Table S-2 Breakdown of Rehabilitation Works

Calcutta (C08) Short-term Plan up to 1995 Unit: Million Rupees, 1988 prices

No.	Description		Q'ty	Local currency			Foreign currency	Total:Equivalent Amount	Labour Fee				Material/Equipment			etc.	Note
				(A)	Tax (B)	Total (C)	(D)	(H+L+M) & (C+D)	Un-skilled (F)	Skilled (G)	-do- F.(G')	Total:H F+G+G'	Imported (J)	Local (K)	Total (J+K=L)		
1)	Pavement :		sq.m														Reffer Chapter 13-4-1
	G1 Heavy Cargo		4,000	1.7		1.7	0.3	2.0	0.1	0.1	0.3	0.5		1.3	1.3	0.2	
	G2 Containers		80,000	29.0		28.0	3.0	32.0	3.0	2.0	3.0	8.0		20.0	20.0	4.0	
	G3 Break Bulk		390,000	87.8		87.8	9.7	97.5	10.3	10.0	9.7	30.0		55.0	55.0	12.5	
	G4 Car Park		30,000	5.4		5.4	0.6	6.0	0.8	0.4	0.8	1.8		3.0	3.0	1.2	
	G5 Undisposed Materials		8,000	2.3		2.3	0.4	2.7	0.2	0.2	0.4	0.8		1.6	1.6	0.3	
	Sub-total		513,000	126.2		126.2	14.0	140.2	14.4	12.7	14.0	41.1		80.9	80.9	18.2	
2)	Quarters/Fence & Demolish works		LS	13.5		13.5	1.5	15.0	2.0	1.0	1.5	4.5		7.5	7.5	3.0	50 quarters, 1,300m fences, 35,000 sq.m demolish area etc.
3)	Fender System &		24sets	22.2	19.8	42.0	28.0	70.0	1.0	1.0	6.0	8.0	41.8	12.0	53.8	8.2	Imported rubber fenders at critical berth's corners, with 9 sets of fenders each
	NSD/KPD Approach Jetty		LS														
4)	Communucation/Computer		1 set	20.0		20.0		20.0						20.0	20.0		including wireless phone,
5)	Dock Gate		1 set	8.5	9.0	17.5	12.5	30.0	1.5	1.0	2.5	5.0	19.0	4.0	23.0	2.0	Oil hydraulic system
6)	Replacement of existing rail		52 km	36.0		36.0	4.0	40.0	5.0	3.0	4.0	12.0		24.0	24.0	4.0	
7)	Reinforcement of NSD No.5 Berth			13.5		13.5	1.5	15.0	1.2		1.5	2.7		11.8	11.8	0.5	At apron area for CTN handling
8)	Modernization of Work-shop			5.0		5.0		5.0						5.0	5.0		
	Total			244.9	28.8	273.7	61.5	335.2	25.1	18.7	28.5	73.3	60.8	185.2	226.0	35.9	

[Remarks] 1) Item-1 : Total port area of Calcutta is about 5 million sq.m (2 km by 2.5 km). The area covered by item-1 is about 12 % of the total area. This work is necessary for smooth traffic movement of cargo handling equipment to increase the productivity of the port.
2) Item-3 including renovation of KPD & NSD approach jetty.
3) Item-5 not included replacement of existing floating caisson gate. The detailed study shall be down for this matter beforehand.

8th Revision/19890914

Table S-3 Breakdown of Yard Works

Haldia (H08) — Short-term Plan up to 1995 — Unit: Million Rupees 1988 prices

No.	Description		Q'ty	Local currency			Foreign currency	Total:Amount (H+L+M) & (C+D)	Labour Fee				Material/Equipment			etc.	Note
				(A)	Tax (B)	Total (C)	(D)		Un-skilled (F)	Skilled (G)	-do- F.(G')	Total:H F+G+G'	Imported (J)	Local (K)	Total (J+K=L)	(M)	
A	Container Yard 1) CFS		1 set	14.6	1.8	16.4	3.4	19.8	3.0	1.8	1.4	6.0	3.8	8.4	10.2	3.8	5,800 sq.m
	2) Pavement		125,000 sq.m	37.4		37.4	3.8	41.2	5.5	3.2	3.8	12.5		22.5	22.5	6.25	Container : 350m by 200m Multi : 250m by 220m
	3) Soil improvement		125,000 sq.m	31.8	4.5	36.3	11.2	47.5	3.5	2.8	6.2	12.5	9.5	9.3	18.8	16.2	Sand piles
	4) Lighting		4 berths	40.0		40.0	4.0	44.0	5.0	3.0	4.0	12.0		20.0	20.0	12.0	Including exist. 2 berths
	5) A D Building	1,200 sq.m	1 set	6.0		6.0		6.0	1.2	0.6		1.8		3.6	3.6	0.6	5 floors including workshop, canteen etc.
	6) Computer etc.		1 set	9.8		9.8	0.2	10,0	0.7	0.3	0.2	1.2		8.0	8.0	0.8	
B	Truck Terminal		20,000 sq.m	5.0		5.0		5.0	1.0	0.5		1.5		3.0	3.0	0.5	
C	Quarters		228	30.0		30.0		30.0	6.0	4.0		10.0		15.0	15.0	5.0	
	Total			174.6	6.3	180.9	22.6	203.5	25.9	16.0	15.6	57.5	13.3	87.8	101.1	44.9	

[Remarks]

4th Revision/19880628

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Table S-4 Breakdown of CHANNEL NAVIGATION SYSTEM

ALTERNATIVE-Plan 4

Calcutta/Haldia (CH1) Short-term Plan up to 1995 Unit: Million Rupees 1988 prices

No.	Description		Q'ty	Local currency			Foreign currency	Total:E Amount (H+L+M) & (C+D)	Labour Fee				Material/Equipment			etc.	Note
				(A)	Tax (B)	Total (C)	(D)		Un-skilled (F)	Skilled (G)	-do- F.(G')	Total:H F+G+G'	Imported (J)	Local (K)	Total (J+K=L)	(M)	
A	Replacement of Pilot Station Vessel																Exist. 1,000 GT
B																	
C	Tug-Boats	200GT	2	4.0		4.0	62.0	66.0	0.5	0.5	2.0	3.0	60.0	1.0	61.0	2.0	1,800 ps
D	Pilot Station 1) Building		500sq.m	2.5		2.5	0.5	3.0	0.3	0.2	0.5	1.0		1.5	1.5	0.5	with subsidiaries
	2) Basin & Pontoon for pilot boats			25.5	4.5	30.0	10.0	40.0	7.0	3.0	5.0	15.0	8.5	10.5	20.0	5.0	
	3) Car for pilots		2	0.6		0.6		0.6						0.6	0.6		
	Sub-total			28.6	4.5	33.1	10.5	43.6	7.3	3.2	5.5	16.0	9.5	12.6	22.1	5.5	
E	Navigation Aids : Lower Traffic Lanes 1) Beacon		4 sets	0.9	4.1	5.0	5.5	10.5	0.3	0.2	1.0	1.5	8.6	0.1	8.7	0.3	on Light Vessels
	2) Light Buoy		12 uniits	1.2	10.8	12.0	13.0	25.0	0.3	0.2	1.0	1.5	22.8	0.2	23.0	0.5	High wave type
	Sub-total			2.1	14.9	17.0	18.5	35.5	0.6	0.4	2.0	3.0	31.4	0.3	31.7	0.8	
F	Buoys at anchorage			0.8	3.6	4.5	4.5	8.0	0.2	0.1	0.5	0.8	7.6	0.4	8.0	0.2	
G	Traffic control system 1) Communication system			1.3	18.7	20.0	22.0	42.0	0.2	0.1	1.2	1.5	39.5	0.5	40.0	0.5	
	2) Tower for antennas			0.7	3.0	3.7	4.3	8.0	0.2	0.1	1.0	1.3	6.3	0.2	6.5	0.2	
	Sub-total			2.0	21.7	23.7	26.3	50.0	0.4	0.2	2.2	2.8	45.8	0.7	46.5	0.7	
H	Wave Protection		1 set	11.9		11.9	1.2	13.1	1.5	1.3	1.2	4.0		7.0	7.0	2.1	At exist.tower sides, Sagor
	Total			49.5	44.7	94.2	123	217.2	10.5	5.7	13.4	28.6	154.3	22	176.3	11.3	

[Remarks] 1) Quantity & Amount of Item C to F are same as Plan-3.

7th Revision/890804

Table S-5C Breakdown of HANDLING EQUIPMENT

⇒ Calcutta/Haldia — Short-term Plan up to 1995 — Unit: Million Rupees 1988 prices

No.	Description		Q'ty	Local currency (A)	Tax (B)	Total (C)	Foreign currency (D)	Total:Amount (H+L+M) & (C+D)	Labour Fee: Un-skilled (F)	Skilled (G)	-do- F.(G')	Total:HF+G+G'	Material/Equipment: Imported (J)	Local (K)	Total (J+K=L)	etc. (M)	Note
01c	Fork-lift	2.0t	(30)														to be charged by CPT own
																	by ADB
02c	-do-	3 t	63	(31.5)		(31.5)		(31.5)						(31.5)	(31.5)		to be charged by CPT own
03c	-do-	5 t	19	15.2		15.2		15.2						15.2	15.2		
04c	-do-	10 t	1	2.0		2.0		2.0						2.0	2.0		
05c	-do-	45 t	1	14.0		14.0		14.0						14.0	14.0		
	Sub-total			31.2		31.2		31.2						31.2	31.2		
06c	Mobile Crane	10 t	4	16.0		16.0		16.0						16.0	16.0		
07c	-do-	18 t	5	22.5		22.5		22.5						22.5	22.5		
08c	-do-	30 t	3	18.0		18.0		18.0						18.0	18.0		
09c	-do-	45 t	2	20.0		20.0		20.0						20.0	20.0		
	Sub-total			76.5		76.5		76.5						76.5	76.5		
10c	Chassis	20'	18	3.6		3.6		3.6						3.6	3.6		
11c	-do-	40'	15	6.0		6.0		6.0						6.0	6.0		
	Sub-total			9.6		9.6		9.6						9.6	9.6		
12c	Tractor		8	8.4		8.4		8.4						8.4	8.4		
13c	Truck-scale	50 t															
14c	Yard Crane	30 t	1 set	22.0		22.0		22.0						21.5	21.5	0.5	Between Berth No.28 & 29
		20 t	1 set	18.0		18.0		18.0						17.5	17.5	0.5	Between Berth No.27 & 28
	Sub-total			40.0		40.0		40.0						39.0	39.0	1.0	
21c	Transfer Crane (Rubber)		9	108.0		108.0		108.0						108.0	108.0		
22c	Shore Crane																Schedule in M/P
23c	-do- (Fertilizer)		3 set	60.0		60.0		60.0						57.0	57.0	3.0	At NSD A & B
	Total (Calcutta)			331.7		331.7		331.7						326.2	326.2	5.5	
				(31.5)		(31.5)		(31.5)						(31.5)	(31.5)		

[Remarks] 1) No foreign portion & import duty. All the equipment listed above shall be procured locally.

8th Revision/19890919

Table S-5H Breakdown of HANDLING EQUIPMENT

Calcutta/Haldia — Short-term Plan up to 1995 — Unit: Million Rupees 1988 prices

No.	Description		Q'ty	Local currency			Foreign currency (D)	Total:Amount (H+L+M) & (C+D)	Labour Fee				Material/Equipment			etc. (M)	Note
				(A)	Tax (B)	Total (C)			Un-skilled (F)	Skilled (G)	-do- F.(G')	Total:H F+G+G'	Imported (J)	Local (K)	Total (J+K=L)		
01h	Fork-lift	2.0 t	18	(6.4)		(6.4)		(6.4)						(6.4)	(6.4)		to be charged by CPT own
02h		3 t	14	(7.0)		(7.0)		(7.0)						(7.0)	(7.0)		8 nos for CTN,5 nos for G/C
03h		5 t	1	0.8		0.8		0.8						0.8	0.8		
05h		45 t	1	14.0		14.0		14.0						14.0	14.0		
	Sub-total			14.8		14.8		14.8						14.8	14.8		
				(13.4)		(13.4)		(13.4)						(13.4)	(13.4)		
06h	Mobile Crane	10 t	1	4.0		4.0		4.0						4.0	4.0		for G/C
07h		16 t	1	4.5		4.5		4.5						4.5	4.5		
08h		30 t	1	6.0		6.0		6.0						6.0	6.0		
09h		45 t															
	Sub-total			14.5		14.5		14.5						14.5	14.5		
10h	Chassis	20'	23	4.6		4.6		4.6						4.6	4.6		
11h		40'	20	8.0		8.0		8.0						8.0	8.0		
	Sub-total			12.6		12.6		12.6						12.6	12.6		
12h	Tractor		20	16.0		16.0		16.0						16.0	16.0		
13h	Truck-scale	50 t	2	1.68	2.38	4.06	2.94	7.0	0.1	0.1	0.3	0.5	5.02	0.98	6.0	0.5	
14h	Boulder Removal equipment		1	18.5		18.5	1.5	20.0	1.0	0.5	1.5	3.0		16.0	16.0	1.0	
15h	Stacker/Reclaimer																Schedule in 9th plan
16h	Belt-conveyor																
17h	Watering facility		1	10.0		10.0		10.0						10.0	10.0		
18h	Unloader,Stacker/Reclaimer							[424.0]									for coking coal by SAIL
19h	Belt-conveyor	1,400t/h	1,800m					[82.0]									-do-
20h	Tripper							[2.2]									-do- loader for wagons
21h	Quay Crane		3	8.8	131.2	140	148.0	289.0	3.0	1.8	3.2	8.0	277.0	2.0	278.0	2.0	for container
22h	Transfer Crane (Rubber)		9	108.0		108.0		108.0						108.0	108.0		
	Total(Haldia)			204.9 (13.4)	133.8	338.5 (13.4)	153.4	491.9 (13.4)	4.1	2.4	5.0	11.5	282.0	184.9 (13.4)	478.9 (13.4)	3.5	10th Revision/18890913

Table S-6C Breakdown of PORT SERVICE VESSELS

Calcutta(C14) Short-term Plan up to 1995 Unit: Million Rupees 1988 prices

No.	Description	Capacity	Q'ty	Local currency			Foreign currency (D)	Total:E Amount (H+L+M) & (C+D)	Labour Fee				Material/Equipment			etc. (M)	Note
				(A)	Tax (B)	Total (C)			Un-skilled (F)	Skilled (G)	-do- F.(G')	Total:H F+G+G'	Imported (J)	Local (K)	Total (J+K=L)		
01c	Grab Dredger	750 cu.m	1 unit	2.0		2.0	33.0	35.0		0.5	1.0	1.5	32	1.0	33.0	0.5	with hoppers , self-propelled
02c	Tug-Boat	2,500ps 37t B/P	2	4.0		4.0	82.0	86.0	1.0	1.0	2.0	4.0	80.0	1.0	81.0	1.0	360 degree steerable nozzle propeller(4 blades fixed pitch)
03c	River Survey Launch		2	12		12		12						12	12		
04c	Pilot/Harbor/Dock Launch		3	18		18		18						18	18		
05c	Floating Crane	150 t															Non-propellar, fixed type Schedule in M/P
06c	-do-	60 t	1	1.5		1.5	35.5	37.0	0.3	0.4	1	1.7	34.5	0.5	35	0.3	Self-Propelled, swing type
07c	Multi-purpose ship		2	6.2 1.8		8.2 1.8	74 0	80.2 1.8	0.4 0.6	0.4 0.6	2 0	2.8 1.2	72 0	3.2 0.8	75.2 0.8	2.2 -0.2	Misc. items
				8.0		8.0	74	82.0	1.0	1.0	2	4.0	72	4.0	76.0	2.0	Sub-total
	Total(Calcutta)			45.5		45.5	224.5	270.0	2.3	2.8	8.0	11.2	218.5	36.5	255.0	3.8	

[Remarks] 1) No import duty for the floating equipment.

13th Revision/880925

Table S-6H Breakdown of PORT SERVICE VESSELS

Haldia(H18) Short-term Plan up to 1995 Unit: Million Rupees 1988 prices

No.	Description	Capacity	Q'ty	Local currency			Foreign currency (D)	Total:Amount (H+L+M) & (C+D)	Labour Fee				Material/Equipment			etc. (M)	Note
				(A)	Tax (B)	Total (C)			Un-skilled (F)	Skilled (G)	-do- F.(G')	Total:H F+G+G'	Imported (J)	Local (K)	Total (J+K=L)		
01h	Hopper Dredger	1,700 cu.m	1	2.2		2.2	305.0	307.2		1.0	3.0	4.0	302		302	1.2	
02h	Grab Dredger	750 cu.m	1 unit	2.0		2.0	33.0	35.0		0.5	1.0	1.5	32	1.0	33.0	0.5	with hoppers , self-propelled
03h	Tug-boat	2,500ps 37t B/P	3	6.0		6.0	123.0	129.0	1.5	1.5	3.0	6.0	120.0	1.5	121.5	1.5	360 degree steerable nozzle propeller(4 blades fixed pitch)
04h	Floating Crane	60 t	1	1.2		1.2	13.8	15.0	0.2	0.2	0.3	0.7	13.5	0.5	14.0	0.3	Multi-use for containers Non-propellar, fixed type
07h	Multi-purpose ship		1	3.1		3.1	37.0	40.1	0.2	0.2	1.0	1.4	36	1.8	37.8	1.1	
	Total(Haldia)			14.5		14.5	511.8	526.3	1.9	3.4	8.3	13.6	503.5	4.6	508.1	4.6	

[Remarks] 1) No import duty for the floating equipment.

11th Revision/890919

Chapter 14 Recommendations on Port Management and Operations

14-1 Realization of the Functional Allocation

Based on the analysis of the functional allocation between Calcutta and Haldia, It is recommended by the Team that a full-fledged container terminal should be established at Haldia in order to make Haldia more attractive for future container traffic.

The following points would be advisable from the viewpoint of the port management and operations so as to realize this recommendation;

1) to establish an autonomous operating unit which has entire responsibility for container handling operations throughout the Haldia Container Terminal (hereinafter referred as HCT),
2) to secure a reliable telecommunication system within the Haldia Dock System and between Haldia and Calcutta, and
3) to install a computer-based container handling system at HCT.

14-1-1 Autonomous Operating Unit

Establishment of an autonomous unit for the container handling operation would be advisable in order to realise the following points;

1) to maximize the utilization of the container terminal, and
2) to meet the port users' requirements which are particularly requested at Haldia.

Regarding the general concept of the container terminal, it is basically designed on the assumption that various sections of the terminal such as the Gate, the Yard Operation and the Loading/Unloading Operations would function systematically as a whole. For export containers, for instance, the location at the CY will be indicated when they are received at the Gate, so the vessel-wise location of export containers at the CY should be decided before receiving the containers. Therefore, the calling schedule of the loading vessel and her stowage plan have to be confirmed in advance, and so on. In other words, the efficiency of the container terminal entirely depends on the smooth information-exchange among the sections concerned.

Taking into consideration the huge amount of investment, establishment of an autonomous unit for container handling operation would be recommended in order to maximize the full utilization of the full-fledged HCT.

In addition to this, the present situation that the stevedoring works are conducted by the port workers themselves at Haldia will make it easier for the port to establish an autonomous unit which can cover even the arrangement and implementation of on-board operations by itself smoothly.

Regarding port users' requirements, the shortage of the appropriate software required for container handling at Haldia was stressed by the shipping wing. The disadvantage of Haldia compared with Calcutta is that there is not enough banking and commercial infrastructure including shipping agents and clearing/fowarding agents. If HCT can cover the area of these agents to the greatest possible extent such as empty container control and container inventory information, the disadvantages of Haldia could be overcome.

The functions of the container terminal which would be covered by HCT are summarized as follows;

1) Yard Operation : Yard Stacking, In-yard Movement, CFS Container Control
2) Gate Operation : Receiving/Delivery, Damage Check, Weight Check
3) Loading/Unloading Operation : Stowage Planning, Equipment Deployment
4) CFS Operation : Receiving/Delivery of LCL Cargo, Stuffing/Unstuffing

The following functions would be taken into consideration from the viewpoint of port users' convenience in the future.

5) Maintenance : Repair, Cleaning of Containers

In order to implement the functions above, it is necessary to keep close contact with shipping companies or their agents to gain the necessary information such as sailing schedule, stowage plan, bookling list, etc., and for this purpose, a reliable communication system between Haldia and Calcutta should be secured.

The basic organization structure should best be established based on the concept that the purpose of the container terminal is to maintain

smooth container movement for port users, and from this point of view, the operators of equipment should be under the control of the traffic section in order to maintain the smooth flow of operational directions.

14-1-2 Reliable Telecommunication System

Establishment of a reliable telecommunication system should be taken into consideration as follows;

1) VHF system inside the terminal
2) Strengthening of internal telecommunication system in the Haldia Dock System, and
3) Exclusive telecommunication and data communication linkage between Haldia and Calcutta.

Regarding item 1) above, smooth flow of containers inside the terminal demands the smooth transmission of information between equipment operators such as gantry cranes, transfer cranes, tractors and the Terminal Control Section. Therefore, installation of a VHF system in the terminal is necessary for this purpose.

Regarding item 2) above, The Port of Felixstowe, for instance, provided an internal telephone system for use by the dock company, port users and service companies with the installation of over 1,200 lines. An advantage of the service is mentioned that after initial connection and yearly rental charges all internal telephone calls are free of charges.

So for as telecommunication is concerned, the Government of India is giving high priority to its Telecommunications Project especially at Calcutta, Bombay, Madras and Delhi using the foreign assistance of OECF and IBRD, etc. Therefore, the telecommunication system in the Calcutta metropolitan area is expected to be improved remarkablely in the near future.

In addition to this, strengthening of telecommunication system between Calcutta and Haldia should also be given high priority taking into consideration that Haldia has been developed as the satellite region for Calcutta in order to resolve the urban congestion of the city and the telecommunication system between the two cities is the lifeline of the further development of Haldia including the port development.

14-1-3 Computer System

It is generally said that a computer based container handling system should be introduced when the cargo volume of the container terminal exceeds 60,000 TEUs per year. According to the demand forecast, the cargo volume of HCT will reach the amount of 60,000 TEUs in 1995.

Therefore, installation of a computer based container handling system at Haldia should be implemented during the Short Term development Plan including the period of running a trial.

The purposes of the installation of a computer based container handling system at HCT is not only to make efficient utilization of the terminal facilities but also to meet the port users' demand that an appropriate software required for container handling should be established at Haldia.

Taking such demand of port users into consideration, establishment of a data transmission office connected with the HCT by an on-line real time computer system in Calcutta Head Office would be recommended provided that necessary data communication system between Calcutta and Haldia will be developed in the near future. The function of this office are as follows;

1) to receive the necessary information mentioned earlier form the parties concerned and transmit them to HCT, and
2) to provide the necessary information such as the container inventory report and bills of port charges to port users at Calcutta.

14-1-4 Concessions

According to the Scale of Rates of CPT, the following concessions are given to the port users at Haldia in order to draw more container traffic to the port.

Table 14-1-1 Container Concessions

TEUs per Voyage	Concession
151 to 300	5 %
301 to 600	10 %
over 600	15 %

So far as liner shipping services are concerned, Shipping companies generally maintain their services as scheduled. It means, in other words, that they are sometimes forced to operate their liner vessels regularly even though the cargo volume is much lower than the vessel's loading capacity. Therefore, the concessions based on TEUs per voyage would not be so attractive to the shipping companies.

It would be advisable to shift the above concessions to a TEUs per annum base instead of a per voyage base taking into consideration that the main calling frequency of container vessels at Haldia is by-monthly at present.

14-2 Others

(1) Standardization

At present, the development of the container park is on-going at D NSD and a on-line computerised system is to be installed in the container park. However, the present format of the documents such as the Jetty Challan seems not to suit the smooth flow of port procedures. The UNLK (United Nations Layout Key) which is the standard form used for the design of trade related documents are widely used in the world and many trade documents including the Bill of Lading have been designed based on the UNLK in order to simplify the process of making various documents by "One Run Method". Therefore, it would be recommendable to design the port related documents based on the UNLK so as to match the format with the documents which are generally used by the port related parties.

The introduction of a computerised system requires the coding of various items such as names of countries and ports, types of cargo, package etc..

In this regards, it would be recommended to utilized the international standard codes such as the Codes for Representation of Names of Countries by the United Nations taking into consideration the future possibility of the national and international linkage of the on-line computerised information systems each other. The form of the UNLK is attached in Appendix 14.

(2) Tariff Structure

The responsibility of a shipping company for the break bulk general cargo has historically limited at the hook-point, i.e. "Tackle to Tackle" base. However, the development of containerisation has changed this traditional principle and a shipping company has become to be responsible to shippers for the delivery/receiving of containers at the points of the CY/CFS instead of the hook-point and all the charges from the quay to the CY/CFS and vise versa are charged to shippers as the terminal handling charges including the demurrage of LCL cargo. Therefore, it is possible for the port to collect the charges relating to the cargo handling operation done by the port from a shipping company or it's agent.

Taking into consideration the tendency above, it is preferable for the port to review the tariff structure for containers from the viewpoint of

simplification of port procedures provided that such container rules can be established by shipping companies.

Regarding the wharfage on containers at Calcutta Dock System, the wharfage on the box and on the containerized cargo are levyed sepalately at present. From the viewpoint of simplification of port procedures, the unit rate applicable to containers including both the wharfage on the box and the containerized cargo should also be examined.

In the case of shipping companies, the freight per TEU called Freight All Kind (FAK) is applicable to FCL containers irrespective of the kind of the contents. On the other hand, the rates for LCL cargo are determined based on the tonnage of the cargo.

(3) Establishment of Marketing Department

There is no independent department which has responsibility of cargo marketing in CPT at present. The purposes of establishment of the marketing department can be mentioned from the external and internal points of view.

From the external point of view, the purposes of th department are to collect the information of port users' requirements and to advertize them the advantages of the port and to develop the new customers.

From the internal point of view, the department can function as an advisory organization to other departments from the viewpoint of convenience of port users based on the collected information of the customers requirements and such a cross-departmental function can vilatize the activities of CPT as a whole.

Chapter 15 Economic Analysis

15-1 Purpose and Methodology of the Economic Analysis

15-1-1 Purpose

The purpose of this chapter is to appraise the economic feasibility of the Short-term Plan of Calcutta/Haldia dock system explained in Chapter 12.

The economic evaluation of a project should show whether the project is justifiable from the economic point of view by assessing its contribution to the national economy.

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

15-1-2 Methodology

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 Calcutta/Haldia dock system, "economic pricing" is applied. "Economic pricing" here means the appraisal of costs and benefits in terms of international prices (border prices). Fig. 15-1-1 shows the process of the economic analysis in this study.

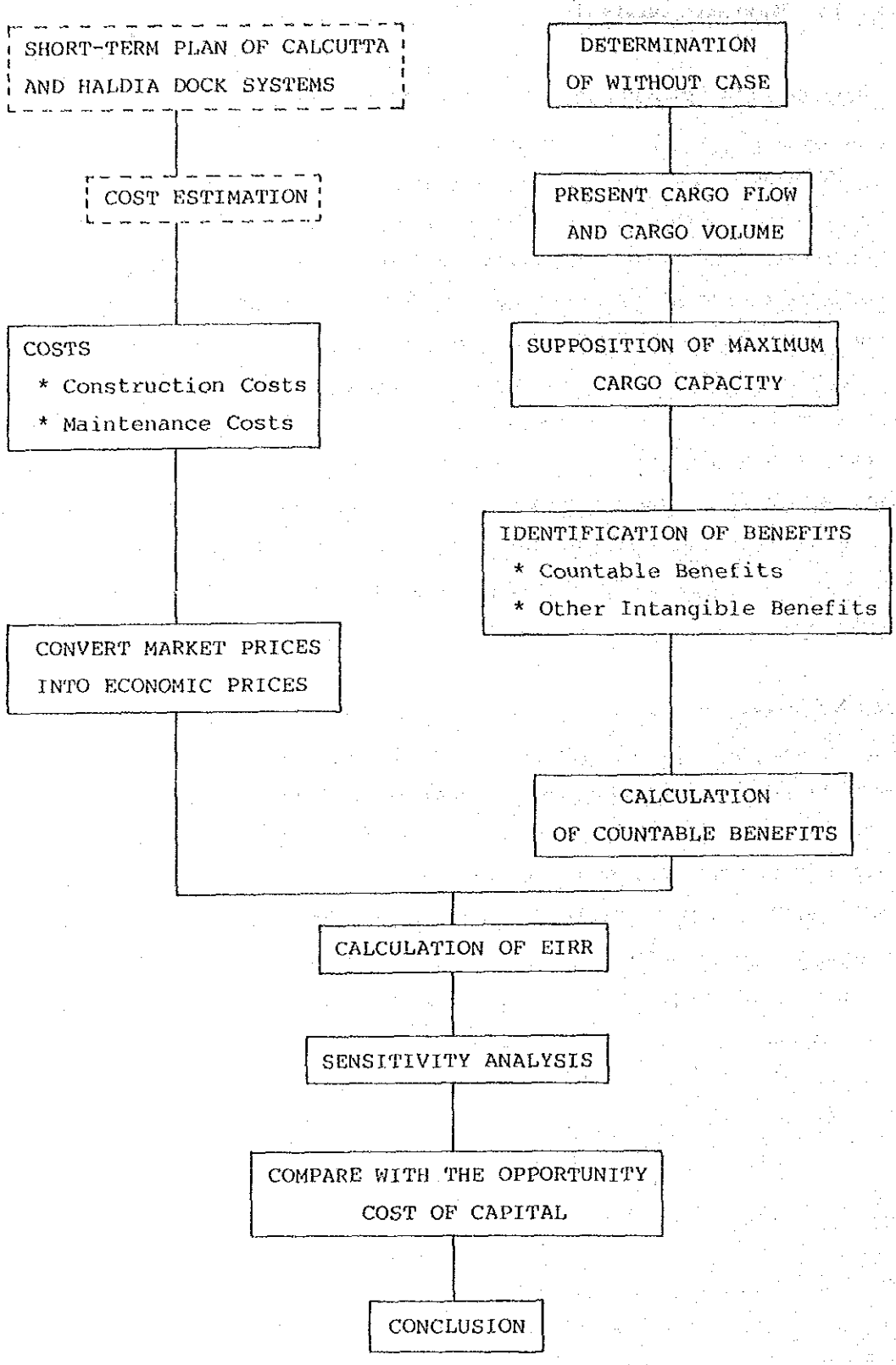


Fig. 15-1-1 Process of the Economic Analysis

15-2 Prerequisites of the Economic Analysis

15-2-1 "With" Case

Benefit of economic analysis is mainly brought about by improvement of productivity. In this study it is possible to improve productivity by establishment of cargo handling equipment, development of yard and berth, training of workers and so on. Therefore we assume that all improvement of productivity is the result of "With" case.

15-2-2 "Without" Case

A cost-benefit analysis is conducted on the difference between the "With" and "Without" investment cases. In other words, incremental benefits and costs arising from the proposed investment are compared, and it is examined whether or not the net benefits generated by the project exceed the opportunity cost of capital in the India. Therefore, determining the "Without" case is one of the key points of the economic appraisal. In this study, the following conditions are adopted as the "Without" Case after various possibilities are discussed.

1) The "Without" case is based on existing facilities and operational efficiency levels.
2) No investment is to be made except a), b) and c) as follows.
   a) Facilities under construction such as CPT projects financed by OECF and ADB etc loans are considered as part of the existing facilities.
   b) Because of insufficient past maintenance, the existing facilities and operational levels are not at a normal or sound level. So, the minimum investment should be made recover the soundness of these facilities.
   c) Minimum maintenance to keep the existing facilities and operational efficiency levels.

15-2-3 Base Year

The "base year" here means the starting year of the economic evaluation, and therefore the year of 1990 is set as the base year for this study.

15-2-4 Project Life

The economic service life of the main facilities, that is, large cargo handling equipments such as gantry crane, transfer crane are 25 years.

Therefore the economic cost/benefit evaluation is carried out starting in 1990/91 and ending 2019/20 (the 30th year from the engineering service starting year, 1990/91)

15-2-5 Foreign Currency Exchange Rate

The exchange rate used in this study is as follows:

US $ 1 = Rs 13.50 (as of July 1988)

15-3 Benefit

15-3-1 Benefit Items

As benefits brought about by the Short-term Plan of Calcutta and Haldia Dock Systems, the following items are identified;

1 Savings in ships' staying costs.
2 Savings in time costs.
3 Savings in cargo handling costs.
4 Reduction in damages, accidents and pilferage.
5 Improvement of cargo handling safety.
6 Increase in employment opportunities
7 Promotion of regional economic development through development of port-related industries and agriculture.
8 Other intangible benefits.

Some of the above-mentioned benefits (4 - 8) are difficult to be evaluated in strictly monetary terms.

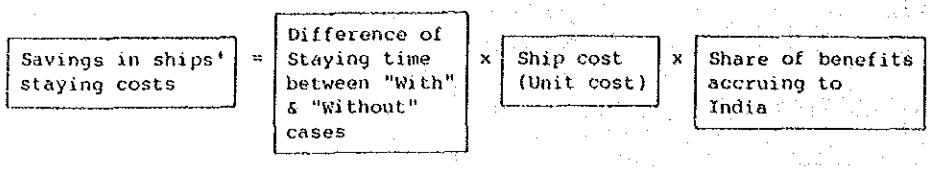
In this report the two benefits (1 - 2) which can be evaluated monetarily are considered as countable benefits.

15-3-2 Savings in Ships' Staying Costs

The volume of cargo handled at Calcutta and Haldia will increase in the future. If the increased volume were to be handled only by the existing facilities with the present (1986/87) productivity (Without case), then the number of ships waiting for berth space would increase to the point where port congestion would become a serious problem.

Implementing the project will prevent this problem. Investment in improved port facilities will reduce the waiting time for berth space and the time for loading and unloading cargo. The staying time of ships will be reduced, and this cost reduction is a major benefit of the project. Benefits that will accrue to India from the improved facilities can be calculated by comparing the "With" case versus the "Without" case.

The formula used to calculated this benefit is as follows:



15-3-2-1 Difference of Staying Time

For calculation of the total staying time (waiting time + handling time) we assumed the following prerequisites for the "With" case and "Without" case.

(1) Waiting time per ship and handling time per ship of the "Without" case are set at the present level and maximum total waiting time and handling time will be reached at the year of 1994/95 when the short term plan construction is completed.

(2) The waiting time per ship and handling time per ship of the "With" case are set at the level of 1994/95 and do not change during the project life until 2019/20.

The difference of total staying time in 1995 and 2005 between the "With" and "Without" cases is shown in Table 15-3-1.

Table 15-3-1 Total Staying Time

(Calcutta) (Unit: Days)

			Waiting Time			Handling Time			Total Staying Time		
			W/O case	With case	Difference	W/O case	With case	Difference	W/O case	With case	Difference
1995	Liquid Bulk	B.B	85.68	0.72	84.96	509.49	279.99	229.50	595.17	280.71	314.46
		No.3 B.B	9.52	2.90	6.62	56.61	31.11	25.50	66.13	34.01	32.12
		CNSD	10.64	3.66	6.98	63.27	34.77	28.50	73.91	38.43	35.48
	Dry Bulk		73.72	44.82	28.90	965.96	530.48	435.48	1,039.68	575.30	464.38
	Container		325.75	189.42	136.33	949.52	551.98	397.54	1,275.27	741.40	533.87
	General Cargo		337.26	137.77	199.49	5,026.56	4,495.26	531.30	5,398.13	4,633.03	730.79
2005	Liquid Bulk	B.B	85.68	1.31	84.37	509.49	508.74	0.75	595.17	510.05	85.12
		No.3 B.B	9.52	3.76	5.76	56.61	40.26	16.35	66.13	44.02	22.11
		CNSD	10.64	2.89	5.51	49.95	27.45	22.50	58.35	30.34	28.01
	Dry Bulk		73.72	68.42	5.30	965.96	809.68	156.28	1,039.68	878.10	161.58
	Container		216.41	125.84	90.57	630.80	366.70	264.10	670.51	492.54	354.67
	General Cargo		337.26	151.19	186.07	5,026.56	4,933.11	93.45	5,363.82	5,084.30	279.52

Table 15-3-1 Total Staying Time

(Haldia) (Unit: Days)

		Waiting Time			Handling Time			Total Staying Time		
		W/O case	With case	Difference	W/O case	With case	Difference	W/O case	With case	Difference
1995	Liquid Bulk									
	P.O.L (Crude)	28.60	16.25	12.35	32.50	15.50	17.00	61.10	31.75	29.35
	P.O.L (Crude)	23.10	13.13	9.97	26.25	11.03	15.22	49.35	24.16	25.19
	P.O.L (Product)	213.40	121.25	92.15	242.50	151.13	91.37	455.90	272.38	183.52
	Other	18.70	10.63	8.07	21.25	15.10	6.15	39.95	25.73	14.22
	Coal 25,000 DWT	90.59	68.11	22.48	306.50	60.54	245.6	397.09	128.65	268.44
	30,000 DWT	70.64	53.11	17.53	239.00	53.24	185.76	309.64	106.35	203.29
	35,000 DWT	54.86	41.25	13.61	185.61	46.89	138.72	240.47	88.14	152.33
	Fertilize/Raw Material	72.09	54.20	17.89	243.90	33.66	210.24	315.99	87.86	228.13
	Coking Coil	168.36	61.00	107.36	427.61	111.57	316.04	595.97	172.57	423.40
	Break-bulk	171.00	13.20	157.80	480.60	333.00	147.60	651.60	346.20	305.40
	Fertilizer-bagged	3.42	0.26	3.16	9.61	9.07	0.54	13.03	9.33	3.70
	Container	67.20	29.12	38.08	432.32	212.80	219.52	499.52	241.92	257.60
2005	Liquid Bulk									
	P.O.L (Crude)	38.50	21.87	16.63	43.75	18.37	25.38	82.25	40.24	42.01
	P.O.L. (Products)	258.50	146.87	111.63	293.75	183.06	110.69	552.25	329.93	222.32
	Other	57.20	187.0	38.50	65.00	21.25	43.75	122.20	39.95	82.25
	Coal 25,000 DWT	93.91	70.61	23.30	317.73	62.75	254.98	411.63	133.35	278.28
	30,000 DWT	66.22	49.79	16.43	224.07	49.90	174.17	290.29	99.69	190.60
	35,000 DWT	49.19	36.98	12.21	166.43	22.39	144.04	215.62	59.37	156.25
	Fertilize/Raw Material	72.09	72.09	0	243.90	49.06	194.84	315.99	121.15	194.84
	Coking Coil	154.56	56.00	98.56	392.56	102.42	290.14	547.12	158.42	388.70
	Break-bulk	171.00	21.78	149.22	480.60	480.60	0	651.60	502.38	149.22
	Fertilizer-bagged	3.42	0.35	3.07	9.61	9.61	0	13.03	9.96	3.07
	Container	67.20	62.40	4.80	432.32	432.32	0	499.52	494.72	4.80

(Haldia) Lock-entrance

		Waiting Time		
		W/O case	With case	Difference
1995	P.O.L (Crude)	-	-	-
	P.O.L (Products)	36.9	8.1	28.8
	Other Liquid bulk	3.3	0.7	2.6
	Coal 25,000 DWT	34.4	7.5	26.9
	30,000 DWT	39.5	6.7	32.8
	35,000 DWT	26.8	5.9	20.7
	Fertilize	10.3	2.3	8.0
	Coking Coil	11.6	2.6	9.0
	Break-bulk	11.4	2.5	8.9
	(Fertilizer-bagged)	0.2	--	0.2
	Container	42.6	9.3	33.3
2005	P.O.L (Crude)	-	-	-
	P.O.L (Products)	26.7	1.8	24.9
	Other Liquid bulk	2.3	0.2	2.1
	Coal 25,000 DWT	24.9	1.6	23.3
	30,000 DWT	22.0	1.4	20.6
	35,000 DWT	19.4	1.3	18.1
	Fertilize	7.4	0.5	6.9
	Coking Coil	8.4	0.5	7.9
	Break-bulk	8.3	0.5	7.8
	(Fertilizer-bagged)	0.1	--	0.1
	Container	30.8	2.0	28.8

15-3-2-2 Ship Staying Cost (Unit Cost)

Ship staying cost is estimated at economic prices as follows.

The following table shows the ship staying cost estimated by a Japanese shipping company.

Table 15-3-2 Ship Staying Cost

(Unit: US$/Day)

		Ship Size (DWT)	Ship Staying Cost (US$/Ship/Day)
Calcutta	Liquid Bulk	10,258	5,673
	Dry Bulk	10,288	7,087
	Container	7,624	4,790
	General Cargo	8,425	6,062
Haldia	P.O.L. (Crude)	87,000	19,894
	P.O.L. (Crude)	144,000	27,120
	P.O.L. (Product)	35,000	11,538
	Other Liquid Bulk	18,500	7,955
	Coal	25,000	10,093
		30,000	10,318
		35,000	10,543
	Fertilizer/Raw	25,000	10,093
	Coking Coal]	35,000	10,543
	Break-bulk	11,860	7,819
	Fertilizer bagged	14,286	8,254
	Container	7,409	4,717

15-3-2-3 Share of Benefits Accruing to India

The Saving in ships' staying costs are primarily realized by shipping companies. For foreign ships, therefore, the benefits accrue to foreign countries. However, some portion of these benefits should be returned to India. It is possible for India to acquire some of the benefits by, for example, increasing tariffs because the service level at the port will be improved or by decreasing freight rates reflecting the reduced incidence of delays at the port. In this study, we assume that 50 % of the benefits attributed to foreign ship operators will be transferred to the Indian economy.

The average share of Indian vessels in the country's foreign trade from 1985/86 to 1987/88 is 15 % in Calcutta Dock and 30 % in Haldia Dock. Therefore, the total benefit to the Indian economy from the reduced staying costs is the sum of the direct benefits (100%) from Indian vessels and the indirect benefits (50%) from foreign vessels.

The formula used to calculate the share of the benefit to the India is as follows:

$$\boxed{\text{Share of Benefit to India}} = \boxed{\text{Share of Indian vessels}} \times 100\% + \boxed{\text{Share of foreign vessels}} \times 50\%$$

(Calcutta) $= 0.15 \times 100\% + 0.85 \times 50\%$

$= 57.5\%$

(Haldia) $= 0.30 \times 100\% + 0.70 \times 50\%$

$= 65.0\%$

15-3-2-4 Calculation Result (Saving in Ship's Staying Costs)

Table 15-3-3 Shows the savings in ships' staying costs.

(Calcutta)

	Staying cost ($ 1,000)		57.5% of staying cost ($ 1,000)		57.5% of staying cost (Rs. million)	
	1995	2005	1995	2005	1995	2005
Liquid Bulk	2,167	767	1,246	441	16.8	6.0
Dry Bulk	3,291	1,145	1,892	658	25.5	8.9
Container	2,557	1,699	1,470	977	19.9	13.2
General Cargo	4,430	1,694	2,547	974	34.4	13.2

(Haldia)

	Staying cost ($ 1,000)		65.0% of staying cost ($ 1,000)		65.0% of staying cost (Rs. million)	
	1995	2005	1995	2005	1995	2005
P.O.L. (Crude)						
87,000 DWT	584	-	380	-	5.1	-
150,000 DWT	683	1,139	444	741	6.0	10.0
P.O.L. (Product)	2,117	2,565	1,376	1,667	18.6	22.5
Other Liquid Bulk	113	654	74	425	1.0	5.7
Coal 25,000 DWT	2,709	2,809	1,761	1,826	23.8	24.7
30,000 DWT	1,837	1,722	1,194	1,120	16.1	15.1
35,000 DWT	1,606	1,647	1,044	1,071	14.1	14.5
Fertilizer/Raw	2,303	1,967	1,497	1,279	20.2	17.3
Coking Coal	4,464	4,098	2,902	2,664	39.2	36.0
Break-bulk	2,388	1,167	1,552	759	21.0	10.2
Fertilizer bagged	31	25	20	16	0.3	0.2
Container	1,215	23	790	15	10.7	0.2

(Haldia) Lock-entrance

	Staying cost ($ 1,000)		65.0% of staying cost ($ 1,000)		65.0% of staying cost (Rs. million)	
	1995	2005	1995	2005	1995	2005
P.O.L. (Product)	332.3	287.3	216.0	186.7	2.9	2.5
Other Liquid Bulk	20.7	16.7	13.4	10.9	0.2	0.2
Coal 25,000 DWT	271.5	235.2	176.5	152.9	2.4	2.1
30,000 DWT	296.4	186.2	192.7	121.0	2.6	1.6
35,000 DWT	218.2	190.8	141.9	124.0	1.9	1.7
Fertilizer/Raw	80.7	69.6	52.5	45.3	0.8	0.6
Coking Coal	94.9	83.3	61.7	54.1	0.8	0.7
Break-bulk	69.6	61.0	45.2	39.7	0.6	0.5
Fertilizer bagged	1.7	0.8	1.1	0.5	-	-
Container	157.1	135.8	102.1	88.3	1.4	1.2

15-3-3 Saving Time Costs by Detour of Ship Cargo

As stated at "15-3-2-1 Difference of Staying Time", maximum total waiting time of without case will be reached at the year of 1994/95. On the without case calling ships after 1994/95 beyond number of calling ships at the year of 1994/95 will call at other ports, say Paradeep, instead of calling at Calcutta/Haldia. Therefore ship cargo conveyed from/to other port will cost higher than with case. This is also benefits of saving time costs by detour of ship cargo. For the calculation of this benefit the following assumptions are set up.

(1) Ships beyond the number of calling ships at the year of 1994/95 will call at Paradeep (Distance from Calcutta to Paradeep is about 115 km)

(2) Ship cargo from/to Paradeep will be conveyed by train.
(Freight cost by train: Rs. 0.6/ton/km for liquid cargo and Rs. 0.23/ton/km for dry bulk cargo and general cargo).

Thus the benefit of saving time costs by detour of ship cargo is calculated as follows.

Table 15-3-4 Saving Time Costs by Detour of Ship Cargo

		Cargo Volume ('000 tonnes)			Cargo from/to Paradeep ('000 tonnes)		Freight Cost (Rs/ton/km)	Distance from/to Paradeep (km)	Saving Costs (Million Rs.)	
		1995	2000	2005	2000-1995	2005-1995			2000	2005
Calcutta	Liquired Cargo	1,210	1,845	2,495	635	1,285	0.60	115	43.8	88.7
	Dry Cargo	610	905	1,070	295	460	0.25	115	8.5	13.2
	General Cargo*	2,210	2,365	3,270	155	1,060	0.25	115	4.5	30.5
Haldia	Fertilizer/Raw Material for Fertilizer	555	1,380	1,835	825	1,280	0.25	115	23.8	36.9
	Break-bulk	300	405	495	105	195	0.25	115	3.0	5.6
	Container	405	710	3,283	305	2,878	0.25	115	8.8	82.9

Note: (*) except container Cargo

According to CPT information, around 1.54 million tonnes of coking coal per annum was imported by SAIL for the steel plants of Durgapore, IISCO, Bokaro and Rourkella located in the hinterland of Calcutta and Haldia. Only 0.5 million tonnes of this cargo was routed through Haldia and residual 1.04 million tonnes of the cargo was routed through Paradip and Vizag. When the cargo through Paradip and Vizag was moved to Haldia, the estimated possible savings by routing traffic through Haldia will be Rs 56.2 million per annum (the estimated possible savings per tonne is Rs 54).

After completion of Short-Term Development Plan in 1994/95, Haldia can handle 1.8 million tonnes of coking coal ("with" case). As stated at 15-2-2 "Without Case", there is change in 1994/95 to present existing facilities and operational efficiency levels. Therefore at "Without" case, Haldia dock system handles 0.5 million tonnes of coking coal in 1994/95 onwards. Thus the estimated possible saving by routing the traffic through Haldia in 1994/95 onwards are approximately Rs. 70 million per annum.

15-3-4 Saving in Time Costs

The reduction of staying time due to the implementation of the project brings about a remarkable reduction in the time required for imports and exports. By the reduction of staying time, the importer/exporter can collect funds faster and have more opportunity to invest the money in other activities and thus the importer/exporter can earn more profit from this working capital. If the reduced time is converted into monetary terms, it can be estimated using the following equation:

$$STC = Q \times D \times V \times I/365$$

Where, Q : Average parcel size (tons/ship)
D : Reduction of ships' staying time (days)
V : Average cargo value (US$/ton)
I : Interest rate of funds (%/year)

Table 15-3-5 presents the estimated saving in time costs by imports and exports.

Reduction of ship staying time includes the reduction of waiting time at the lock-entrance.

Table 15-3-5 Saving in Time Costs

(Calcutta)

Year	Cargo	Average Percel Size (Ton/vessel)	Cargo Value (Rs/Ton)	Interest Rate (%/Year)	Reduction of Ship Staying Time (Days)	Saving of Time Costs (Million Rs)
1	Liquid Cargo	6,405	3,951	8.0	382.1	2.12
9	Dry Bulk Cargo	8,024	6,780	8.0	464.4	5.54
9	Container Cargo	3,885	22,934	8.0	533.9	10.43
5	General Cargo	4,785	22,934	8.0	730.8	17.58
2	Liquid Cargo	7,905	3,951	8.0	135.2	0.93
0	Dry Bulk Cargo	9,259	6,780	8.0	161.6	2.22
0	Container Cargo	4,835	22,934	8.0	354.7	8.62
5	General Cargo	5,735	22,934	8.0	279.5	8.06

(Haldia)

Year	Cargo	Average Percel Size (Ton/vessel)	Cargo Value (Rs/Ton)	Interest Rate (%/Year)	Reduction of Ship Staying Time (Days)	Saving of Time Costs (Million Rs)
	P.O.L (Crude)	50,000	2,750	8.0	29.4	0.89
1	P.O.L (Crude)	63,000	2,750	8.0	25.2	0.97
	P.O.L (Product)	28,000	2,750	8.0	212.3	3.58
	Other Liquid Bulk	17,000	7,516	8.0	16.8	0.47
9	Coal 25,000 DWT	29,500	560	8.0	295.3	1.07
	30,000 DWT	26,000	560	8.0	236.1	0.75
	35,000 DWT	23,000	560	8.0	173.2	0.49
9	Fertilize/Raw Material	10,000	6,780	8.0	236.1	3.51
	Coking Coal	29,500	932	8.0	432.4	2.61
	Break-bulk	5,000	22,934	8.0	314.3	7.90
5	Fertilizer(bagged)	11,000	6,780	8.0	3.9	0.06
	Containers	1,800	22,934	8.0	290.9	2.63
						24.93
2	P.O.L (Crude)	75,000	2,750	8.0	42.0	1.90
	P.O.L (Product)	32,000	2,750	8.0	247.2	4.77
	Other Liquid Bulk	17,000	7,516	8.0	84.4	2.36
0	Coal 25,000 DWT	32,500	560	8.0	301.6	1.20
	30,000 DWT	27,500	560	8.0	211.2	0.71
	35,000 DWT	23,000	560	8.0	174.4	0.49
0	Fertilize/Raw Material	23,000	6,780	8.0	201.7	6.89
	Coking Coil	32,000	932	8.0	396.6	2.59
	Break-bulk	5,000	22,934	8.0	157.0	3.95
5	Fertilizer(bagged)	11,000	6,780	8.0	3.2	0.05
	Containers	1,950	22,934	8.0	33.6	0.33
						25.24

15-4 Costs

Construction costs, repair and maintenance costs, operation costos and administration costs are the costs considered in this section.

15-4-1 Construction Costs

The construction costs, estimated at market prices, are shown in Chapter 13 (13-7 Construction Costs). These costs are divided into the categories of foreign currency items, skilled labour, unskilled labour and others (customs, duties and sales tax).

Tables 15-4-1, 15-4-2 and 15-4-3 show the construciton costs of the study.

15-4-2 Repair and Maintenance Costs and Operation Costs

The repair and maintenance costs and operation costs per year for the facilities are assumed to be the following rate of the original investment.

Repair/Maintenance Costs and Operation Costs

Items	Repair/Maintenance Rate (%)	Operation Rate (%)
1. Civil Engineering Works	1	-
2. Mechanical Works		
Quayside Crane	2	1
R.T.G. Crane	4	3
Forklift/Tractor/Mobil Crane	8	3
Chassis	2	1
Locomotive	4	3
Yard Crane	2	1
Craft/Vessel	5	3
3. Electrical Works	4	3

Table 15-4-1 Construction Costs at Market Prices

(Unit: Million Rs)

		Total Cost	Labour Fee				Material/Equipment			Miscellaneous
			Unskilled Labour	Skilled Labour	Foreign Labour	Total Labour Fee	Imported	Domestic	Total	
CALCUTTA	Replacement of Swing Bridge	52.0	10.0	2.0	3.0	15.0	20.0	10.0	30.0	7.0
	Railway Works	80.9	4.1	2.7	7.1	13.9		56.1	56.1	5.9
	Rehabilitation Works	306.4	25.1	18.7	29.5	73.3	32.0	165.2	197.2	35.9
	CFS	29.6	4.5	2.5	2.3	9.3	2.7	12.6	15.3	5.0
	Cargo Handling Equipment	331.7						326.2	326.2	5.5
	Port Service Vessels	270.0	2.3	2.9	6.0	11.2	218.5	36.5	255.0	3.8
	Sub - total	1,070.6	46.0	28.8	47.9	122.7	273.2	611.6	884.8	63.1
HALDIA	Container Berth	170.0	26.0	10.0	12.0	48.0	20.0	80.0	100.0	22.0
	Waiting Berth	2.2	0.4	0.2	0.2	0.8	0.8	0.3	1.1	0.3
	Multi-purpose Berth	187.0	29.0	10.8	13.2	53.0	22.0	84.2	106.2	27.8
	Lighting for navigation	17.7	2.0	1.0	3.0	6.0		9.0	9.0	2.7
	Yard Works	197.2	25.9	16.0	15.6	57.5	7.0	87.8	94.8	44.9
	Railway Works	120.6	6.5	5.5	9.6	21.6		86.3	86.3	12.7
	Capital Dredging	22.3	3.8	2.0	5.3	11.1		7.8	7.8	3.4
	Parking Basin for small crafts	26.4	6.0	4.0	2.0	12.0	4.0	6.4	10.4	4.0
	Slip way, Workshop for small crafts	17.3	3.0	2.0	2.0	7.0	3.0	4.3	7.3	3.0
	Jetty in River	21.8	4.0	3.0	2.0	9.0	3.5	5.3	8.8	4.0
	Cargo Handling Equipment	358.3	4.1	2.4	5.0	11.5	148.4	194.9	343.3	3.5
	Port Service Vessels	526.3	1.9	3.4	8.3	13.6	503.5	4.6	508.1	4.6
	Sub - total	1,667.1	112.6	60.3	78.2	251.1	721.2	570.9	1,283.1	132.9
	Channel Navigation System	172.5	10.5	5.7	13.4	29.6	109.6	22.0	131.6	11.3

Table 15-4-2 Annual Construction Costs at Market Prices

(Unit: Million Rs)

		Total Cost	1990/91	1991/92	1992/93	1993/94	1994/95
CALCUTTA	Replacement of Swing Brid	52.0		12	18	18	4.0
	Railway Works	80.9	1.5	8.6	57.2	13.6	
	Rehabilitation Works	306.4	20.8	85.9	129.8	69.9	
	CFS	29.6		29.6			
	Cargo Handling Equipment	331.7	28.0	82.2	36.0	145.5	40.0
	Port Service Vessels	270.0		127.0	96.0	47.0	
	Sub - total	1,070.6	50.3	345.3	337.0	294.0	44.0
HALDIA	Container Berth	170.0			90.0	80.0	
	Waiting Berth	2.2					
	Multi-purpose Berth	187.0		72.0	90.0	25.0	
	Lighting for navigation	17.7	17.7				
	Yard Works	197.2	27.0	30.0	30.0	110.2	
	Railway Works	120.6	14.0	64.8		41.8	
	Capital Dredging	22.3				22.3	
	Parking Basin for small crafts	26.4	13.2	13.2			
	Slip way, Workshop for small crafts	17.3		17.3			
	Jetty in River	21.8		21.8			
	Cargo Handling Equipment	358.3	17.1	95.5	29.1	216.5	
	Port Service Vessels	526.3		98.1	193.0	235.2	
	Sub - total	1,667.1	89.0	412.7	432.1	733.3	
	Channel Navigation System	172.5		44.5	117.6	10.4	-
	Consulting service + Physical Contingencies	378.3	18.1	104.3	115.3	134.9	5.7
	Grand Total	3,288.5	157.4	906.8	1,002.0	1,172.6	49.7

Table 15-4-3 Construction Costs under "With" case and "Without" case

(Calcutta)

Item		Cost (Million Rs.)		
		(A) With Case	(B) Without Case	Difference (A)-(B)
Replacement of Swing Bridge		52.0	-	52.0
Railway Works	Track, Pavement, etc.	20.9	-	20.9
	Locomotive	60.0	50.0	10.0
Rehabilitation Works	Pavement, Utilities	175.2	-	175.2
	Fender System	50.2	50.2	-
	Communication	20.0	20.0	-
	Dock Gate	21.0	21.0	-
	Replacement of existing rail	40.0	-	40.0
Replacement of Hide Bridge		3.3	3.3	-
CFS		29.6	-	29.6
Handling Equipment	Forklift, Transfer, Crane, Chassis, Yard Crane, Tractor	255.2	-	255.2
	Mobile Crane	76.5	38.0	38.5
Port Service Vessels		270.0	-	270.0
Total		1,070.6	157.2	913.4

.(Haldia)

Item		Cost (Million Rs.)		
		(A) With Case	(B) Without Case	Difference (A)-(B)
Container Berth		170.0	-	170.0
Waiting Berth		2.2	-	2.2
Multi-purpose Berth		187.0	-	187.0
Lighting for Navigation		17.7	-	17.7
Yard Works		197.2	-	197.2
Railway Works	Yard, Container Loading	45.6	-	45.6
	Terminal Locomotive	75.0	50.0	25.0
Capital Dredging		22.3	-	22.3
Parking Basin & Jetty		26.4	26.4	-
Slipway, Workshop for small Crafts		17.3	-	17.3
Jetty in River		21.8	-	21.8
Cargo Handling Equipment	Mobile crane	14.5	4.0	10.5
	Other	343.8	-	343.8
Port Service Vessels		526.3	-	526.3
Total		1,667.1	80.4	1,586.7
Channel Navigation System		172.5	-	172.5
Grand Total		1,839.6	80.4	1,759.2

15-4-3 Administration Costs

The administration costs per year are assumed to be 20 percent of the operation and service at CPT.

Table 15-4-4 Administration Costs

(Unit: Million Rs., %)

	1987/88 Actual	1988/89 Revised Estimates
1. Direct cost of Operation Depts	638.4	686.3
2. Direct cost of Service Depts	490.5	574.3
3. Administration Depts	222.0	242.9
Total	1,350.0	1,503.5
Percentage 3/(1+2)	19.7	19.3

15-5 Economic Pricing

15-5-1 Methodology

The purpose of the economic analysis is to examine the value of a project, that is to see if it represents an efficient allocation of resources. The values of goods quoted at a given market price do not always represent the true value of those goods to the nation. Thus, planners often use "economic pricing" to examine the costs of labor, capital, and imported goods, as well as the benefits of development, to evaluate a project from the economic viewpoint.

All the costs and benefits examined in previous sections have been calculated based on market prices (world prices and domestic prices). There are several ways of applying the concept of economic pricing, but in this study, the prices of domestic goods and service are revised to border prices in an effort to determine a more rational valuation. In general, these border prices are intended to represent the international market value, or world prices, of these goods and services.

The market prices are changed to border prices using various conversion factors (C.F.). Specifically, transfer items are excluded and the concept of economic pricing is applied selectively.

15-5-2 Exclusion of Transfer Items

In the figures given construction costs in Sec. 15-4-1 above, the foreign currency portion of imported materials and services do not include import duties or sales taxes. Thus, these figures are a reasonable statement of the economic value of these goods and services.

On the other hand, the local currency portion of the construction costs include both sales tax and import duties. These are merely transfer items which do not actually reflect the consumption of any national resources. Therefore, these transfer costs should be excluded from the economic analysis of the value of the project.

15-5-3 Method for Converting to Economic Prices

In general, all the costs and benefits are divided into three categories: labor, tradable goods and non-tradable goods. Labor is further classified in skilled labor and unskilled labor. As for skilled labor, the economic price is determined by multiplying the market wage by the conversion factor for consumption. On the other land, the economic price of unskilled labor is determined by multiplying the nominal wage by the shadow wage rate and the conversion factor for consumption.

The prices of tradable goods are expressed in CIF values for import goods and by the F.O.B. value for export goods. These are actual border prices. However, as the border value of non-tradable goods cannot be converted directly, the border value of the inputs needed to produce the non-tradable goods is considered. The Standard Conversion Factor (SCF) is applied to non-tradable goods. The method of applying conversion factors is shown in the following Table.

Item	Border Prices (MP: Market Price)
Skilled Labour	MP x CFC (Conversion Factor for Consumption)
Unskilled Labour	Norminal Wage Rate x Shadow Wage Rate x CFC
Imported Goods	CIF (Imports) x 1.0
Exported Goods	FOB (Exports) x 1.0
Non-Tradable Goods (Local Material/ Equipment)	MP x SCF (Standard Conversion Factor)

15-5-4 Calculation of Conversion Factors

(1) Standard Conversion Factor (SCF)

Import duties and export subsidies create a price differential between the domestic market and the international market. For the purpose of analysing benefits and costs within the domestic market, the standard conversion factor is applied in order to convert domestic market prices to border prices.

The standard conversion factor is the reciprocal of the shadow exchange rate, and is obtained by the following formula.

$$SCF = \frac{1}{\text{Shadow Exchange Rate}}$$

According to CPT information, the shadow exchange rate in India is set as 1.25 because CPT recommends the application of the shadow value of foreign exchange as 25 %. Therefore in this study the "Standard Conversion Factor" (SCF), 0.80 is adopted.

$$SCF = \frac{1}{1.25} = 0.80$$

(2) Conversion Factor for Consumption (CFC)

This factor is used for converting the prices of consumer goods from domestic market prices to border prices. This is required to convert domestic labour costs to the corresponding border prices. In this study, the conversion factor for consumption is set as equivalent to the standard conversion factor.

$$CFC = SCF = 0.80$$

(3) Conversion Factor for Skilled Labour

The cost of skilled labour is calculated based on actual market wages, assuming that the market mechanism is functioning properly. However, as these are domestic costs, they are converted to border prices by multiplying the local wage by the conversion factor for consumption (CFC). Thus, the conversion factor for skilled labour

= (Local Market Wage Rate) x (CFC)
= 1 x (CFC)
= (CFC)
= 0.80

(4) Conversion Factor for Unskilled Labour

The costs of unskilled labour does not always reflect a correct measure of the real cost of the labour because of minimum wage and other regulations. In an economy marked by extensive unemployment or unemployment, the real costs of labour used in the project may be less than actual wage rates. Therefore the cost of unskilled labour should be calculated at less than the actual wage rate.

When a project is conducted, the inflow of unskilled labour to the project is mainly from the agricultural sector which is relatively elastic in its use of labour. Therefore it is proper that the cost of unskilled labour be set as equivalent to the income level (Opportunity cost) of workers in the agricultural sector.

Thus, the conversion factor for unskilled labour

= (Norminal wage) x 0.688 x (CFC)

= 1 x 0.688 x 0.80

= 0.55

Table 15-5-2

	Unit	GDP	Agricultural Sector
Amount at 1970/71 price	Crores Rs.	50,705	21,103
Number of workers	Lahk persons	2,466	1,480
Per capita	R.s.	2,073	1,426

Source: India A Statistical Outline 1987

15-5-5 Conversion Factors for Costs and Benefits

(1) Construction Costs

The following factors are applied to project cost estimate.

Labour:	Unskilled Labour (Domestic)	0.55
	Skilled Labour (Domestic)	0.80
	Skilled Labour (Foreign)	1.00

Material/Equipment:	Imported	1.00
	Domestic	0.80

(2) Maintenance Costs : 0.80

Maintenance costs includes various indefinite elements. Therefore the conversion factor is estimated as equal to the SCF: 0.80.

(3) Saving s in Ships' Staying Costs : 1.00

The calculation of the savings in ships' staying costs is based on charter rates quoted at world prices. Thus, this figure does not need to be converted to economic prices.

(4) Savings in Time Costs : 1.00

Since time costs are based on F.O.B. and C.I.F., time costs do not need to converted to economic prices.

15-5-6 Construction Costs at Economic Prices

Table 15-5-3 and 15-5-4 show the construction costs at economic prices based upon the above conversion factor.

Table 15-5-3 Construction Costs at Economic Prices

(Unit: Million Rs)

		Total Cost	Labour Fee				Material/Equipment			Miscellaneous
			Unskilled Labour	Skilled Labour	Foreign Labour	Total Labour Fee	Imported	Domestic	Total	
CALCUTTA	Replacement of Swing Bridge	39.1	5.5	1.6	3.0	10.1	16.6	7.3	23.9	5.1
	Railway Works	22.7	1.7	1.4	2.1	5.2	-	15.4	15.4	2.1
	Rehabilitation Works	159.6	12.4	13.4	21.0	46.8	-	94.1	94.1	18.7
	CFS	21.8	2.5	2.0	2.3	6.8	2.2	9.2	11.4	3.6
	Cargo Handling Equipment	213.8	-	-	-	-	-	209.8	209.8	4.0
	Port Service Vessels	236.6	1.3	2.3	4.8	8.4	198.8	26.6	225.4	2.8
	Sub - total	693.6	23.4	20.7	33.2	77.3	217.6	362.4	580.0	36.3
HALDIA	Container Berth	125.1	14.3	8.0	12.0	34.3	16.6	58.2	74.8	16.0
	Waiting Berth	1.7	0.2	0.2	0.2	0.6	0.7	0.2	0.9	0.2
	Multi-purpose Berth	137.5	16.0	8.6	13.2	37.8	18.2	61.3	79.5	20.2
	Lighting for navigation	13.5	1.1	0.8	3.0	4.9	-	6.6	6.6	2.0
	Yard Works	145.0	14.2	12.8	15.6	42.6	5.8	63.9	69.7	32.7
	Railway Works	51.3	2.9	3.4	4.5	10.8	-	33.7	33.7	6.8
	Capital Dredging	17.2	2.1	1.6	5.3	9.0	-	5.7	5.7	2.5
	Slip way, Workshop for small crafts	13.1	1.7	1.6	2.0	5.3	2.5	3.1	5.6	2.2
	Jetty in River	16.3	2.2	2.4	2.0	6.6	2.9	3.9	6.8	2.9
	Cargo Handling Equipment	273.7	2.3	1.9	5.0	9.2	123.0	139.0	262.0	2.5
	Port Service Vessels	476.8	1.0	2.7	8.3	12.0	458.2	3.3	461.5	3.3
	Sub - total	1,271.2	58.0	44.0	71.1	173.1	627.9	378.9	1,006.8	91.3
	Channel Navigation System	143.7	5.8	4.6	13.4	23.8	95.7	16.0	111.7	8.2
	Grand Total	2,108.5	87.2	69.3	117.7	274.2	941.2	757.3	1,698.5	135.8

Table 15-5-4 Annual Construction Costs at Economic Prices

(Unit: Million Rs)

		Total Cost	1990/91	1991/92	1992/93	1993/94	1994/95
CALCUTTA	Replacement of Swing Brid	39.1		8.4	14.0	14.0	2.7
	Railway Works	22.7	0.4	2.4	16.1	3.8	
	Rehabilitation Works	159.6	10.8	44.8	67.6	36.4	
	CFS	21.8		21.8			
	Cargo Handling Equipment	213.8	18.0	53.0	23.2	93.8	28.5
	Port Service Vessels	236.6		111.3	84.1	41.2	
	Sub - total	693.6	29.2	241.7	205.0	189.2	28.5
HALDIA	Container Berth	125.1			66.5	58.6	
	Waiting Berth	1.7				1.7	.0
	Multi-purpose Berth	137.5		53.2	66.5	17.8	
	Lighting for navigation	13.5	13.5				
	Yard Works	145.0	19.2	21.4	21.4	83.0	
	Railway Works	51.3	6.0	27.5		17.8	
	Capital Dredging	17.2				17.2	
	Slip way, Workshop for small crafts	13.1		13.1			
	Jetty in River	16.3		16.3			
	Cargo Handling Equipment	273.7	13.1	72.9	22.3	165.4	
	Port Service Vessels	476.8		88.9	174.8	213.1	
	Sub - total	1,271.2	51.8	293.3	351.5	574.6	
	Channel Navigation System	143.7		37.0	98.0	8.7	-
	Consulting service + Physical Contingencies	274.1	10.5	74.4	85.1	100.4	3.7
	Grand Total	2,382.6	91.5	646.4	739.6	872.9	32.2

15-6 Evaluation

15-6-1 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

The calculation results are shown in Appendix 15-6-1.

15-6-2 Results

The EIRR of the Short-term Plan is calculated as 18.88 %. The leading view is that a project is feasible if the EIRR exceeds the opportunity cost of capital, which is estimated to be 12 % in developing countries according to the IBRD and the ADB.

According to this standard, this project is considered feasible.

15-7 Sensitivity Analysis

15-7-1 Identification of Cases

In order to see if the project is still feasible when some factors are varied, several cases are examined as follows.

Case A: The construction costs are increased by 10%.

Case B: The benefits are decreased by 10%.

Case C: The construction costs are increased by 10% and the benefits are decreased by 10%.

15-7-2 Results

The results of the sensitivity tests are shown in Table 15-6-1.

Table 15-6-1 Sensitivity Analysis for EIRR

Case	(%) EIRR
Base Case	18.88
Case A: Increase in Costs by 10%	16.79
Case B: Decrease in Benefits by 10%	16.58
Case C: Increase in Costs by 10% and Decrease in Benefits by 10%	14.67

Chapter 16 Financial Analysis

16-1 Purpose of the Analysis

The purpose of the financial analysis is to examine the viability of the project itself and the financial soundness of CPT during the project life.

The viability of the project itself is analyzed using the Financial Internal Rate of Return calculated by means of the Discount Cash Flow Method.

The financial soundness of CPT is appraised using the projected financial statements and some indices calculated based on them.

16-2 General Prerequisites of the Analysis

(1) Project Life

Based on the same reasons as for the economic analysis, the project life for the financial analysis is determined as 30 years consisting of 5 years of detailed design and construction and 25 years of operation.

(2) Base Year

For the estimation, all costs, expenses and revenues analyzed here are indicated in prices as of 1988 when the price survey was conducted. Neither inflation of prices nor the nominal increase of salaries are considered during the project life.

(3) Traffic Volume

The traffic volume which can be handled through the proposed project, i.e. the "With Case", is assumed to reach the maximum volume at the beginning of 1997/98 when the following construction program of main port facilities will be completed, and the same volume will be handled continuously thereafter.

In the "Without Case", it is assumed that the traffic handling capacity will reach the limit at the beginning of the planning period, 1990/91.

(4) Costs Expenses

1) Investment

The initial investment is estimated in Chapter 13 and the impact of the import duties will be examined in each case as described in the next section.

2) Re-investment

The facilities and equipment will be renewed based on their service lives which are shown in Appendix A-16-2-2. The expenditures for renewal are considered as re-investments and financed by CPT's internal resources.

3) Maintenance and Repair Expenses

The annual maintenance and repair costs for the facilities and equipment are calculated based on fixed proportions of the original construction or procurement costs. The fixed proportions are also shown in Chapter 15.

4) Administration Expenses

The administration expenses are estimated as 20 % of the total of the operation and the maintenance/repair expenses based on the actual costs and revised estimastes of CPT in 1987/88 and 1988/89. The calculation result is shown in Table 15-4-4.

5) Depreciation

The annual depreciation costs of the proposed project are calculated by the straight line method based on their service lives, which are shown in Appendix A-16-2-2. Residual values after depreciation are neglected except for the residual values of the project related items at the end of the project life.

16-3 Viability of the Project Itself

(1) Bases for the Appraisal

1) FIRR

The viability of the project is analyzed based on the Discount Cash Flow Method and appraised by the FIRR which makes the costs and the benefits during the project life equal, and the FIRR is calculated using

the following formula:

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

where n : Project life
Bi : Benefit in the i-th year
Ci : Cost in the i-th year
r : Discount rate

2) Costs and Benefits which are taken into account for the calculation of the FIRR are summarized as follows:

Cost	Benefit
. Initial investment cost including re-investment for renewal	. Residual value of the fixed assets at the end of the project life
. Operating cash expenses	. Port operating revenue

3) Costs and Benefits which are exempted from the calculation of the FIRR are summarized as follows:

Cost	Benefit
. Depreciation cost	. Fund management income
. Repayment of the loan principal	
. Interest on loans	

Benefits generated from and costs required for the on-going projects such as the construction of the Container Park at D - NSD, 2nd Oil Jetty and the Strengthening of the Existing Oil Jetty at Haldia are also exempted from the calculation.

(2) Scenarios

In order to examine the impact of various factors on the FIRR, the

following conditions are set up.

1) Import Duty

(a) Assumed to be nil on sea-going craft/vessels and 90 % on other items imported for use on the project,

(b) No tax will be levied on items related to the construction of container handling facilities and equipment as well as craft/vessels, and

(c) A 90 % import duty will be levied on all items

2) Personnel Cost

(a) The personnel cost of CPT's officers and staff is assumed to remain at the level of 1988/89 as a whole. However, the recent decision that the salaries will be increased by 15% from 1.1.1988 retroactively is included, and

(b) The personnel cost of CPT will be reduced based on the plan for the reduction of manpower at the Calcutta Dock System, but increased based on the Team's plan for the Haldia Dock System.

3) Tariff Increase

Three cases are considered as follows:

(a) No tariff increase during the Short Term Development Plan period,

(b) 4 % every 2 years during the plan period, and

(c) 10 % every 2 years during the plan period.

Based on the scenarios above, the following case is set up as the "Base Case".

Base Case: Import Duty = 0 % on craft/vessels and 90 % on other items,
Personnel cost = No reduction
Tariff = No increase

And the calculation results of other scenarios are compared with the "Base Case" so as to examine the impact of each factors on the FIRR.

(3) Results

Based on the prerequisites of the financial analysis and the viability of the project, the FIRR of the "Base Case" is calculated as 12.14%.

In the case that a 90 % import duty is levied on all items except craft/vessels and container related facilities equipment (Case (b) of 1), (a) of 2) and (a) of 3)), the FIRR increases by 0.85 point and in the case that a 90 % import duty is levied on all items (Case (c) of 1), (a) of 2) and (a) of 3)), it decreases by 2.68 point.

Similarly, in the case that the port charges increase 4 % every two years (Case (a) of 1), (a) of 2) and (b) of 3)), the FIRR increases by 1.23 point and in the case that the port charges increase 10 % every two years (Case (a) of 1), (a) of 2) and (c) of 3)), it increases by 3.07 point.

In the case that the personnel cost is reduced (Case (a) of 1), (b) of 2) and (a) of 3)), the FIRR increases by 3.74 point.

Thus, the strength of impact of each factor on the FIRR is as follows:

1st : Reduction of manpower

2nd : 10 % (Twice) increase of tariff

3rd : 4 % (Twice) increase of tariff

4th : No import duty on container related facilities/equipment as well as craft/vessels

Table 16-3-1 Impact of Manpower/Tariff/Duty on FIRR

(a) of 2) No reduction in personnel cost				(b) of 2) Reduction in personnel cost			
(a) of 3) Tariff increase 0%	1) Import Duty	(a) 0,90	12.14	(a) of 3)	1)	(a)	15.92
		(b) 0,0,90	12.99			(b)	17.01
		(c) 90,90	9.46			(c)	12.56
(b) of 3) Tariff increase 4% x 2	1) Import Duty	(a)	13.37	(b) of 3)	1)	(a)	17.12
		(b)	14.27			(b)	18.26
		(c)	10.53			(c)	13.58
(c) of 3) Tariff increase 10% x 2	1) Import Duty	(a)	15.21	(b) of 3)	1)	(a)	18.95
		(b)	16.19			(b)	20.18
		(c)	12.13			(c)	15.13

16-4 Financial Soundness of CPT

(1) Bases for the Appraisal

1) Indices

The financial soundness of CPT is appraised using the following indices calculated based on the projected financial statements.

- Working Ratio and Operating Ratio for the appraisal of the soundness of continuing operations
- Return on Net Fixed Assets for the assessment of the earning power
- Debt service Ratio for the evaluation of the debt repayment ability

2) Assumptions

The present moratorium which covers Rs. 135.0553 crores and Rs. 28.9800 crores of Haldia and Channel Dredging Loans respectively is assumed to be continued during the project life.

The debenture loans are assumed to be repaid at the date of maturity and not converted.

(2) Scenarios

In order to examine the impact of various factors on the indices employed, the following conditions are set up.

1) Fund raising Plan

(a) Necessary fund for the project is covered by the Government loans (Interest rate: 10.5 %, Grace period : 5 years and Repaymend period : 20 years)

(b) Foreign portion of the construction cost is covered by a soft loan (44 % of total fund, Interest rate : 3 %, Grace period 10 years, Repayment period : 20 years) and the rest is covered by the Government loans (Weighted average interest rate : 7.2 %)

2) Conversion of the existing loans

Total amount of 47.5 crores of the Government loans which cover the 9th Loan on the 112th Loan except the loans covered by the moratorium is assumed to be converted into the equity.

3) Personnel Cost

The same conditions adopted for the calculation of the FIRR are used.

(3) Results

Regarding Working Ratio, Operating Ratio and Rate of Return on Net Fixed Assets, there is no serious problem of the financial performance of CPT even if all the funds is covered by the Government Loan of 10.5 % interest rate.

However, Debt Service Ratio indicates the burden of past financial performance of CPT. Table 16-4-1 shows the calculation results of Return on Net Fixed Assets using some factors aforementioned.

Table 16-4-1 Comparison of Calculation Results

Case	Manpower	Average Interest Rate	Conversion	Accumulated DSR
1	No reduction	10.5 %	Done	1.22
2	Reduction	7.2 %	Not done	1.74
3	Reduction	10.5 %	Done	1.49

Both in Case 1 and Case 3, accumulated Debt Service Ratio indicates the difficulty of debt repayment and DSR of Case 2 shows the preferable level. The calculation results of other cases are shown in Table 16-4-2.

16-5 Sensitivity Analysis

Sensitivity analysis is made for the following 3 cases.

Case A : The project cost increases by 10 %

Case B : The revenue decrease by 10 %

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

The FIRR is computed for each of the cases mentioned above and results are as follows:

Case A : 10.26 %

Case B : 10.10 %

Case C : 8.64 %

16-5 Conclusion

The calculation results of the FIRR indicate the feasibility of the proposed project itself but the debt repayment ability of CPT is critical.

Therefore, following points should be taken into account in order to improve the projected financial situation of CPT, then the project can be regarded as feasible as a whole.

(1) It would be advisable for the Government of India to sanction CPT a concessional rate of loans as well as continuation of present moratorium.

(2) CPT should put forth it's best endeavors to reduce the present manpower strength including the redeployment of it's employees. The scale of rates should also be increased to the possible extent taking into account the trends of neighboring ports.

The financial arrangement for port development in Japan is attached to Appendix 16-1.

Table 16-4-2 Calculation Results of Other Cases

	Manpower Reduction	Average Interest Rate	Tariff Increase (10% x 2)	Conversion of 475MRs	Accumulated DSR
	○	7.2 %	○	○	2.87
	○	7.2 %	○	×	2.72
	○	10.5 %	○	×	2.26
	○	7.2 %	×	○	1.85
Case 2	○	7.2 %	×	×	1.74
	×	7.2 %	×	○	1.55
Case 3	○	10.5 %	×	○	1.49
	×	7.2 %	×	×	1.46
	×	* 10.5 %	×	×	1.42
Case 1	×	10.5 %	×	○	1.22
	×	10.5 %	×	×	1.16

* 20% of initial investment is assumed to be covered by CPT's internal resources.