways. Consequently, it is recommended that private shipping companies as well as public sector should manage and operate container vessels judging from inefficiency of public sector. Technical, financial or operational tie-up between foreign shipping companies operating main or feeder services of international container trade should also be considered.

2.4.2 Organization of the Container Terminal

The services of container waterway transport through this container terminal have to deal with severe competition from trucks and railways. It is desirable that more than one private company should take part in the operations of the terminal, especially entire cargo operations including planning and related documentation work. However, it may be difficult for private companies to fulfill the work in the early stage of container operations at the terminal. Consequently, it is recommended that the BIWTA manage and operate the terminal in the early stage and that the private sector should take part in the work as soon as possible.

In order to promote the privatization of container transport smoothly in the near future, the BIWTA must prevent anyone from having vested interests in management and operations.

It is strongly recommended that the organization managing and operating the terminal be independent of the existing departments or divisions of the BIWTA with respect to both finance and decision-making.

The number of employees required for the management and operations of the terminal is approximately 310.

2.4.3 Managing Systems of Port Facilities

Taking account of the systems in which the BIWTA manages and operates the terminal by itself and of the cargo volume handled in the port, a public-use system will be best for the management of the port facilities. However, in order to prevent congestion through cross-transport of containers inside the port, a preferential system must be adopted.

2.4.4 Cargo Handling Systems

All cargo handling will be carried out on a basis of two shifts. No cargo operations will be carried out on national holidays.

Planning of cargo operations must be done in advance in order to establish efficient and systematic cargo operations at the terminal.

2.4.5 Procedures and Information Processing

In order to prevent demurrage of cargo and inefficient management and operations in the terminal, it is strongly recommended that the procedures for container transport in the terminal be simplified and the formats and sizes of the documents be common among the concerned organizations as much as possible. And manuals for documentation should be prepared to prevent confusion.

It may not be necessary to introduce computers from the beginning of the yard operations, such as preparation for stowage and stacking plan and gate control, judging from the results of the cargo estimation. However, consideration should be given to be introducing computers in accounting and statistics work.

2.4.6 Training System

It is necessary to establish a training system for staff members and laborers in charge of management, operations, maintenance and repairs of the port facilities. It is also recommended that the BIWTA employ foreign experts and send trainees to developed countries.

2.4.7 Maintenance, Repair and Inspection of the Container Handling Equipment

Maintenance and inspection of the equipment are to be carried out in accordance with the manual, either periodically or in slack periods in order to keep the equipment in good order. Necessary spare parts are to be kept in the repair shop so that repair work can be carried out immediately.

2.4.8 Liability Insurance for the Container Terminal

In a vast container terminal, it is possible for the terminal operators or owners to damage a third party's personnel and property due to accident. This insurance should indemnity the insured (container terminal operators) against legal liability for damage in terms of bodily injury or property of any third party due to accidents arising from structural and

management defect of the facilities or from faults during extension of their business such as manufacturing, sales, service, etc., carried out outside/inside of the premises.

Container terminal operators or owners are indemnified by an insurance company by making a contract for a general liability insurance policy with special condition for premises, owners & tenants, liability.

2.4.9 Modernizing the Trading System

During the study, the study team learned that the delivery of cargoes between cargo owners and customs/port authority took a long time, such as more than one month.

This is preventing the development of trade in this country. This situation could be solved by enforcement of a time-limit system of customs clearance after application is made by cargo owners. Thus, it would be very simple to solve this problem.

However, the roots of this problem go deep. The study team makes some suggestion for modernizing the trading system of Bangladesh.

2.5 Economic Analysis

2.5.1 Purpose and Methodology of the Economic Analysis

The purpose of this chapter is to appraise the economic feasibility of the Short-term Plan for the Container Terminal at Dhaka Port explained in 2.2.

Thus, the basic purpose of this chapter is to investigate the economic benefits as well as the economic costs that will arise from the project, and to evaluate whether the net benefits exceed those which could be derived from other investment opportunities in Bangladesh (the opportunity cost of capital).

The economic internal rate of return (EIRR) based on cost-benefit analysis is used in order to appraise the feasibility of the project. In estimating the costs and benefits of the Short-term Plan of Container Terminal at Dhaka Port, "economic pricing" is applied. "Economic pricing" here means the appraisal of costs and benefits in terms of international prices (border prices).

2.5.2 Prerequisites of the Economic Analysis

(1) "With" Case

In an economic analysis, benefits are mainly brought about by improvements in productivity. In this study it is possible to improve productivity by construction of a container terminal at Dhaka Port and by building new container ships that will be operated between Chittagong and Dhaka and between Mongla and Dhaka.

(2) "Without" Case

A cost-benefit analysis is conducted on the difference between the "With" and "Without" investment cases. In this study, the following conditions are adopted as the "Without" Case after various possibilities are discussed:

1) No investment is made for this project.
2) The container cargo between Dhaka and the seaports in Bangladesh will be transported by rail and road.
3) The capacity of Kamalapur ICD for railway does not exceed the Fourth Five-Year Plan.

(3) Base Year and Project Life

It is assumed that the base year of this project is 1991.

The economic cost/benefit evaluation is carried out starting in 1991 and ending in 2025 (the 35 years from the engineering service starting year, 1991).

(4) Foreign Currency Exchange Rate

The exchange rate used in this study is as follows:

US $1 = TK 34.06 = ¥140.50(as of September 1990)

(5) Cargo Throughput

Under the "without" case, all container cargo will be transported by land transportation between Dhaka and Bangladesh's Seaports. Therefore, there is no-container cargo at the container terminal of Dhaka Port

The cargo throughput under the Without Case is shown in Table 2-5-1.

Table 2.5.1 Container Cargo through the "Without" Case

Case	Port	Year	Import				Export
			IWT	Railway	Road		Total
					Trailer	Truck	
			(1000 TEU)	(1000 TEU)	(1000 TEU)	(1000tons)	(1000 TEU)
With case	Chittagong	1995	28	17	0	320	-
		2000	46	35	21	258	-
	Mongla	1995	7	0	0	0	-
		2000	11	0	0	0	-
	Total	1995	34	17	0	320	76
		2000	57	35	21	258	134
Without case	Chittagong	1995	0	17	0	633	-
		2000	0	35	43	532	-
	Mongla	1995	0	0	0	73	-
		2000	0	0	0	122	-
	Total	1995	0	17	0	706	71
		2000	0	35	43	633	129

2.5.3 Economic Pricing

(1) Methodology

All the costs and benefits examined usually have been calculated based on domestic market prices. Thus, in this report, for tradable goods, the domestic market prices are changed to border prices by subtracting customs duty, development surcharge tax, sales tax, import permission fee and advanced income tax from the domestic market prices. For non-tradable goods and Labour costs, the market prices are changed to border prices using various conversion factors.

(2) Standard Conversion Factor (SCF)

In this report, the average SCF from 1982 to 1988 is adopted for the analysis.

The Standard Conversion Factor is calculated as 0.898.

(3) Conversion Factor for Consumption (CFC)

Due to the lack of required data, the Conversion Factor for Consumption cannot be directly calculated in this report. Thus, it is assumed to be 0.915, which is made by the data in 1984 because the most recent detailed data for working days of agriculture workers in Bangladesh is used from 1984.

(4) Conversion Factor for Labour

The conversion factor for skilled labour and unskilled labour are calculated as 0.915 and 0.713 respectively.

2.5.4 Benefit

(1) Benefit Items

As benefits brought about by the Short-term Plan of the container terminal at Dhaka Port, the following items are identified;

1 Savings on transportation costs of container cargo between Dhaka and Bangladesh's seaports.
2 Reduction in damage, accidents and pilferage.
3 Maintaining the transportation of container cargo during devastating floods.

4 Increase in employment opportunities.

5 Increase in income due to port-related industrialization.

6 Other intangible benefits.

It is difficult to evaluate some of the above-mentioned benefits (2-6) in strictly monetary terms.

In this report the first benefit (1) which can be evaluated monetarily is considered as a countable benefit.

(2) Savings on Transportation Costs of Container Cargo between Dhaka and Bangladesh's Seaports

1) General

The volume of container cargo for transportation between Dhaka and Bangladesh's seaports is increasing year by year.

At present, almost all container cargo are carried out loading to / stripping from container boxes at seaports area. However, a very small, percentage of container cargo volume are coming to and from Dhaka area by railway. Then, these almost container cargo is transported by truck.

In future, transportation of these loads will shift from trucks to container semi-trailers after the construction of bridges on the main roads between Dhaka and Bangladesh's seaports.

The major benefit of this project stems from the difference in transportation costs by road and by inland waterway between Dhaka and the seaports.

For rail transportation, the container throughput under the "without case" consists of the same number of containers as under the "with case" because it is assumed that the capacity of the Kamalapur ICD for railway will not exceed the capacity under the Forth Five Year Plan during the planning period of the Short-term plan.

The formula used to calculation this benefit is as follows:

Savings on the transportation costs	=	The different of the transportation costs between Dhaka and the seaports by road and by the IWT	×	The container throughput by the IWT under the "with case"

2) Operation cost by Transportation Mode

The operation costs of container transportation between Dhaka and Bangladesh's seaports by road and IWT at economic prices are estimated based on the calculation of these operation costs at financial prices in Chapter 9 of Part 1 and Chapter 1 of Part 2.

The results of the estimation are shown in Table 2.5.2.

Table 2.5.2 operation Cost by Economic Price

(Unit:1000 TK)

Year	With case				Without case				Benefit
	IWT	Truck	Trailer	Total	IWT	Truck	Trailer	Total	
1995	46.784	220.012	0	266.796	0	496.656	0	496.656	229.861
1996	46.784	212.857	18.316	277.957	0	511.475	37.833	549.308	271.351
1997	46.784	211.919	38.402	297.105	0	516.777	79.257	596.035	298.930
1998	58.494	205.996	62.240	326.730	0	511.864	128.355	640.219	313.488
1999	58.994	194.702	89.910	343.606	0	495.911	185.266	681.177	337.571
2000	58.698	177.727	121.460	357.886	0	468.264	250.066	718.331	360.445

3) Terminal Cost by Transportation Mode

The terminal costs of container transportation between Dhaka and Bangladesh's seaports by road and IWT at economic prices are estimated based on the calculation of those terminal costs at financial prices in the same chapter as mentioned in 2).

The terminal costs of each mode consists of the depreciation cost, maintenance cost, repair cost, operation cost and personnel cost.

The result of the estimation is shown in Table 2.5.3.

Table 2.5.3 *Terminal Cost at Economic Cost*

(Unit:1000 TK)

Year	With case				Without case				Benefit
	IWT	Trailer	Truck	Total	IWT	Trailer	Truck	Total	
1995	206.736	0	94.522	301.258	0	0	166.044	166.044	-135.214
1996	209.974	81.514	84.202	375.690	0	168.028	151.084	319.113	-56.577
1997	208.760	93.755	77.161	379.676	0	193.264	136.452	329.716	-49.960
1998	207.549	104.488	70.138	382.175	0	215.369	121.875	337.244	-44.931
1999	206.341	115.702	63.131	385.174	0	238.439	107.354	345.793	-39.380
2000	205.136	126.898	56.140	388.174	0	261.449	92.890	354.338	-33.836

4) Other costs

Other costs of each mode consists of the road transportation cost for the delivery and the receiving of container cargoes at the Dhaka area and road costs for the expansion and the maintenance. These costs are estimated in the same way as 2) and 3).

The results of the estimation are shown in Table 2.5.4.

Table 2.5.4 Other Case

(Unit:1000 TK)

Year	With case				Without case				Benefit
	IWT	Trailer	Truck	Total	IWT	Trailer	Truck	Total	
1995	45,147	0	50,559	95,706	0	0	103,609	103,609	7,904
1996	52,845	5,861	51,068	109,774	0	12,086	104,652	116,738	6,964
1997	58,424	12,374	51,134	121,933	0	25,501	104,789	130,290	8,357
1998	64,055	20,258	50,499	134,812	0	41,726	103,486	145,212	10,400
1999	69,697	29,667	49,056	148,420	0	61,071	100,528	161,599	13,179
2000	75,319	40,808	46,642	162,769	0	83,957	95,582	179,539	16,770

5) Benefits of This Project

The benefits of this project are calculated by summing up the results of the estimation from 1) to 4).

The benefits of this project are shown in Table 2.5.5.

Table 2.5.5 Calculation of the Benefits

(Unit:1000 TK)

Year	With case				Without case				Benefit
	IWT	Trailer	Truck	Total	IWT	Trailer	Truck	Total	
1995	298,666	0	365,093	663,759	0	0	766,310	766,310	102,550
1996	309,603	105,692	348,126	763,421	0	217,948	767,211	985,159	221,738
1997	313,968	144,530	340,215	798,713	0	298,023	758,018	1,056,041	257,327
1998	330,099	186,986	326,633	843,717	0	385,449	737,225	1,122,675	278,958
1999	335,032	235,279	306,888	877,199	0	484,775	703,794	1,188,569	311,370
2000	339,153	289,167	280,509	908,829	0	595,472	656,736	1,252,208	343,379

2.5.5 Costs

Construction, maintenance and operation costs as included in repair and administration costs for the container terminal at Dhaka Port are considered in this section.

(1) Construction Costs

Construction costs, estimated at domestic market prices, are shown in Chapter 3 of Part 2. These costs are divided into such categories as

tradable goods, non-tradable goods, skilled labour, unskilled labour and others.

The cost of tradable goods at financial prices are changed to economic prices by subtracting customs duty, development surcharge, sales tax, import permission fee and advanced income tax from the financial price.

The cost of non-tradable goods and others at financial prices are changed to border prices by multiplying by the standard conversion factor.

The cost of skilled labour and unskilled labour at financial prices are changed to economic prices by multiplying by the conversion factor for skilled labour and the conversion factor for unskilled labour, respectively.

The table 2.5.6. shows construction cost at economic prices.

Table 2.5.6 Summary of Investment for IWT Container Terminal at Dhaka (Economic Price)

(Unit: 1000TK)

Year	Reclam.	Wharf	M.yard	A.road	Building	Utility	Eng.fee	Contl.	H.equip.	Land	Total
1991	0	0	0	0	0	0	30,729	0	0	0	30,729
1992	72,400	44,891	0	0	0	0	15,389	21,948	0	33,675	188,303
1993	40,083	45,417	0	30,560	8,984	0	10,965	19,583	0	0	155,592
1994	0	74,597	94,812	13,607	47,374	227,525	10,782	28,657	394,524	0	891,877
1995											
1996											
1997											
1998											
1999									154,237		154,237
2000											0
2001											0
2002											0
2003											0
2004			94,812	44,167			13,469	13,930	154,237		320,616
2005											0
2006											0
2007											0
2008											0
2009									394,524		394,524
2010											0
2011											0
2012											0
2013											0
2014			94,812	44,167			13,469	13,930	154,237		320,616
2015											0
2016											0
2017											0
2018											0
2019									154,237		154,237
2020											0
2021											0
2022											0
2023											0
2024		164,375	94,812	44,167			29,400	30,406	394,524		757,684
2025											0

Note Reclam.: Reclamation
M.Yard:Marshalling Yard
A.Road:Access Road
Eng.fee:Engineering Fee
Contl.:Contingency
Handling Equipment
Land:Land Acquisition
Wharf:Whrf & Revetment

(2) Maintenance and Operation Costs

The main items of the operation costs of the container terminal are personnel, fuel and administration expenses.

The details of these items are mentioned in chapter 6.

The maintenance costs are assumed to consist of maintenance expenses for handling equipment and other depreciated assets.

These expenses are assumed to be a percentage of original procurement cost.

The former is 4 percent and the latter is 1 percent.

Table 2.5.7 shows the maintenance and operation cost of the container terminal at economic prices.

Table 2.5.7 Maintenance and Operation Cost for IWT Container Terminal at Economic Price

(Unit:1000 TK)

Item		Economic operation cost
Maintenance expenses	Handling equipments	15,781
	Others	8,383
	Total	24,164
Fuel expense		3,945
Personnel expenses	Officer(skilled) 120persons	5,819
	Staff(unskilled) 190persons	4,877
	Total	10,696
Administration expense		3,209
Total		42,014

2.5.6 Evaluation

(1) Calculation of the EIRR

The economic profitability of the project is evaluated in terms of the economic internal rate of return. The internal rate of return is a discount ratio satisfying the following equation:

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

Where, Bi: Benefit at i-th year
Ci: Cost at i-th year
r: Rate of discount
n: Period of Economic Calculation

From the result of calculation, the EIRR of this project is found to be approximately 14.7 percent.

(2) Sensitivity Tests

Sensitivity tests are made for 2 cases:

(a) Construction, Maintenance and Operation cost increases by 10%. (Case - 1)

(b) Cargo volume decreases by 10% (Case - 2)

The calculated EIRR is 12.97 percent for (a) and 12.55 percent for (b).

(3) Results

The opportunity cost of capital in developing countries ranges up to 8% or more are shown in Table 2.5.8.

It is a generally accepted criterion that a project with an EIRR of more than 8% is economically feasible. For this project, the EIRR of all cases exceeds 8%, hence, the project is considered justifiable.

Table 2.5.8 Opportunity Cost of Capital

Nation	Sector	IRR(%)
India	Manufacturing	10 - 12
Pakistan	Agriculture	10
	Manufacturing	10
Nepal	Transport	8
Egypt	Manufacturing	8
Sudan	Agriculture	8
Gambia	Transport	10
Solomon Is.	Forestry	8
Indonesia	Power	6
Jordan	Water Supply	8

Source: O.D.M., U.K., 1975

2.6 Financial Analysis

2.6.1 Purpose of the Analysis

The purpose of the financial analysis is to appraise the financial feasibility of the short-term development plan for the new container terminal. This analysis focuses on the viability of the project and the financial soundness of the terminal management body during the project life.

2.6.2 Methodology of the Financial Analysis

The viability of the project is analyzed using the Discount Cash Flow Method and appraised by the FIRR. The FIRR is a discount rate that makes the costs and the revenues during the project life equal.

The financial soundness of the organization is appraised based on its projected financial statements(Profit and Loss Statement, Cash Flow

Statement and Balance sheet). The appraisal is made from the viewpoints of profitability, loan repayment capacity and operational efficiency, using Rate of Return on Net Fixed Assets, Debt Service Coverage Ratio and Operating/Working Ratio, respectively.

2.6.3 Evaluation

(1) Viability of the Project

The FIRR of this project is 12.7% exceeding the weighted average interest rate of funds during the project life(11.5%).

(2) Financial Soundness of the Organization

1) Profitability

The rate of return on net fixed assets exceeds the average interest rate after 1998.

2) Loan Repayment Capacity

The debt service coverage ratios exceed 1 throughout the project life.

3) Operational Efficiency

Both the operating ratios and the working ratios constantly keep favorable levels.

2.6.4 Sensitivity Analysis

Sensitivity analysis is made for the following three cases:

Case I: The revenues decrease by 10%.
Case II: The project costs increase by 10%.
Case III:The revenues decrease by 10% and the project costs increase by 10%.

The ratio of each case is less than the lower limit.

2.6.5 Conclusion

Judging from the analysis, this project is financially feasible in the base case. However, it is recommended that the interest rate on the long-term loans from the government be kept less than 11.5% in order to ensure the competitive position of inland waterway container transport.

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